Can human values explain one's interest in cryptocurrencies? An explorative study in Germany

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Abstract

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Introduction

Cryptocurrencies are digital money, and much more. The idea of cryptocurrency has developed recently, in 2009, when a person or a group of people known as Satoshi Nakamoto have launched a novel currency that was entirely digital and based on a chain of mathematical algorithms. Their vision was one in which the centralized financial system as we know it can one day be de-centralized in that financial transactions will be possible directly between involved parties. The idea was a simple one: by eliminating the role of banks and governmental bodies that secure trust in financial transactions, unnecessary taxes can be eliminated, people can have more control of their finances, as well as global barriers due to currency conversion might as well be abolished. This has since entered the public knowledge domain and is now known as Bitcoin. Several variations of it and a number of alternative cryptocurrencies later, and it is becoming increasingly clear that the topic is no longer in the under-ground of our society, but quite the contrary, it is here to stay.

This research sets to explore reasons why some people are interested in this new form of finance whereas other are against it, or they are skeptical. Throughout the paper we refer to digital currencies and cryptocurrencies interchangebly, despite several differences between them (see Cryptoverze, 2020). We focus on human values as possible explanators and seek to understand associations with engagement with cryptocurrencies in the general German population. We look at the associations between human values in the Theory of Basic Human Values (TBHV, Schwartz, 2012) and varying cryptocurrency items as formulated in a recent survey by the OECD (OECD, 2019). Data for the study stems from a quota

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sample in line with the demographics of the German general population and was collected in April 2022.

Cryptocurrencies

[input from Mariana]

Human values

TBHV is currently the most complete theory of human values (Schwartz, 2012; Schwartz et al., 2012; Schwartz & Boehnke, 2004). This theory states that values represent socially desirable goals that individuals pursue in coping with existential needs. There are ten (or nineteen according to the refined theory, Schwartz et al., 2012) value types that transcend specific actions and situations and serve as standards (see Figure 1). These value types are universal in the sense that individuals, regardless of age, gender, country of birth or any other attributes, endorse them to some degree. Therefore, people differ not in the endorsement of one value over another, but they do because they prioritize one value more than the other.

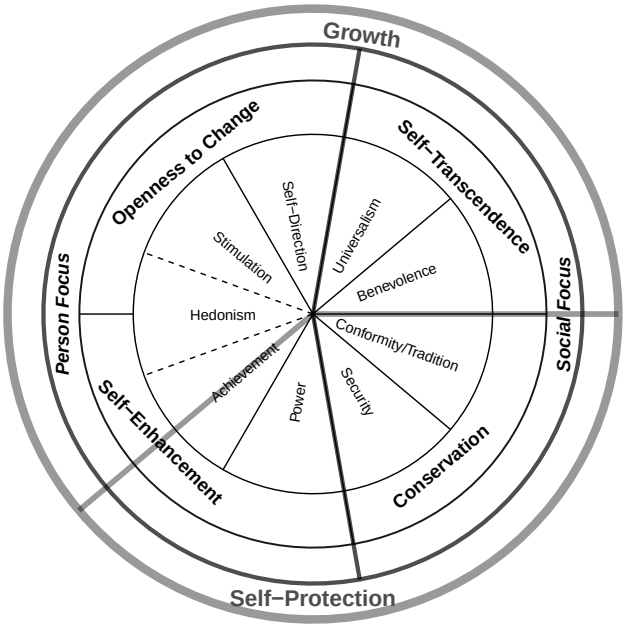


Figure 1

Value typologies specified in the refined TBHV.

The theory organizes value types according to incompatibilities between underlying goal motivation in a circular fashion. For instance, universalism opposes power since the motivational goal of the former is protection for the welfare of all people and of the latter is

dominance over people and resources. Or, conformity conflicts with self-direction since the motivational of the former is restraint of impulses likely to violate social expectations or norms and of the latter is independent thought. These examples were not given randomly; due to shared motivational contents, specific values pertain to a higher ordering of values in fact. Self-enhancement, conformity, and tradition all share the goal of maintaining the status quo which is incompatible with the goal of being open to change shared by hedonism, self-transcendence, and self-direction. On the other hand, universalism and benevolence share the goal of transcending the self which contrasts the goal of enhancing the self-shared by achievement and power. It is because of these relations of goal incompatibility that values drive and motivate human behavior (also see Bardi & Schwartz, 2003).

The present research

Why should it matter if values inform people's interst in cryptocurrencies? What makes values ultimately relevant is that they are culture-informed, have a developmental trajectory that is lifelong (Smallenbroek et al., 2022), while they can change due to specific life events such as entering parenthood (Lönnqvist et al., 2018), but also due to drastic changes in society such as due to the Covid-19 Pandemic (Daniel et al., 2022). Cryptocurrencies hold several similarities with other technological advancements such as the Internet and mobile phones. Compared to previous advancements however, the notion of cryptocurrencies is also in a way an economic and a political statement [Mariana = do you have a citation for this?]. Though this technology is still in its onset, there are reasons to expect that it will impact people's financial awareness and potentially people's dependencies on established monetary and governmental institutions [Mariana = do you have a citation for this?].

In other words, the concept of cryptocurrency is potentially going to shape in the future in currently unknown ways people's motivational goals. We speak of the future because we want to raise awareness that a new technology is now being adopted, in spite of groups of people being against it or disbelieving its mission. This is happening. Therefore, to begin understanding how this will shape our beliefs in the future, we reason that the pertinent first step is to explore what makes this technology possible from a social perspective. That is, why some people are interested, engaged with, and open for this form of finance, while others are not.

We study the link between human values and an interest in cryptocurrencies in a general sense. We draw on the Theory of Planned Behavior (TPB, Ajzen, 1991; Conner & Armitage, 1998) and seek to identify a "gradient" that describes the influence of human values at varying stages in the formation of actual behavior of holding cryptocurrencies. TPB suggests that behavior takes shape after an intention was formed, which in turn has been informed by attitudes, subjective norms and perceived behavioral control. Studying the role of values in the more generalist theory of planned behavior is not a novelty in the literature. For instance, Kruse et al. (2019) examined the effects of human values on social entrepreneurship (intention to solving societal issues) as mediated by attitudes, subjective norms and a perceived behavioral control. One further example is the work by Stanciu (2022) on explaining ageism towards older people. Stanciu reasoned that human values can

act as internal motives to either suppress or justify negative stereotypes and prejudice which in turn can explain discriminatory behavior towards older people in younger individuals.

[here a paragraph on previous studies on explaning crypto interest. See Marie's (not Mariana!) document]

Thus, we explore the role of values in (a) creating an intention to (b) presently or in the future hold cryptocurrencies. *Intention creation* is here defined as possessing knowledge of/having awareness of what cryptocurrencies are and what they stand for. *Holding of cryptocurrencies* is here understood as possession/intention on possessing them in the future. Please note that this study does not test for causal mechanisms and therefore the present study frame and hypotheses have the role of guiding our interpretations of findings rather than informing claims about theory. We attempt a first insight into this phenomenon in Germany, while an end-goal is to prepare, so-to-speak, the study of the topic in more generalist surveys here.

We can think of two approaches to how human values contribute to a person's interest in cryptocurrencies. Please note that this is here meant in a general sense; it addresses both awareness and holding of cryptocurrencies as well as overall beliefs about the topic. First, we acknowledge the fact that cryptocurrencies are a new form of finance thus it is potentially linked with people's motivational goals of accepting or rejecting novelty in their life. The first hypothesis is that values of openness to change will associate with a stronger interest in cryptocurrencies (Hypothesis 1).

Second, we acknowledge the primary goal of cryptocurrencies-that of creating a decentralized financial system-thus facilitating financial independence in people who otherwise are dependent on monetary institutions such as banks. We reason that this might be linked with people's motivational goal of self-enhancing themselves, striving for own financial well-being that is. The second hypothesis is that values of self-enhancement will associate with a stronger interest in cryptocurrencies (Hypothesis 2).

Method

Participants

A total of $N = 794$ participants were interviewed in an online questionnaire by *respondi* in April 2022 in Germany. The sampling strategy used quotas of gender, education level, and age categories to meet the general population standards. These quotas were created in accordance with the respective numbers in the population as was recorded in the Microcensus 2017, which covers 1% of the persons and households in the country [@ add literature]. Upon a quality check in view of their answers on the present value items, we had to exclude $n = 80$ participants due to straightlining (identical answers on 15 consecutive items) and an overal lack of answer variation (within-person $sd < 0.50$).

The cleaned and final data for the present study had $N = 714$ participants (age: $M = 43.05$, $SD = 13.72$; Min = 18, Max = 65). Of these there were 52.94% women, 62.18% employed, and 35.85% had finished at least ten classes in the local education system (i.e., *Mittlerer Schulabschluss*) (also see the Appendix).

Measurement

Unless otherwise stated, all measurements were translated from English into German by a bilingual author, and then the German translation was checked by a second bilingual author. Measurement on cryptocurrencies was taken from the OECD report covering the topic in Asia (OECD, 2019).

Values

Human values were measured in the refined TBHV (Schwartz, 2012; Schwartz et al., 2012) with the available German version of the PVQ-RR instrument (Schwartz & Cieciuch, 2021). Fifty-seven brief value descriptions of a fictitious character were presented to the study participants. Men and women received their gender specific questionnaire. Study participants were asked to indicate how much they saw themselves similar to these fictitious characters on an asymetric 6-points scale: 1 *not at all like to me*, 2 *not like to me*, 3 *a little like me*, 4 *moderately like me*, 5 *like me*, 6 *very much like me me*. These items were then used to create ten value typologies and 4 higher order values. An example item that measures universalism is: "It is important to him/her that the weak and vulnerable in society be protected."

Cryptocurrency themes

Intention creation. Under intention creation we subsumed awareness and understanding of and general beliefs on cryptocurrencies. *Awareness* was self-reported as (1) *already has* or (2) *never has* heard of them. Awareness served as a filter question: Only participants who already have heard of the topic continued to answer the following questions. The rest were thanked for their participation and their study ended.

Understanding was measured with a single-item question as to how good or bad participants understood in their opinion cryptocurrencies. Their answer was recorded on a 5-point Likert scale where 1 = *not that well* and 5 = *very good*.

General beliefs were measured in five questions, each probing a distinct dimension of concern (or hope) among people in society: Cryptocurrencies (1) are an investment opportunity, (2) can be a money exchange opportunity, (3) are regularized by the state and (4) facilitate illegal commerce. The fifth item asked whether participants thought that it was a good time to buy cryptocurrencies. These items were measured on a 5-point Likert scale where 1 = *complete disagreement* and 5 = *complete agreement*.

The latter two questions were shown only to those participants who already heard of cryptocurrencies.

Holding. Under *holding* we subsumed presently holding or in the future intending on holding cryptocurrencies as well as reasons for doing so. Answer options for holding behavior were (1) *now*, (2) *in the past*, or (3) *never*. This question was a filter question to reasons for acquisition: Participants who chose either of the first two answer options were later inquired about their reasons for holding cryptocurrencies, whereas participants who

chose the latter answer option were inquired about their reasons for not holding cryptocurrencies.

Holding in the future was measured with a single-item while the answer options were (1) *would like to*, (2) *would not like to*, or (3) *undecided*.

Reasons for acquiring cryptocurrencies were measured with a single-item and participants could choose up to three of eleven answers: (1) fear of missing out, (2) for fun, (3) to learn more about cryptocurrencies, (4) win money fast, (5) long-term investment option, (6) inheritance purposes, (7) support of Block-chain technology, (8) online shopping, (9) money transfer, (10) investment portofolio diversification, (11) other reason.

Reasons for not acquiring cryptocurrencies were measured with a single-item question and participants could choose up to three of ten answers: (1) cannot afford it, (2) risk is too high, (3) insufficient knowledge, (4) insufficient control by state, (5) other investment more appealing, (6) no interest in cryptocurrencies, (7) generally no interest in investment, (8) price volatility is worrying, (9) money needed for other things, (10) other reason.

Aanalytical approach

All the present analyses were carried out in R (R Core Team, 2018) and using varying packages. These packages are referred to in the respective scripts (see GitHub repository [add here link]).

We studied the link between human values and interest in cryptocurrencies in an explorative manner. First, we used secondary sources such as published literature (e.g., Witte et al., 2020) and available data sets [European Social Survey, @ add literature] to understand how did the present sample fare when compared to the German general population in view of representativity. This step allowed us to understand limitations of generalizing findings on the association between values and cryptocurrency interst to the population in the country.

Second, we decomposed the present sample according to a gradient from intention creation to behavior. Since the present data was collected with a questionnaire that used strategic filter questions, we were able to re-trace at the sample level which participants (1) heard of, (2) currently are and (3) intend on holding cryptocurrencies. This funneling out due to study design allowed us then to explore at each stage the role of human values. That is, we investigated frequency distributions, density curves, and central tendency indicators (e.g., mean, median) and determined whether human values had comparable roles at each of the three levels mentioned above.

Finally, we explored associations between human values and beliefs that people associated with the cryptocurrency topic and how together they impacted behavior and intention. Four models were estimated and this was done separately for behavior and intention.

- **Model 1**: $Behavior/Intention_{yes/no} = \beta_0 + \beta_{1:3} X_{Covariates}$
- **Model 2**: $Behavior/Intention_{yes/no} = \beta_0 + \beta_{1:3} X_{Covariates} + \beta_4 X_{OCH} + \beta_5 X_{SEN}$

- **Model 3**: $Behavior/Intention_{yes/no} = \beta_0 + \beta_{1:3}X_{Covariates} + \beta_4 X_{OCH} + \beta_5 X_{SEN} + \beta_{6:10}X_{belief-1:5}$
- **Model 4**: $Behavior/Intention_{yes/no} = \beta_0 + \beta_{1:3}X_{Covariates} + \beta_4 X_{OCH} + \beta_5 X_{SEN} + \beta_{6:10}X_{belief-1:5} + \beta_{11:15}X_{OCH} * X_{belief-1:5} + \beta_{16:20}X_{SEN} * X_{belief-1:5}$

Model 1 included the intercept, and age, gender (1 = female, 0 = other), and education (1 = Abitur, 0 = other) as covariates. Abitur was selected because it is the highest possible school degree in the German education system. Model 2 added main effects of openness to change and self-enhancement. Model 3 added main effects of beliefs associated with cryptocurrencies. Finally, Model 4 included interaction terms between value preferences and beliefs.

We chose to include only openness to change and self-enhancement as predictors because (a) predictions regarding their effects were made and (b) this allowed us to avoid multicoliniarity that values with incompatible contents might bring to model estimation. Results based on regressions with non-hypothesized effects of incompatible value preferences are presented in the Appendix.

There were values missing at random on each of the five beliefs associated with cryptocurrencies. The missing values were estimated with a multivariate imputation technique by chained equations. This was done in R using the package *mice* (van Buuren & Groothuis-Oudshoorn, 2011). The approach is iterative and imputes missing information on a variable-by-variable basis according to conditional densities. Between 10 and 20 iterations are considered sufficient to arrive at a robust imputation model. Here, 10 iterations were used. We produced 5 imputed complete datasets which were pooled for estimation of models 1 to 4. Robustness of these imputations is provided in the Appendix.

Model fit improvement in nested models was evaluated using a loglikelihood comparison test on the imputed data (see above). A nested model is generally considered as contributing to variance explanation if the fuller model (with more predictors) has a loglikelihood that is greater than the loglikelihood of the emptier model (with fewer predictors). That is, if the comparison test is associated with a significant p-value.

Results

Representativity

The present data diverged in several ways from representative surveys and therefore from what it is expected to be the demographic structure in the German general population when human values were most recently recorded in the refined-TBHV (also see the Appendix). Notable discrepancies could be observed in view of age: the 30-40 years old group was the most over-represented in the present study with 11.06% over the value in the ESS-2018, which was followed by the 50-60 group with 6.06% and the 18-30 group with 4.15% respectively over the value in the ESS-2018. The age groups 60-70 (5.52%) and 70+ (16.28%) were on the other hand underrepresented when compared to the same survey.

Table 1

The four higher order value preferences in the present data and ESS-2018

Entry	Data	Value	M	SD	Med	Min	Max	SE
1	equivalence	CON	0.09	0.40	0.10	-1.58	1.25	0.01
2	ess2018	CON	0.07	0.58	0.05	-2.43	2.79	0.01
3	equivalence	OCH	0.28	0.47	0.25	-1.31	2.36	0.02
4	ess2018	OCH	0.07	0.52	0.07	-1.81	1.98	0.01
5	equivalence	SEN	-0.93	0.71	-0.93	-3.17	1.36	0.03
6	ess2018	SEN	0.74	0.62	0.70	-1.71	3.14	0.01
7	equivalence	STR	0.38	0.41	0.39	-1.20	1.79	0.02
8	ess2018	STR	-0.75	0.52	-0.71	-2.71	0.82	0.01

Note: [a] SEN = Self-enhancement, STR = Self-transcendence, OCH = Openness to change, CON = Conservation. [b] M = mean, SD = standard deviaiton, Med = median, Min = minimum value, Max = maximum value, SE = standard error

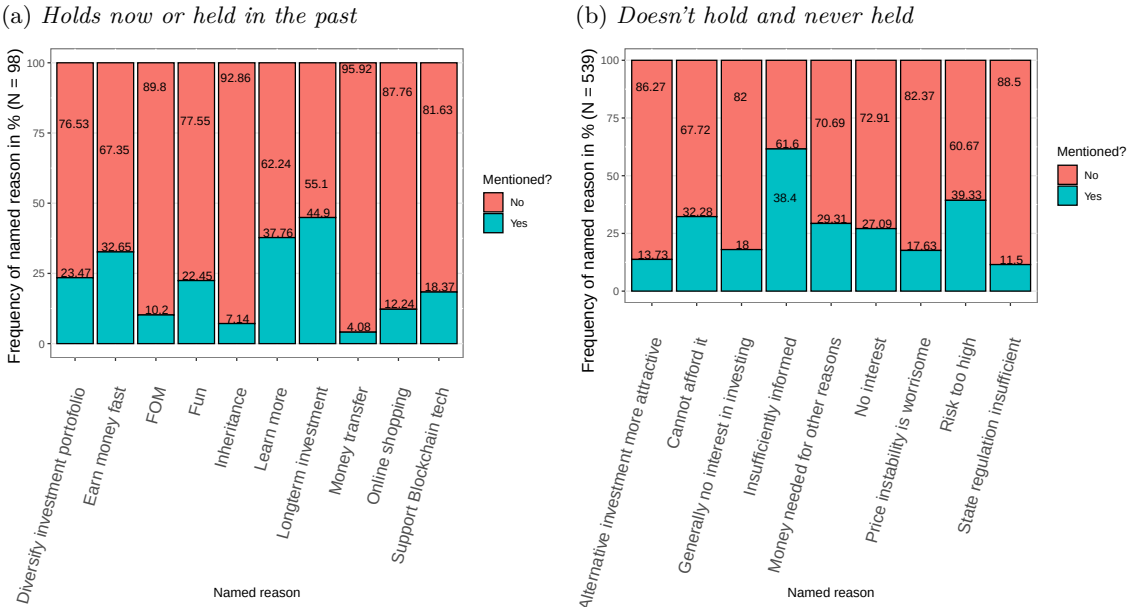


Figure 2

Mentioned reasons for holding or not holding cryptocurrencies

The present data matched the ESS-2018 descriptions along the openness to change - conservation dimension (CON, OCH) but not along the self-enhancement - self-transcendence dimension (SEN, STR). The preference for SEN was overall low in the present data (M = -0.93) compared to the ESS-2018 where it was very high (M = 0.74). Conversely, the preference for STR was overall moderate in the present data (M = 0.38) compared to

the ESS-2018 where it was very low (M = -0.75) (also see Table 1).

Gradient from intention to behavior

Reach of phenomenon

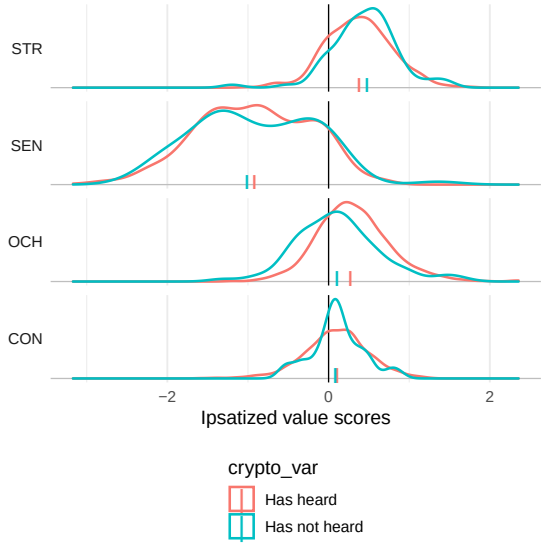
A detailed sample decomposition after cryptocurreny awareness, holding behavior now, and holding behavior in the future is available in the Appendix. It can be seen that, n = 77 (or 10.78%) of the total sample have never heard of cryptocurrencies. Among participants who previously heard of cryptocurrencies, 11.3% held currently, 4.08% held in the past, while 84.62% never held cryptocurrencies. Conversely, 16.64% indicated they would like to hold cryptocurrencies in the future, while 43.49% said no and 39.72% were undecided. Finally, among participants who previously heard of cryptocurrencies but never held, there were 8.53% who said they would like to in the future, while 46.57% said that they would not, and 44.71% were unsure. These percentages are a first indication that the phenomenon of cryptocurrency should not be treated as negligible.

Reasons for behavior

Figure 2 displays frequencies of named reasons for holding or not holding cryptocurrencies. Overall, there were n = 98 participants who heard of cryptocurrencies and held now or in the past cryptocurrencies, whereas n = 539 participants heard of cryptocurrencies but never held. As it can be seen, the most frequently mentioned reason for ever holding cryptocurrencies was *Longterm investment* (44.9%), which was followed by *Learn more* (37.76%), whereas the least mentioned reason was *Money transfer* (7.14%). Conversely, the most frequently mentioned reason for never holding was *Insufficiently informed* (61.6%), whereas the least mentioned reason was *State regulation insufficient* (11.5%). Perhaps unsurprisingly, it can be seen that information on the matter was central to participants' decision to hold or not to hold cryptocurrencies.

Role of values

(a) *Awareness*



(b) *Holding behavior now or in the past*

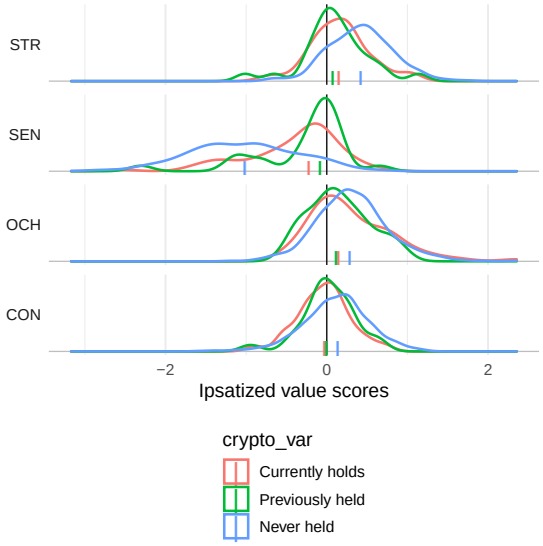
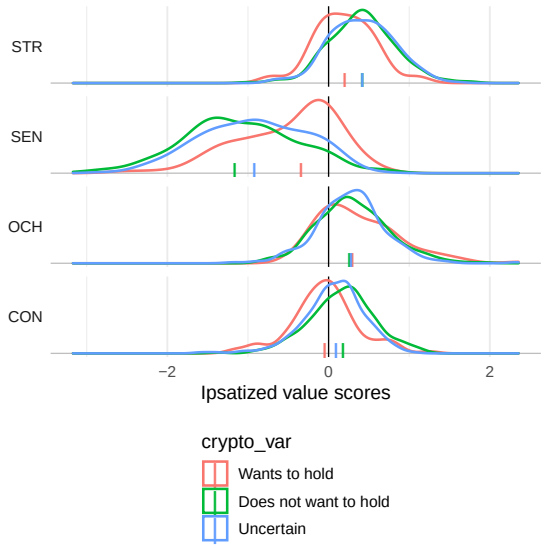


Figure 3

Awareness of and holding behavior of digital- and/or cryptocurrencies

(a) *Has heard and previously held*



(b) *Has heard but never held*

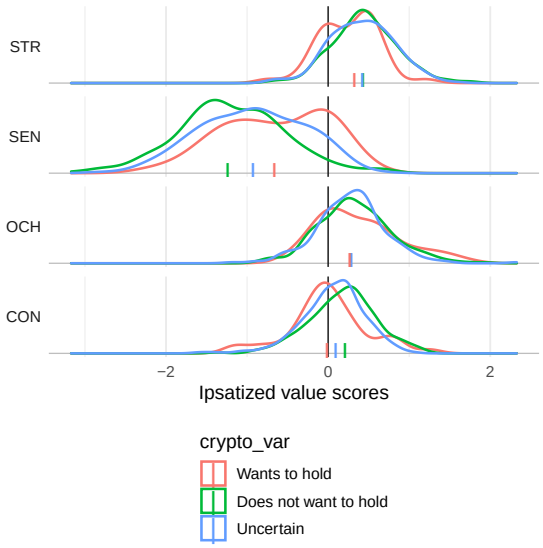


Figure 4

Intention to hold digital- and/or cryptocurrencies in the future

Figures 3 and 4 depict density distributions of value preferences. Value preferences are not making a difference between people in view of whether they have heard of cryptocurrencies or not. Nonetheless, values of self-transcendence are generally highly preferred both among people who have heard and haven't heard of cryptocurrencies, whereas values of self-enhancement are generally less preferred in both groups. We also note that density plots for self-enhancement and self-transcendence are different both in shape and central tendency (median displayed) between people who currently hold, previously held, or never held cryptocurrencies. Furthermore, values of self-enhancement and of self-transcendence are most visibly divergent between people who want to hold, do not want to hold, or are unsure about holding cryptocurrencies in the future. The fact that the density plots of these values are most visibly diverging suggests a robust finding, namely that the content incompatibility between the two had an effect on people's decision to, at some point in the past or future, acquire such assets as cryptocurrencies.

The following section is dedicated to exploring associations between value preferences and behavior and intention in view of cryptocurrencies, while effects due to demographics and beliefs associated with cryptocurrencies are accounted for.

Logistic regressions

Model fit indices and nested model comparisons for estimated logistic regression models are summarized in the Appendix. We note that the inclusion in model 4 of interaction terms between value preferences and beliefs about cryptocurrencies did not lead to an improvement in model fit over the estimated terms in model 3. That is, the interaction terms did not contribute to explaining either the cryptocurrency behavior nor the intention to hold cryptocurrencies. Thus, in the following paragraphs we focus on reporting main effects in models 1 to 3 and return to the finding concerning interaction terms in Discussion.

Table 2 summarizes results of logistic regressions with cryptocurrency holding behavior as the outcome variable. The fullest model had the main effect of self-enhancement values as statistically significant and in the predicted direction ($b = 0.75$, $p = 0.01$), whereas the main effect of openness to change values was not significant ($b = 0.09$, $p = 0.8$). Furthermore, two of the five beliefs associated with cryptocurrencies had likewise a main effect that was statistically significant, namely a belief regarding the monetary exchange potential ($b = 0.37$, $p = 0.03$) and a belief that it was a good time to buy cryptocurrencies ($b = 0.81$, $p = 0$).

Table 3 summarizes results of logistic regressions with intention to hold cryptocurrencies as the outcome variable. The fullest model had the main effect of openness to change values significant and in the predicted direction ($b = 0.99$, $p = 0.01$), whereas the main effect of self-enhancement values was not significant ($b = 0.5$, $p = 0.09$). The main effect of self-enhancement values however was significant in model 2, where the effects of beliefs were not included ($b = 0.52$, $p = 0.03$). Moreover, there was a significant main effect of the belief that it was a good time to buy cryptocurrencies ($b = 1.24$, $p = 0$).

Table 2

Results for logistic regression carried out according to the hypothesized effects on holding cryptocurrencies behavior

Predictor	b_m1	Test_m1	Df_m1	p_m1	b_m2	Test_m2	Df_m2	p_m2	b_m3	Test_m3	Df_m3	p_m3
Intercept	0.78	1.90	630.95	0.06	0.72	1.67	628.95	0.10	-2.72	-2.28	270.99	0.02
Age	-0.05	-5.55	630.95	0.00	-0.03	-3.01	628.95	0.00	-0.04	-2.39	270.99	0.02
Female	-1.39	-5.41	630.95	0.00	-1.15	-4.33	628.95	0.00	-1.28	-3.25	270.99	0.00
Abitur	0.46	1.91	630.95	0.06	0.34	1.36	628.95	0.17	-0.04	-0.12	270.99	0.91
OCH					-0.16	-0.58	628.95	0.56	0.09	0.25	270.99	0.80
SEN					1.16	5.26	628.95	0.00	0.75	2.47	270.99	0.01
Investment									-0.03	-0.18	270.99	0.86
Exchange									0.37	2.24	270.99	0.03
Regularization									0.26	1.52	270.99	0.13
Illegal									-0.11	-0.64	270.99	0.52
Good time									0.81	4.13	270.99	0.00

Note: [a] Outcome variable was coded 1 = currently holds or in the past held, 0 = never held [b] OCH = openness to change, SEN = self-enhancement [c] Model estimations based on data pooled from 5 iterations of missing value imputation [d] Suffixes m1, m2, and m3 stand for estimated models [e] p = p value [f] Test = test statistic [g] b = regression beta coefficient [h] Df = degrees of freedom

Table 3

Results for logistic regression carried out according to the hypothesized effects on intention to hold cryptocurrencies

Predictor	b_m1	Test_m1	Df_m1	p_m1	b_m2	Test_m2	Df_m2	p_m2	b_m3	Test_m3	Df_m3	p_m3
Intercept	0.45	1.17	629.95	0.24	0.27	0.68	627.95	0.50	-3.27	-2.78	270.99	0.01
Age	-0.05	-5.27	629.95	0.00	-0.03	-3.30	627.95	0.00	-0.03	-1.89	270.99	0.06
Female	-0.74	-3.26	629.95	0.00	-0.54	-2.29	627.95	0.02	-0.91	-2.38	270.99	0.02
Abitur	0.37	1.65	629.95	0.10	0.25	1.07	627.95	0.29	-0.13	-0.39	270.99	0.70
OCH					0.52	2.14	627.95	0.03	0.99	2.51	270.99	0.01
SEN					0.86	4.36	627.95	0.00	0.50	1.70	270.99	0.09
Investment									0.06	0.36	270.99	0.72
Exchange									0.16	0.96	270.99	0.34
Regularization									-0.17	-1.01	270.99	0.31
Illegal									-0.17	-1.04	270.99	0.30
Good time									1.24	5.90	270.99	0.00

Note: [a] Outcome variable was coded 1 = would like to hold, 0 = would not want to hold or unsure [b] OCH = openness to change, SEN = self-enhancement [c] Model estimations based on data pooled from 5 iterations of missing value imputation [d] Suffixes m1, m2, and m3 stand for estimated models [e] p = p value [f] Test = test statistic [g] b = regression beta coefficient [h] Df = degrees of freedom

Discussion

Our sample was not representative to the German general population, but it used strict quotas of gender, age and education. Please note that our intention was to gain first insights into an overall pattern regarding adoption of cryptocurrencies in society.

Limitations and future research

Conclusion

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Appendix

1 Sample representativity

Table 4

Sample representativity after age, education, and gender compared to Microcenus 2020 and European Social Survey 2018

Entry	Data	Dimension	N	%[a]	Difference %
1	equivalence	18-30	149	20.87	0.00
2	ess2018	18-30	380	16.72	-4.15
3	equivalence	30-40	176	24.65	0.00
4	ess2018	30-40	309	13.59	-11.06
5	equivalence	40-50	109	15.27	0.00
6	ess2018	40-50	335	14.74	-0.53
7	equivalence	50-60	179	25.07	0.00
8	ess2018	50-60	432	19.01	-6.06
9	equivalence	60-70	101	14.15	0.00
10	ess2018	60-70	447	19.67	5.52
11	ess2018	70+	370	16.28	0.00
12	equivalence	Still in school	2	0.28	0.00
13	ess2018	Still in school	6	0.26	-0.02
14	equivalence	Grundschule	10	1.40	0.00
15	ess2018	Grundschule	69	2.95	1.55
16	equivalence	Volks-/ Hauptschulabschluss	168	23.53	0.00
17	ess2018	Volks-/ Hauptschulabschluss	535	22.88	-0.65
18	equivalence	Mittlere Reife	256	35.85	0.00
19	ess2018	Mittlere Reife	764	32.68	-3.17
20	equivalence	Polytechnische Oberschule	52	7.28	0.00
21	ess2018	Polytechnische Oberschule	242	10.35	3.07
22	equivalence	Abitur	226	31.65	0.00
23	ess2018	Abitur	722	30.88	-0.77

Entry	Data	Dimension	N	%[a]	Difference %
24	equivalence	Men	336	47.06	0.00
25	ess2018	Men	1208	51.32	4.26
26	equivalence	Women	378	52.94	0.00
27	ess2018	Women	1146	48.68	-4.26

Note: [a] Relative percentages from the sample indicated in column Data.

2 Gradient from interest to behavior

Table 5

Gradient interest in cryptocurrencies in the present sample

Dimension	N	Case	%
Awareness	714	Yes	89.22
		No	10.78
Holding	637	Yes	11.30
		Yes, in the past	4.08
		Never	84.62
Holding intention	637	Yes	16.64
		No	43.49
		Unsure	39.72
		Data missing	0.16
Holding intention if never held	539	Yes	8.53
		No	46.57
		Unsure	44.71
		Data missing	0.19

Note: [a] Awareness = 'If the study participant has previously heard of cryptocurrencies or digital currencies', Holding = 'If the study participant currently holds or in the past has held cryptocurrencies or digital currencies', Holding intention = 'If

the study participant intends to hold cryptocurrencies or digital currencies in the future', Holding intention if never held = the holding intention question asked only to those study participants who said they never held cryptocurrencies or digital currencies.

3 Model fit indices

Table 6

Model fit indices for logistic regression on holding cryptocurrencies behavior

Model	N	Values	Deviance (null)	Df (null)	LogLik	AIC	BIC	Deviance	Df
m1.1	637	none	546.96	636	-235.67	479.34	497.17	471.34	633
m2a.1	637	OCH & SEN	546.96	636	-219.12	450.24	476.98	438.24	631
m2b.1	637	CON & STR	546.96	636	-223.62	459.23	485.97	447.23	631
m3a.1	284	OCH & SEN	335.81	283	-116.57	255.13	295.27	233.13	273
m3b.1	284	CON & STR	335.81	283	-117.05	256.10	296.24	234.10	273
m4a.1	284	OCH & SEN	335.81	283	-113.24	268.47	345.10	226.47	263
m4b.1	284	CON & STR	335.81	283	-113.44	268.88	345.51	226.88	263

Note: [a] LogLik = Loglikelihood [b] Fit indices calculated on data pooled from 5 iterations of missing values imputation

Table 7

Model fit indices for logistic regression on intention to hold cryptocurrencies in the future

Model	N	Values	Deviance (null)	Df (null)	LogLik	AIC	BIC	Deviance	Df
m1.2	636	none	573.11	635	-262.21	532.41	550.23	524.41	632
m2a.2	636	OCH & SEN	573.11	635	-250.44	512.88	539.61	500.88	630
m2b.2	636	CON & STR	573.11	635	-250.13	512.26	538.99	500.26	630
m3a.2	284	OCH & SEN	333.89	283	-121.95	265.91	306.05	243.91	273
m3b.2	284	CON & STR	333.89	283	-122.98	267.96	308.09	245.96	273
m4a.2	284	OCH & SEN	333.89	283	-114.72	271.43	348.06	229.43	263

Model	N	Values	Deviance (null)	Df (null)	LogLik	AIC	BIC	Deviance	Df
m4b.1	284	CON & STR	333.89	283	-115.58	273.15	349.78	231.15	263

Note: [a] LogLik = Loglikelihood [b] Fit indices calculated on data pooled from 5 iterations of missing values imputation

4 Nested model comparison

Table 8

Nested model comparisons for holding cryptocurrencies behavior

Comparison	Test	Df1	Df2	Df comparison	p	Riv
m2a.1 ~ m1.1	16.55	2	Inf	631	0.00	0
m2b.1 ~ m1.1	12.06	2	Inf	631	0.00	0
m3a.1 ~ m2a.1	41.02	5	Inf	273	0.00	0
m3b.1 ~ m2b.1	42.63	5	1.782634e+29	273	0.00	0
m4a.1 ~ m3a.1	0.67	10	Inf	263	0.76	0
m4b.1 ~ m3b.1	0.72	10	Inf	263	0.70	0

Note: [a] Loglikelihood based comparison [b] Model comparison based on data pooled from 5 iterations of missing values imputation [c] Column p contains p-values associated with the likelihood comparison test. Non-significant values indicate nested models that are not better fitted.

Table 9

Nested model comparisons for intention to hold cryptocurrencies in the future

Comparison	Test	Df1	Df2	Df comparison	p	Riv
m2a.2 ~ m1.2	11.77	2	Inf	630	0.00	0
m2b.2 ~ m1.2	12.08	2	1.237940e+27	630	0.00	0

Comparison	Test	Df1	Df2	Df comparison	p	Riv
m3a.2 ~ m2a.2	51.39	5	Inf	273	0.00	0
m3b.2 ~ m2b.2	50.86	5	1.980704e+28	273	0.00	0
m4a.2 ~ m3a.2	1.45	10	1.787585e+30	263	0.15	0
m4b.2 ~ m3b.2	1.48	10	4.468964e+29	263	0.14	0

Note: [a] Loglikelihood based comparison [b] Model comparison based on data pooled from 5 iterations of missing values imputation [c] Column p contains p-values associated with the likelihood comparison test. Non-significant values indicate nested models that are not better fitted.

5 Logistic regression with opposing value preferences than those predicted

Table 10

Results for logistic regression carried out using value preferences that are in contradiction to those from the hypothesized effects on holding cryptocurrencies behavior

Predictor	b_m1	Test_m1	Df_m1	p_m1	b_m2	Test_m2	Df_m2	p_m2	b_m3	Test_m3	Df_m3	p_m3
Intercept	0.78	1.90	630.95	0.06	0.73	1.70	628.95	0.09	-2.74	-2.30	270.99	0.02
Age	-0.05	-5.55	630.95	0.00	-0.04	-4.04	628.95	0.00	-0.04	-2.72	270.99	0.01
Female	-1.39	-5.41	630.95	0.00	-1.13	-4.26	628.95	0.00	-1.33	-3.36	270.99	0.00
Abitur	0.46	1.91	630.95	0.06	0.35	1.43	628.95	0.15	-0.04	-0.12	270.99	0.90
CON					-0.85	-2.38	628.95	0.02	-0.70	-1.32	270.99	0.19
STR					-1.56	-4.63	628.95	0.00	-1.03	-2.22	270.99	0.03
Investment									-0.02	-0.11	270.99	0.91
Exchange									0.38	2.26	270.99	0.02
Regularization									0.30	1.81	270.99	0.07
Illegal									-0.15	-0.86	270.99	0.39
Good time									0.82	4.16	270.99	0.00

Note: [a] Outcome variable was coded 1 = would like to hold, 0 = would not want to hold or unsure [b] OCH = openness to change, SEN = self-enhancement [c] Model estimations based on data pooled from 5 iterations of missing value imputation [d] Suffixes m1, m2, and m3 stand for estimated models [e] p = p value [f] Test = test statistic [g] b = regression beta coefficient [h] Df = degrees of freedom

Table 11

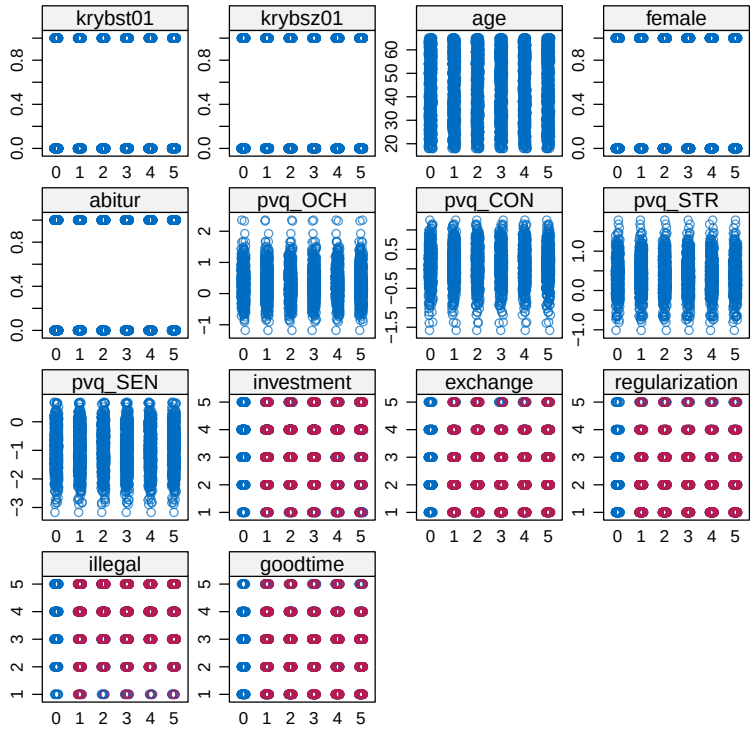
Results for logistic regression carried out using value preferences that are in contradiction to those from the hypothesized effects on intention to hold cryptocurrencies

Predictor	b_m1	Test_m1	Df_m1	p_m1	b_m2	Test_m2	Df_m2	p_m2	b_m3	Test_m3	Df_m3	p_m3
Intercept	0.45	1.17	629.95	0.24	0.32	0.80	627.95	0.42	-3.14	-2.69	270.99	0.01
Age	-0.05	-5.27	629.95	0.00	-0.03	-3.57	627.95	0.00	-0.02	-1.51	270.99	0.13
Female	-0.74	-3.26	629.95	0.00	-0.51	-2.14	627.95	0.03	-0.85	-2.26	270.99	0.02
Abitur	0.37	1.65	629.95	0.10	0.26	1.13	627.95	0.26	-0.14	-0.41	270.99	0.68
CON					-1.05	-3.15	627.95	0.00	-1.15	-2.13	270.99	0.03
STR					-1.38	-4.42	627.95	0.00	-0.93	-2.03	270.99	0.04
Investment									0.05	0.29	270.99	0.77
Exchange									0.13	0.78	270.99	0.43
Regularization									-0.22	-1.36	270.99	0.18
Illegal									-0.13	-0.81	270.99	0.42
Good time									1.23	5.88	270.99	0.00

Note: [a] Outcome variable was coded 1 = would like to hold, 0 = would not want to hold or unsure [b] OCH = openness to change, SEN = self-enhancement [c] Model estimations based on data pooled from 5 iterations of missing value imputation [d] Suffixes m1, m2, and m3 stand for estimated models [e] p = p value [f] Test = test statistic [g] b = regression beta coefficient [h] Df = degrees of freedom

6 Robustness check of imputed datasets

(a) *Stripplot for observed vs. imputed data*



(b) *Denisty plots for observed vs. imputed data*

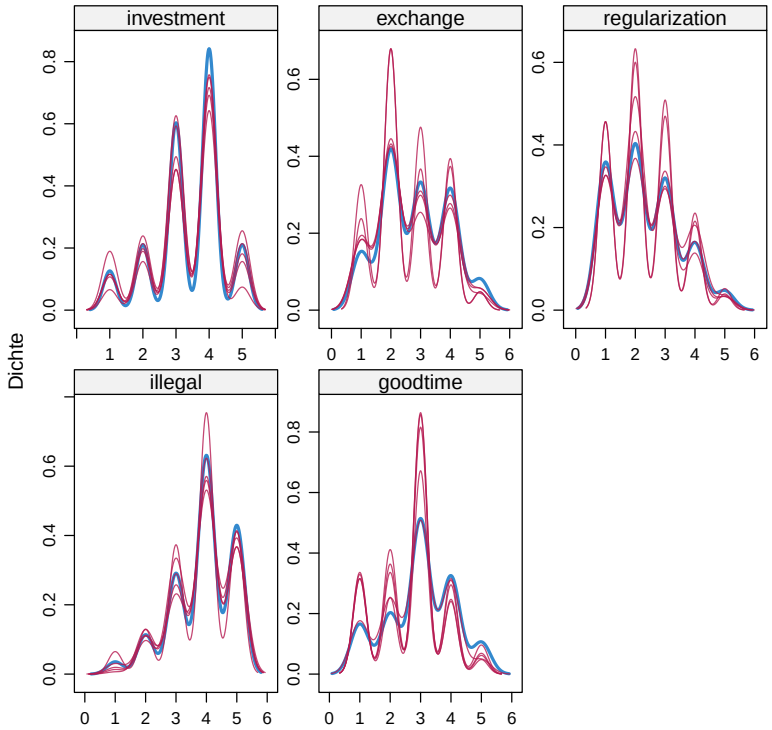


Figure 5

Robustness check for imputed data. Blue color depicts observed data