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Environmental-Social-Governance Preferences and Investments in Crypto-Assets

Pavel Ciaian, Andrej Cupak, Pirmin Fessler, d'Artis Kancs

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PO Box 61, 1011 Vienna, Austria
www.oenb.at
oenb.info@oenb.at
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Environmental and Social Attitudes and Investments in Crypto-Assets*

Pavel Ciaian † Andrej Cupák‡ Pirmin Fessler § d'Artis Kancs ¶

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Abstract

The purpose of this study is to contribute to our understanding of the relationship of environmental and social attitudes of investors and their investment into crypto-assets compared to traditional assets. Given the controversies over the environmental footprint of some crypto-asset classes, primarily due to energy-intensive mining, they present an intriguing subject for investigation. Leveraging a unique household finance survey representative of the Austrian population, we examine whether environmental and social attitudes can elucidate the variance in individual portfolio exposure to crypto-assets. Results indicate a robust link between investors' environmental and social attitudes and their exposure to crypto-investments, yet no significant association was found with traditional asset benchmarks like bonds and shares.

JEL code: D14, G11.

Keywords: crypto-assets; investment portfolio; financial behaviour; financial literacy; environmental and social attitudes.

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†Joint Research Centre, European Commission, e-mail: pavel.ciaian@ec.europa.eu.

‡National Bank of Slovakia; University of Economics in Bratislava, e-mail: andrej.cupak@nbs.sk.

§Corresponding author. Economic Microdata Lab, Oesterreichische Nationalbank, e-mail: pirmin.fessler@oenb.at.

¶Joint Research Centre, European Commission, e-mail: d'artis.kancs@ec.europa.eu.

Corrigendum: Correction of Data Analysis Error in Previous Version

In the previous version of this working paper, there was a coding error in the analysis of the relationship between Environmental and Social (E&S) attitudes and investments in crypto-assets. This error notably affected our results, leading to an inaccurate interpretation of the relationship between E&S attitudes and the probability of holding crypto-assets.

Upon identifying this error, we have corrected the coding and re-analyzed the data. The revised analysis shows that, contrary to our initial findings, a higher E&S score is associated with lower propensity to possess crypto-assets. This finding aligns more intuitively with the expected relationship between responsible investment practices and cryptocurrency investment tendencies. Please refer to this result, rather than the initial one.

We apologize for any confusion or inconvenience caused by the error in the earlier version of this paper. We are committed to maintaining high standards of accuracy and transparency in our research and appreciate your understanding in this matter.

Non-technical Summary

Since the inception of Bitcoin in 2008 through Satoshi Nakamoto's groundbreaking white paper, the crypto-asset world has seen remarkable growth and diversification. From digital currencies aimed at facilitating the exchange of goods and services to those purely for investment, the crypto-asset landscape is vast and evolving. Particularly noteworthy are cryptocurrencies and blockchains supporting smart contracts and decentralized applications, offering efficient computer power allocation in a decentralized framework.

One of the key challenges in understanding the crypto-asset market is its decentralized and relatively anonymous nature compared to traditional financial assets. While blockchain technology offers a treasure trove of digital data, it provides limited insights into the identities of the asset holders. To fill this gap, our research utilizes data from the Austrian Survey of Financial Literacy (ASFL) 2019, a comprehensive survey focusing on household financial behavior, including crypto-asset ownership.

This paper specifically explores the relationship between Environmental and Social (E&S) attitudes and investments in crypto-assets. Our findings reveal a compelling dynamic: individuals with higher E&S scores show a lower propensity to invest in crypto-assets. This aligns with conventional thinking about responsible investment practices, suggesting that individuals with strong E&S Attitudes are more cautious or skeptical about investing in crypto-assets.

Our study contributes to the broader understanding of how ESG preferences influence investment decisions, particularly in the realm of emerging financial technologies like cryptocurrencies. It also underscores the value of integrating detailed questions on crypto-assets in household finance surveys. Such data is crucial for a comprehensive understanding of investment behaviors and preferences, especially in the context of socio-economic factors.

As the crypto-asset market continues to grow and attract diverse investors, including younger generations, this research offers valuable insights into the intersection of ESG considerations and digital asset investments. It emphasizes the need for ongoing research and

data collection to inform potential regulations and to understand the financial behaviors of households in relation to financial stability and responsible investment trends.

1 Introduction

In a standard asset pricing framework, financial decisions are determined by investors' attitudes and beliefs over asset returns. A more recent literature has also identified the relevance of investor environment and non-pecuniary effects in driving cross-sectional differences in investment decision (Chen et al., 2020; Jiang et al., 2021). Accordingly, an investor weighs between optimising a standard mean-variance utility[1] and maintaining a "target portfolio". The mean-variance utility captures the pecuniary effect of standard mean-variance attitudes; investors' characteristics and personality differences affect investment decisions through these channels of beliefs and risk attitudes. The target portfolio, in a reduced form, reflects non-pecuniary effects, such as the social and ethical/moral concerns.

The focus of the present paper is on non-pecuniary effects related to environmental and social (E&S)[2] attitudes reflected in retail investor portfolio exposure to financial assets, including both traditional financial assets such as bonds and shares as well as new instruments such as crypto-assets. Controversies surrounding the ESG footprint of certain crypto-asset classes — mainly on grounds of their energy-intensive crypto mining -– offer an informative object of inquiry.

In the financial investment literature, very little is known about E&S-conscious investor subjective beliefs about crypto-assets and how do these compare to traditional assets in the portfolio formation (Giglio et al., 2023). We aim to answer the question to what extent can environmental and social/ethical considerations explain cross-sectional differences in crypto-asset investments after controlling for investor individual characteristics and demographic variables. To benchmark our results, we compare how investors' E&S attitudes are related to their portfolio exposure to crypto-assets on the one side and "E&S-blind" traditional financial

[1] The mean-variance utility assumes that random variables with the same mean and variance have equal desirability.

[2] Through the paper we use term "E&S" since we can observe and measure only the environmental (E) and social (S) attitudes of individuals.

assets, such as bonds and shares,[3] on the other side.

The fact that crypto-assets are decentralised and rather anonymous compared to other centralised financial products is both, a blessing and a curse for research. The blockchain — a back bone of crypto-assets — contains a wealth of information in digital format and makes them near-real-time accessible for researchers. However, from a blockchain one can only get limited insight about investors actually holding these assets. Therefore, it is convenient to complement block-chain transactions with survey data to learn more about crypto-assets in the portfolio of private households.

This is the first paper that investigates if and to what extent E&S attitudes determine individual portfolio exposure to crypto-assets by leveraging representative individual-level portfolio data. The Austrian Survey of Financial Literacy (ASFL) data are unique because it includes separate data on crypto-asset holdings, a feature often lacking in standard household finance surveys. The ASFL data allow us to distinguish between individuals' investment choices between crypto-assets, bonds and shares. A common empirical challenge when estimating the effect of attitudes on portfolio composition is the potential endogeneity of investors' E&S attitudes. We take a number of steps in response to endogeneity concerns including an IV estimator. To deal with potential endogeneity in the absence of instruments for a standard IV approach, we employ an alternative identification strategy proposed by Lewbel (2012)[4]. It exploits variation on higher moment conditions of the error distribution from the first stage regression of the likely endogenous covariate on (a subset of) other covariates in the model.

There are two strands of literature our work is primarily related to. First, the household finance and asset pricing models in the sustainable and responsible investing (SRI) literature have examined the unconditional and conditional ESG stock return performance. The

[3]Unlike the Swedish household survey utilised by Anderson and Robinson (2021), our survey questions do not identify separately E&S bonds/stocks and non-E&S assets.

[4]The use of this estimation technique is increasingly popular in the household finance literature (e.g., Bannier and Schwarz, 2018; Deuflhard et al., 2019). Practical application of this estimation procedure is detailed in Baum and Lewbel (2019).

empirical literature has established that ESG assets might outperform non-ESG assets when positive shocks hit the ESG factor, which captures for example shifts in consumers' tastes for green products and investors' tastes for green holdings (e.g., Pastor et al., 2021a). The explosive growth in responsible investing has given rise to a growing theoretical asset pricing literature that relies on non-pecuniary utility functions (e.g., Ahmed et al., 2021; Pastor et al., 2021b; Liu and Peifer, 2022). The conceptual explanation of the relationship between ESG attitudes and investment decision-making relies on the idea that social attitudes can affect investment decisions because they serve as a proxy for value-relevant information or risk, they can enhance performance or reduce risk (Krueger et al., 2020). Empirically the link between ESG attitudes and portfolio choice is not that clear. Hu et al. (2019) find no relationship between ESG attitudes and pro-environmental portfolios. Even less is known about non-pecuniary utility and its relation to crypto-assets. How do E&S-conscious investors value crypto-assets, and do more sustainable based crypto investment products — such as those based on Proof-of-Stake (PoS)[5] — offer superior risk-adjusted returns? Distinctively bridging the literature on non-pecuniary utility in financial decisions with the rapidly evolving world of crypto-assets, our study pioneers an exploration of how E&S-consciousness impacts individual exposure to this contemporary asset class. Our study contributes to a better understanding of non-pecuniary effects in individual investment decisions by assessing the role of an E&S-driven motivation in individual crypto investment decisions and benchmarking results against traditional asset holdings.

Second, a rich crypto-asset literature estimates the realised ESG footprint of crypto-assets (e.g., Krause and Tolaymat, 2018; Barone and Masciandaro, 2019; Foley et al., 2019; Kohler and Pizzol, 2019; Richman et al., 2021; Teichmann and Falker, 2021; Parmentola et al., 2022). On the one hand, this literature suggests that crypto-assets have the potential to generate a variety of social and governance benefits either directly via a decentralised

[5]The PoS consensus mechanism is relatively energy-efficient, resulting in lower negative environmental impacts, especially when compared to the Proof-of-Work (PoW) consensus mechanism. The evidence suggests that PoS's energy efficiency may be several orders of magnitude lower than that of PoW (Platt et al., 2021; Ibañez and Rua, 2023; Wendl et al., 2023).

governance mechanism or via the way crypto-assets and the underlying blockchain technology are deployed (e.g., Ciaian et al., 2016; Chapron, 2017; Richman et al., 2021). On the other hand, crypto-assets are sometimes associated with undesirable social activities, such as illicit trade, money laundering and tax evasion (e.g., Barone and Masciandaro, 2019; Foley et al., 2019; Teichmann and Falker, 2021). Further, due to a continuously growing energy consumption to maintain the underlying blockchain network, certain crypto-assets are associated with negative environmental impacts. Particularly the Proof-of-Work (PoW) consensus mechanism consumes large amounts of energy generating negative environmental externalities (e.g., Krause and Tolaymat, 2018; Dilek and Furuncu, 2019; Kohler and Pizzol, 2019; Ghosh and Bouri, 2022; Wendl et al., 2023).

Overall, the literature findings of the relationship between social, environmental and governance aspects of crypto-assets on individual portfolio exposure to crypto holdings is largely inconclusive; it depends among others on the specific crypto-asset and individual perceptions of investors. Our main finding that stronger E&S attitudes go along with lower probability to hold crypto-assets, but not with traditional assets such as shares or bonds, conceivably ties in with previous literature on ESG attitudes and financial portfolio choice (see Anderson and Robinson, 2021).

The present study contributes to enhancing our knowledge about the interplay between revealed E&S beliefs and portfolio holdings by providing novel insights about the relationship between environmental and social attitudes and individual portfolio exposure to crypto-assets. Indirectly it therefore also conveys information about the perceived E&S footprint of crypto-assets by retail investors. Furthermore, it illustrates the value added of augmenting the information on crypto-assets in standard household finance surveys for enhancing our understanding about crypto-asset holdings and investment decisions within a general portfolio choice context and along with socio-economic information. Finally, the paper contributes to the growing literature on investor behaviour regarding cryptocurrencies (Almeida and Gonçalves, 2023). Exiting studies have analysed the role of various drivers in influenc-

ing cryptocurrency investment decisions, including news and media attention, emotions and investor sentiment (e.g., Kristoufek, 2013; Mai et al., 2018; Flori, 2019), investors' herding behaviour (e.g., da Gama Silva et al., 2019; Raimundo Júnior et al., 2022; Bouri et al., 2019; King and Koutmos, 2021), investors' speculative behaviour (e.g., Grobys and Junttila, 2021; Kukacka and Kristoufek, 2023) diversification, hedging, and safe-haven properties of cryptocurrencies (e.g., Borri, 2019; Petukhina et al., 2021a,b), intrinsic investor characteristics (e.g., financial literacy, attitudes toward risk) (e.g., Pelster et al., 2019; Gemayel and Preda, 2021; Gupta et al., 2021) and socio-demographic characteristics of investors (e.g., Xi et al., 2020; Fahlenbrach and Frattaroli, 2021). Our paper expands this literature by specifically examining ESG investor behaviour in the context of crypto-asset decisions.

The paper proceeds as usual. Data and variables are described in Section 2 and Section 3 presents the implemented empirical framework and strategies. Results of the multivariate analysis, along with several robustness checks, are presented and discussed in Section 4. Finally, Section 5 concludes and offers policy implications.

2 Data and Variables

2.1 Austrian Survey of Financial Literacy

We leverage a unique individual portfolio data from the Austrian Survey of Financial Literacy (ASFL) for 2019 – the Austrian contribution to the OECD/INFE (International Network for Financial Education) survey on adult financial literacy. The standard OECD/INFE survey comprises questions on financial knowledge, attitudes and behaviour, used by the OECD to calculate the respective financial literacy scores, as well as several control variables and demographics (see OECD, 2018). The ASFL survey was conducted with 1,418 respondents through computer-assisted personal interviews (CAPIs) between April and May 2019. After verifying individual responses and cleaning the data, the final working sample consists of 1,016 individual-level observations. The main descriptive results of the ASFL as well as

methodological details are reported in Fessler et al. (2020). First results on crypto-assets owners in Austria are reported in Stix (2021).

The description of variables used in empirical estimations is provided in Table A.1 of the Appendix. Our main dependent variable measures whether an individual owns crypto-assets (*Crypto-assets ownership*). To compare how investors' behaviour differs between crypto-assets and traditional financial assets, we construct two further dependent variables capturing individuals' ownership of bonds (*Bonds ownership*) and shares (*Stocks/shares ownership*). In the empirical analysis we focus solely on household investment participation decisions without considering the specific amounts invested in the particular asset class. This limitation is common in empirical household/personal finance literature that relies on observational survey data (e.g., Cupák et al., 2021; Ehrlich and Yin, 2022). Additionally, our data does not differentiate between various types of crypto-assets, especially those using PoW versus PoS consensus mechanisms. The future potential extension of the scope of crypto-asset questions in larger household surveys will allow accounting for these important issues.

The explanatory variables of particular interest are those capturing environmental and social attitudes of retail investors. We consider one variable proxying environmental attitudes, *Attitudes for enviro. issues* (E), and two alternative variables capturing social attitudes, *Attitudes for social issues* ($S1$) and *Attitudes for social issues* ($S2$), respectively. All three environmental and social attitudes variables take values between 1 to 5 with a higher value indicating stronger attitude. More specifically, for environmental variable (E) a higher score indicates a stronger attitudes for environmental impact reduction over prioritizing financial returns.[6] As for the first social variable ($S1$), a higher value indicates stronger positive attitudes towards financial choices with a stronger ethical stance. Regarding the second social variable ($S2$), a higher value suggests a stronger commitment to ethical choices, even when they might lead to a financial disadvantage. We also construct composite E&S indicators

[6]Note that we have reversed the response scale for the environmental attitudes variable compared to the original formulation of the question on which this variable is constructed. We made this adjustment to align it with the social attitudes variables.

that measure combined environmental and social attitudes of surveyed individuals. The composite E&S indicators are constructed by summing up the values of environmental and social attitude variables: i.e., *E&S1* is calculated as the sum of *E* and *S1* and *E&S2* as the sum of *E* and *S2*. Distributions of the computed E&S scores are shown in Figure 1.

[Figure 1 about here]

Drawing from the financial literature related to traditional financial assets, which argues that investors' non-pecuniary ESG beliefs can influence their investment choices (e.g., Chen et al., 2020; Jiang et al., 2021; Ahmed et al., 2021; Pastor et al., 2021b; Liu and Peifer, 2022), we expect that the variables proxying E&S attitudes will impact investors' decisions regarding crypto-assets. This relationship will hold as long as investors associate cryptocurrencies with positive or negative environmental and social effects. The literature identifies both positive and negative environmental effects related to cryptocurrencies (e.g., Dilek and Furuncu, 2019; Kohler and Pizzol, 2019; Saleh, 2021; Ghosh and Bouri, 2022; Ibañez and Rua, 2023; Wendl et al., 2023) as well as positive and negative social impacts (e.g., Ciaian et al., 2016; Chapron, 2017; Barone and Masciandaro, 2019; Foley et al., 2019; Teichmann and Falker, 2021; Richman et al., 2021). Overall, if we estimate a positive (negative) relationship between the variables proxying E&S attitudes and crypto holdings, it will imply that the positive (negative) E&S concerns among investors more than offset the negative (positive) ones. Conversely, if the estimation yields statistically insignificant coefficients related to E&S attitudes, this will imply that investors fail to associate cryptocurrencies with either positive or negative environmental and social effects, or that these positive and negative social effects offset each other out (as perceived by investors).[7]

Following previous studies on individual investors' portfolio composition and returns and risky financial behaviour (e.g., Duarte et al., 2021; Ehrlich and Yin, 2022), we include a number of control variables to account for individual characterises such as age, gender, education (*Primary education*, *Secondary education*, *Tertiary education*) and income (*Individual*

[7]Similar arguments hold for traditional financial assets (shares and bonds) considered in the regression.

monthly net income). An important driver of investment decisions of individuals identified in the literature is their objective financial literacy as well as their self-assessment of their own financial knowledge (see Lusardi and Mitchell, 2014; Bannier and Schwarz, 2018; Bannier et al., 2019). Two alternative explanatory variables describe financial literacy: the objectively measured financial literacy (*Objective fin. literacy*) and the self-reported financial literacy (*Confidence in own fin. knowledge*).[8] In an attempt to control for risk attitudes of surveyed responders, which were identified in the literature to affect investment decisions (Bekhtiar et al., 2019; Jiang et al., 2021), we also include a variable capturing self-reported willingness to take investment risk (*Risk attitude score*).

2.2 Descriptive Statistics

Table 1 reports descriptive statistics of surveyed individuals. Overall, around 3% of Austrian individuals report holding crypto-assets, while the share of individuals owning bonds or shares is 7% and 11%, respectively. The average score for environmental attitudes (3.7) exceeds the social attitudes scores (2.2 and 2.0, respectively) suggesting that the Austrian population might find environmental issues related to finance more important than social ones. Note that while S1 relates to ethics with regard to experienced choices of financial agents, S2 relates more generally to an assessment of one own's weight placed on ethics in financial decisions. That is why the first measure contains more missing values than the latter as not all individuals experience (regular) choices of financial assets (see Table 1). Both the objective and subjective financial literacy scores (average values of 5.3 and 3.3, respectively) place Austria to a group of OECD countries with a high financial awareness (see OECD, 2018, for international comparison). Summary statistics of other relevant variables used in

[8]Note that, investors interact with different virtual asset service providers (e.g., (de)centralised exchanges, wallets, banks, etc.) when acquiring crypto-assets. The use of different service providers may require varying levels of knowledge and skills among investors to execute crypto-assets acquisition transactions. For example, an investor using a decentralised cryptocurrency exchange is likely to possess more knowledge about different service providers than an investor using a standard method of acquiring crypto-assets, such as a centralised cryptocurrency exchange. We expect that the knowledge and skill variance across investors concerning different service providers is indirectly (and at least partially) captured by financial literacy and/or education variables.

the empirical analyses are detailed in Table 1.

[Table 1 about here]

To gain further insights about the underlying ASFL data, we correlate the computed E&S1 and E&S2 scores with the probability of holding various financial assets: crypto-assets, bonds and shares by means of binned scatter plots (Figure 2). A nuanced and somewhat unexpected pattern emerges: while we observe no relationship between environmental and social attitudes and the probability to own bonds or shares, the relationship is negative and statistically significant for crypto-assets.

[Figure 2 about here]

3 Estimation Approach

Our objective is to estimate the relationship between stated investors' E&S attitudes and the probability that individuals hold crypto-assets (non-pecuniary effect hypothesis), which we compare to traditional financial asset holdings. In particular, we estimate a linear probability model (LPM)[9] by means of OLS separately for each of the three asset classes (crypto-assets, bonds, shares) using the ASFL data:

$$Ownership_{ik} = \alpha + \beta_j E\&S_{ij} + \gamma X_i + \delta Z_i + \varepsilon_i \tag{1}$$

where $Ownership_{ik}$ indicates whether i-th individual owns k financial asset, with $k = crypto-assets, bonds, shares$. $E\&S_{ij}$ are i-th individual's attitudes for environmental and social issues, for $j = E, S1, S2, E\&S1, E\&S2$ (see Table A.1 in Appendix). X_i represents a set of control variables relevant for individual i's investment decisions, such as age, gender,

[9]Note that one can also use logit and probit models, which result in estimates of marginal effects of similar order of magnitude. However, the linear probability model (LPM) specification, which is commonly used in the literature to analyse binary outcomes (e.g., Cupák et al., 2019; Gan et al., 2022), ties in better with the approach of Lewbel (2012) we use later in our paper.

education, objective and self-assessed financial literacy, risk aversion, income, etc. To absorb time-invariant cross-sectional variation e.g., in informal institutions, social norms across Austrian provinces, we include regional fixed effects, Z_i, in all regressions. As usual, ε_i denotes the error term.

The choice of a portfolio allocation by an individual may itself affect E&S attitudes through different channels such as media exposure about related developments, interactions with investment fund managers or specific marketing targeting. We attempt to mitigate such omitted variable bias by including economically-relevant covariates related to higher education and financial literacy in the regression model.

Despite the useful guidance of accumulated evidence from previous studies, it is impossible to know if all important variables have been included. Hence the concern of the E&S endogeneity remains. To address remaining confounders related to potentially endogenous E&S attitudes, we use an instrumental variables (IV) approach. Linear regression models containing endogenous regressors are generally identified using outside information such as exogenous external instruments or by parametric distribution assumptions.

As argued above, in our main model (see equation (1)), $E\&S_{ij}$ attitudes can be viewed as endogenous and hence correlated with ε_i. In the ASFL data, we have no exclusion assumption, meaning we have no outside source of instruments. As shown by Lewbel (2012), in such situations the model can be identified by exploiting variation on higher moment conditions of the first-stage error distribution.

Following Lewbel (2012) we first regress endogenous attitudes, $E\&S_{ij}$, on a constant and a set of covariates X_i: $E\&S_{ij} = \psi X_i + \omega_i$. Then we take the estimated residuals $\hat{\omega}_i$ from the first-stage regression and let $R_i = \left(X_i - \bar{X}\right)\hat{\omega}_i$, where $\bar{X}$ is the sample average of X_i. Lewbel (2012) shows that under certain assumptions regarding heteroscedasticity in the first-stage regression, which is a feature of our data (see Table 2), R_i is a valid vector of instruments for $E\&S_{ij}$ in the equation (1), resulting in consistent estimates.

4 Results

4.1 Main Results

Our baseline model specifications of equation (1) — M1 and M2 — consider alternative composite E&S variables alongside the above detailed explanatory variables. The estimation results employing OLS and Lewbel (2012) IV approach (correcting for potential endogeneity of the E&S attitudes) for crypto-assets, bonds, and shares are displayed in Table 2. For a comparison with baseline results, we estimate four additional OLS specifications of equation (1) in order to account for a potential multi-collinearity between the explanatory variables and to check the robustness of estimated coefficients. Models 3 and 4 consider E&S variables individually alongside the relevant socio-economic explanatory variables. Models 5 and 6 are similar to Models 3 and 4 except that they also include financial literacy and financial self-confidence. The estimated OLS results are reported in Table 3, Table 4 and Table 5 for crypto-assets, bonds, and shares, respectively.

A striking key result is that the non-pecuniary effect hypothesis cannot be rejected based on the ASFL data: E&S-consciousness of investors has a statistically significant impact on individual portfolio exposure to crypto-assets. We observe this negative significant effect of E&S attitudes on crypto-asset portfolio composition for both baseline specifications in the IV estimations in Table 2. This novel result is also confirmed across most OLS specifications in Table 3: in models M1, M2, M4 and M6. In line with crypto-asset perceptions often shaped by news media regarding their ESG footprint, our results confirm that retail investors with stronger E&S attitudes are less likely to invest in crypto-assets than their less E&S-conscious peers.

Turning to augmented OLS models, they provide additional specification and robustness checks by confirming that environmental attitudes have stronger negative impact on crypto-assets holdings than social attitudes of investors. Further, composite E&S coefficients tend to be as statistically significant as individual environmental but more statistically significant

than social attitudes. This result is also confirmed by IV estimates[10] reported in Table 2 where all E&S coefficients are statistically significant and their magnitude is greater than in OLS models.

The results in Table 2 and Table 3 further show that investment in crypto-assets varies by how risk averse investors are in their portfolio choices, by investor's financial literacy and age. Financially better educated and more risk-taking investors are more likely to invest in crypto-assets — a result also found in the recent empirical literature (e.g., Fujiki, 2021). Regarding age, older individuals are less likely to invest in crypto-assets — as expected.

These results are in line with the previous literature (e.g., Krueger et al., 2020), as investors receive imperfect signals about the crypto-asset ESG footprint, which usually come from public sources such as news media or from their own idiosyncratic observations. Both risk and ambiguity lead to a cautious investor behaviour and an uncertainty premia in asset markets; learning under risk and ambiguity generates asymmetric responses to ESG-news. ESG attitudes affect investment decisions because they serve as a proxy for value-relevant information or risk, they enhance performance or reduce risk.

As a benchmark, we compare the crypto-asset holding probabilities with holding probabilities of traditional risky assets, namely bonds and shares in Table 2. While the estimated relationship between E&S attitudes and crypto holdings is statistically significant in most estimated models, we do not find such a statistically significant relationship between E&S attitudes and the probability to hold bonds or shares (see columns 1-4 in Table 2 compared to columns 5-8 and 9-12). OLS estimates in Table 4 and Table 5 confirm these findings. This result finds strong support in the recent empirical literature on the ESG investing. For example, Anderson and Robinson (2021) have not found any statistically significant relationship between individuals' ESG attitudes and ownership of pro-environment portfolios (green bonds, stocks, and pension funds) in a sample of Swedish households. For our estimations,

[10]First-stage regression results of the Lewbel (2012) approach are reported in Table A.2. Holding other things equal, E&S attitudes positively correlate with being female, and with the level of individuals' financial literacy. These results are overall in line with the previous empirical literature (e.g., Sabbaghi et al., 2013; Gillan et al., 2021). On the other hand, E&S attitudes are lower for risk-loving individuals.

which are based on the AFLS data that do not identify separately E&S bonds/stocks and non-E&S assets, this implies that the relationship between E&S attitudes and the probability to hold traditional assets are even less likely to be present if the findings of Anderson and Robinson (2021) were generalisable for Austria.

[Table 2 about here]

[Table 3 about here]

[Table 4 about here]

[Table 5 about here]

For the household finance literature that studies determinants of portfolio holdings, our results add a further piece of evidence that non-pecuniary effects indeed matter in explaining cross-sectional differences in investment decisions; whereby the association between E&S attitudes and crypto-assets is stronger compared to traditional risky assets like bonds and shares.

There are several environmental and social related factors at play that are likely perceived heterogeneously by investors and likely have implications for our findings. Regarding environmental factors, the leading cryptocurrency, Bitcoin, which holds the largest market share among crypto-assets, relies on a PoW consensus mechanism. This mechanism is often associated with high energy consumption and adverse environmental effects. On the other hand, many other crypto-assets, particularly those in the PoS category, are more energy efficient resulting in lower environmental footprint. At the same time, the PoW-based blockchains are increasingly becoming more environmentally friendly by transitioning to renewable energy sources like solar, hydro or wind power (e.g., Dilek and Furuncu, 2019; Kohler and Pizzol, 2019; Saleh, 2021; Ghosh and Bouri, 2022; Ibañez and Rua, 2023; Wendl et al., 2023). Similarly, from social dimension perspective, crypto-assets exhibit both negative and positive outcomes. While crypto-assets (regardless of being PoW and PoS based) have sometimes been associated with undesirable social activities, such as illicit trade, money laundering and

tax evasion (e.g., Barone and Masciandaro, 2019; Foley et al., 2019; Teichmann and Falker, 2021), they also hold the potential to bring forth various social benefits (e.g., privacy, financial inclusion, trust and transparency decentralization, charitable contributions) (e.g., Ciaian et al., 2016; Chapron, 2017; Richman et al., 2021).

Our findings, which reveal a negative relationship between E&S attitudes and crypto holdings, suggest that the negative E&S concerns among investors tend to more than offset the positive ones. Further, the finding that environmental attitudes have a stronger negative impact on crypto-asset holdings than social attitudes indicates that concerns related to the high energy consumption associated with PoW-based blockchains are more dominant. Social issues, on the other hand, either do not significantly concern investors or the positive and negative social outcomes associated with crypto-assets tend to offset each other out.

For the crypto-asset literature, the evidence we provide is supportive of crypto asset-related environmental concerns (e.g., high energy consumption in the PoW mining) being of first-order for crypto holdings, whereas social issues (e.g., financial inclusion) of second-order. E&S-conscious investors are less likely to invest in crypto-assets even though in the general crypto-asset class there are also cryptocurrencies with neutral environmental effects (Platt et al., 2021). We find less support for a causal relationship between non-pecuniary effects related to social attitudes in the Austrian individual investor portfolio exposure to crypto-assets.

4.2 Further Analysis and Robustness

We estimate several additional models serving as robustness checks, for diagnostic purposes and transparency. First, we check if the coefficients remain stable after accounting for possible nonlinearities in effects of age and income. The results suggest that even considering the non-linear quadratic terms do not alter our main set of estimated E&S effects (see Table A.3 in Appendix).

Second, given the binary nature of our dependent variable (ownership of crypto-assets),

we estimate a set of probit regressions (results shown in Table A.4) to check the robustness of our baseline estimates presented in Table 2 through Table 5. Reassuringly, the probit marginal effects are somewhat smaller though of the same order of magnitude.

Furthermore, given the rare occurrence of the crypto-assets owners (around 3% of the sample), simple OLS or probit estimates might suffer from bias as suggested by King and Zeng (2001). Therefore, we have re-estimated our main OLS and probit models by means of a rare-events logit model. We report the estimation results from three rare-event specifications next to each other in Table A.4 in Appendix. Once again, the OLS/LPM estimates are quite close to the marginal effects obtained from the estimated coefficients for rare-events logit model. This supports the OLS estimation approach also in the 2SLS IV framework.

Finally, we have checked the robustness of the estimated results with respect to the ordinal scales of each social and environmental attitude. Here we consider a set of binary variables that take on a value of 1 if a respondent indicates that he or she cares about social and environmental issues, and 0 otherwise. The estimation results of this specification are presented in Table A.5 and are qualitatively very similar to the baseline estimates presented in Table 2.

5 Conclusions

We studied the relevance of non-pecuniary effects in driving cross-sectional differences in individual investment decisions. In particular, we examined the relationship between E&S attitudes and holdings of crypto-assets; and compared how the investors' E&S attitudes effect on investment decisions differ between crypto-assets and traditional financial assets.

Our results suggest that on average individuals with stronger E&S attitudes tend to invest less frequently in crypto-assets than less E&S-conscious investors. Second, the association between environmental attitudes and crypto investments is of first-order, whereas social attitudes do not determine the portfolio exposure to crypto-assets of E&S-conscious investors.

Our paper delivers a novel evidence regarding the E&S attitudes of individual investors exhibiting a subjective belief dynamics – in line with the household finance literature finding that a priori stated socially "desirable" attitudes do not always match the attitudes revealed in the portfolio choice (Anderson and Robinson, 2021). In line with a typical crypto-asset perception generated by news media with respect to their ESG footprint, our results confirm that retail investors with stronger E&S attitudes invest less likely in crypto-assets than their less E&S-conscious peers. We note, however, there are also other potential reasons why such a result could actually be in line with consistent attitudes with regard to communication and actual portfolio choice. The individual investors who exhibit stronger nonpecuniary beliefs for their portfolio ESG footprint tend to be younger, above-average educated, and financially more literate compared to the general population or large corporate crypto-asset holders (Stix, 2021; Fujiki, 2021; Mustafa et al., 2022). Given the evident negative influence of E&S attitudes on crypto-asset investments, regulators and policymakers should therefore consider tailored financial education and awareness programs, particularly targeting more affected or susceptible investors (e.g., younger, less educated), to ensure informed investment decisions in this rapidly evolving asset space.

These findings underscore the importance of considering non-pecuniary effects, such as the environmental, social, and ethical/moral attributes, when designing new digital currencies. As a number of central banks explore digital currency initiatives — i.e., central bank digital currency (CBDC) — recognizing these aspects is essential to ensure broader acceptance, particularly among ESG-conscious individuals. In this context, it is crucial for developers to disseminate educational programs and materials aimed at raising awareness among the public, especially ESG-conscious individuals, regarding the ESG-related features and benefits of CBDC. This approach can help build trust and promote the adoption of CBDC. The relevance of the awareness campaign is highlighted by survey results of Abramova et al. (2022), which indicate rather small interest of Austrian residents in the digital Euro, especially in terms of its expected benefits.

Furthermore, our results demonstrate the value added of including separate items and more detailed information on crypto-assets and other alternative financial instruments in standard finance and wealth surveys. Our results also highlight the need to collect detailed information on investor's beliefs and attitudes within the household portfolio context, beyond the standard socio-economic variables, to gain a better understanding of individual investment decisions and behaviour. Moreover, given the growing interplay between EGS attitudes and investment dynamics, it becomes pertinent for financial institutions to offer clearer ESG disclosures and ratings specific to crypto-assets, enabling investors to align their portfolio decisions seamlessly with their ethical and social values.

While this paper delivered first insights, they are subject to a number of limitations which need to be kept in mind when interpreting these results. First, we need to mention a rather small sample size and the cross-section dimension of our data. Both limitations could be addressed with larger (both n and t) data sets. In this context, the relatively low proportion of individuals holding crypto-assets in the sample restricted the possibility to explore more nuanced relationships across different investor subgroups (e.g., by age, education, financial literacy, cryptocurrency literacy, large versus small investors). At the same time, a more detailed profile of individuals would also be required to further reduce potential sources of endogeneity. Further, our reliance on cross-sectional data limited to the year 2019 prevented us from capturing temporal dynamics of investors' decision-making, especially considering the historical significant market volatility and the variable media exposure of cryptocurrencies over different time periods. Second, as the data is from Austria, the findings may not be generalisable to other countries or regions with different socio-economic, cultural, or regulatory contexts. Third, the binary nature of the dependent variable for crypto-asset ownership, without considering investment amounts or portfolio distributions restricted the possibility to provide more in-depth analyses regarding the full scope of investors' financial behaviours in relation to E&S attitudes of investors. Finally, the data used in the paper does not differentiate between various types of crypto-assets, particularly those employing differ-

ent consensus mechanisms (e.g., PoW and PoS). These variations could influence investors' E&S perceptions and impact their portfolio choices differently.

Only survey data which includes both extensive and intensive margins of crypto-asset holdings along with the rest of the household balance sheet as well as a large number of socio-economic characteristics and attitudes will allow to create a deeper understanding of portfolio choice with regard to crypto-assets. Overall, we strongly believe that more research is needed using larger household finance datasets which allow for a more detailed and comprehensive socio-economic analysis of the relationship of ESG attitudes and portfolio choice with regard to crypto-assets. For these reasons, we call for an inclusion of crypto-asset questions into standard household finance surveys such as the Survey of Consumer Finances (US), the Wealth and Asset Survey (UK) or the Household Finance and Consumption Survey (Continental Europe). Such a micro-evidence-based understanding is urgently needed given the quick rise of crypto-assets especially among the younger investor cohorts, not only for potential regulation purposes but also to monitor the financial behaviour of households and potential risks created for the financial stability.

References

Abramova, S., R. Böhme, H. Elsinger, H. Stix, and M. Summer (2022): "What can CBDC designers learn from asking potential users? Results from a survey of Austrian residents," Tech. rep., Working Paper.

Ahmed, M. F., Y. Gao, and S. Satchell (2021): "Modeling demand for ESG," *The European Journal of Finance*, 27, 1669–1683.

Almeida, J. and T. C. Gonçalves (2023): "A systematic literature review of investor behavior in the cryptocurrency markets," *Journal of Behavioral and Experimental Finance*, 100785.

Anderson, A. and D. T. Robinson (2021): "Financial Literacy in the Age of Green Investment," *Review of Finance*, 63, 1572–3097.

Bannier, C., T. Meyll, F. Röder, and A. Walter (2019): "The gender gap in 'Bitcoin literacy'," *Journal of Behavioral and Experimental Finance*, 22, 129–134.

Bannier, C. E. and M. Schwarz (2018): "Gender-and education-related effects of financial literacy and confidence on financial wealth," *Journal of Economic Psychology*, 67, 66–86.

Barone, R. and D. Masciandaro (2019): "Cryptocurrency or usury? Crime and alternative money laundering techniques," *European Journal of Law and Economics*, 47, 233–254.

Baum, C. F. and A. Lewbel (2019): "Advice on using heteroskedasticity-based identification," *Stata Journal*, 19, 757–767.

Bekhtiar, K., P. Fessler, and P. Lindner (2019): "Risky assets in Europe and the US: risk vulnerability, risk aversion and economic environment," Working Paper Series 2270, European Central Bank.

Borri, N. (2019): "Conditional tail-risk in cryptocurrency markets," *Journal of Empirical Finance*, 50, 1–19.

Bouri, E., R. Gupta, and D. Roubaud (2019): "Herding behaviour in cryptocurrencies," *Finance Research Letters*, 29, 216–221.

Chapron, G. (2017): "The environment needs cryptogovernance," *Nature*, 545, 403–405.

Chen, X., L. P. Hansen, and P. G. Hansen (2020): "Robust identification of investor beliefs," *Proceedings of the National Academy of Sciences*, 117, 33130–33140.

Ciaian, P., M. Rajcaniova, and d. Kancs (2016): "The digital agenda of virtual currencies: Can BitCoin become a global currency?" *Information Systems and e-Business Management*, 14, 883–919.

Cupák, A., P. Fessler, and A. Schneebaum (2021): "Gender differences in risky asset behavior: The importance of self-confidence and financial literacy," *Finance Research Letters*, 42, 101880.

Cupák, A., G. I. Kolev, and Z. Brokešová (2019): "Financial literacy and voluntary savings for retirement: novel causal evidence," *The European Journal of Finance*, 25, 1606–1625.

da Gama Silva, P. V. J., M. C. Klotzle, A. C. F. Pinto, and L. L. Gomes (2019): "Herding behavior and contagion in the cryptocurrency market," *Journal of Behavioral and Experimental Finance*, 22, 41–50.

Deuflhard, F., D. Georgarakos, and R. Inderst (2019): "Financial literacy and savings account returns," *Journal of the European Economic Association*, 17, 131–164.

Dilek, Ş. and Y. Furuncu (2019): "Bitcoin mining and its environmental effects," *Journal of Economics and Administrative Sciences*, 33, 91–106.

Duarte, V., J. Fonseca, A. S. Goodman, and J. A. Parker (2021): "Simple Allocation Rules and Optimal Portfolio Choice Over the Lifecycle," Working Paper 29559, National Bureau of Economic Research.

Ehrlich, I. and Y. Yin (2022): "A Cross-Country Comparison of Old Age Financial Readiness in Asian Countries vs. the United States: The Case of Japan and the Republic of Korea," Working Paper 29649, National Bureau of Economic Research.

Fahlenbrach, R. and M. Frattaroli (2021): "ICO investors," *Financial Markets and Portfolio Management*, 35, 1–59.

Fessler, P., M. Jelovsek, M. Silgoner, et al. (2020): "Financial literacy in Austria–focus on millennials," *Monetary Policy and the Economy*, 3, 21–38.

Flori, A. (2019): "News and subjective beliefs: A Bayesian approach to Bitcoin investments," *Research in International Business and Finance*, 50, 336–356.

Foley, S., J. R. Karlsen, and T. J. Putniņš (2019): "Sex, drugs, and bitcoin: How much illegal activity is financed through cryptocurrencies?" *The Review of Financial Studies*, 32, 1798–1853.

Fujiki, H. (2021): "Crypto asset ownership, financial literacy, and investment experience," *Applied Economics*, 53, 4560–4581.

Gan, X., F. M. Song, and Y. Zhou (2022): "Language skills and stock market participation: Evidence from immigrants," *Journal of Financial and Quantitative Analysis*, 57, 3281–3312.

Gemayel, R. and A. Preda (2021): "Performance and learning in an ambiguous environment: A study of cryptocurrency traders," *International Review of Financial Analysis*, 77, 101847.

Ghosh, B. and E. Bouri (2022): "Is Bitcoin's carbon footprint persistent? Multifractal evidence and policy implications," *Entropy*, 24, 647.

Giglio, S., M. Maggiori, J. Stroebel, Z. Tan, S. Utkus, and X. Xu (2023): "Four facts about ESG beliefs and investor portfolios," Working Paper 31114, National Bureau of Economic Research.

Gillan, S. L., A. Koch, and L. T. Starks (2021): "Firms and social responsibility: A review of ESG and CSR research in corporate finance," *Journal of Corporate Finance*, 66, 101889.

Grobys, K. and J. Junttila (2021): "Speculation and lottery-like demand in cryptocurrency markets," *Journal of International Financial Markets, Institutions and Money*, 71, 101289.

Gupta, S., S. Gupta, M. Mathew, and H. R. Sama (2021): "Prioritizing intentions behind investment in cryptocurrency: a fuzzy analytical framework," *Journal of Economic Studies*, 48, 1442–1459.

Hu, A. S., C. A. Parlour, and U. Rajan (2019): "Cryptocurrencies: Stylized facts on a new investible instrument," *Financial Management*, 48, 1049–1068.

Ibañez, J. I. and F. Rua (2023): "The energy consumption of Proof-of-Stake systems: A replication and expansion," *arXiv preprint arXiv:2302.00627*.

Jiang, Z., C. Peng, and H. Yan (2021): "Personality differences and investment decision-making," *SSRN 3580364*.

King, G. and L. Zeng (2001): "Logistic regression in rare events data," *Political Analysis*, 9, 137–163.

King, T. and D. Koutmos (2021): "Herding and feedback trading in cryptocurrency markets," *Annals of Operations Research*, 300, 79–96.

Kohler, S. and M. Pizzol (2019): "Life cycle assessment of bitcoin mining," *Environmental Science & Technology*, 53, 13598–13606.

Krause, M. J. and T. Tolaymat (2018): "Quantification of energy and carbon costs for mining cryptocurrencies," *Nature Sustainability*, 1, 711–718.

Kristoufek, L. (2013): "BitCoin meets Google Trends and Wikipedia: Quantifying the relationship between phenomena of the Internet era," *Scientific reports*, 3, 3415.

Krueger, P., Z. Sautner, and L. T. Starks (2020): "The importance of climate risks for institutional investors," *Review of Financial Studies*, 33, 1067–1111.

Kukacka, J. and L. Kristoufek (2023): "Fundamental and speculative components of the cryptocurrency pricing dynamics," *Financial Innovation*, 9, 61.

Lewbel, A. (2012): "Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models," *Journal of Business & Economic Statistics*, 30, 67–80.

Liu, J. and J. L. Peifer (2022): "A Moral Foundations Framing Approach: Retail Investors' Investment Intention in Ethical Mutual Funds," *Business & Society*, 1–27.

Lusardi, A. and O. S. Mitchell (2014): "The economic importance of financial literacy: Theory and evidence," *Journal of Economic Literature*, 52, 5–44.

Mai, F., Z. Shan, Q. Bai, X. Wang, and R. H. Chiang (2018): "How does social media impact Bitcoin value? A test of the silent majority hypothesis," *Journal of management information systems*, 35, 19–52.

Mustafa, F., S. Lodh, M. Nandy, and V. Kumar (2022): "Coupling of cryptocurrency trading with the sustainable environmental goals: Is it on the cards?" *Business Strategy and the Environment*, 31, 1152–1168.

OECD (2018): "OECD/INFE toolkit for measuring financial literacy and financial inclusion," Tech. rep., OECD Publishing, Paris.

Parmentola, A., A. Petrillo, I. Tutore, and F. De Felice (2022): "Is blockchain able to enhance environmental sustainability?" *Business Strategy and the Environment*, 31, 194–217.

Pastor, L., R. F. Stambaugh, and L. A. Taylor (2021a): "Dissecting Green Returns," Working Paper 28940, National Bureau of Economic Research.

——— (2021b): "Sustainable investing in equilibrium," *Journal of Financial Economics*, 142, 550–571.

Pelster, M., B. Breitmayer, and T. Hasso (2019): "Are cryptocurrency traders pioneers or just risk-seekers? Evidence from brokerage accounts," *Economics Letters*, 182, 98–100.

Petukhina, A., S. Trimborn, W. K. Härdle, and H. Elendner (2021a): "Investing with cryptocurrencies–evaluating their potential for portfolio allocation strategies," *Quantitative Finance*, 21, 1825–1853.

Petukhina, A. A., R. C. Reule, and W. K. Härdle (2021b): "Rise of the machines? Intraday high-frequency trading patterns of cryptocurrencies," *The European Journal of Finance*, 27, 8–30.

Platt, M., J. Sedlmeir, D. Platt, P. Tasca, J. Xu, N. Vadgama, and J. I. Ibanez (2021): "Energy footprint of blockchain consensus mechanisms beyond proof-of-work," *arXiv:2109.03667*.

Raimundo Júnior, G. d. S., R. B. Palazzi, R. d. S. Tavares, and M. C. Klotzle (2022): "Market stress and herding: a new approach to the cryptocurrency market," *Journal of Behavioral Finance*, 23, 43–57.

Richman, B., N. Frankovitz, and L. McDonald (2021): "Crypto & ESG White Paper," Tech. rep., Sarson Funds.

Sabbaghi, O., G. F. Cavanagh SJ, and T. Hipskind SJ (2013): "Service-learning and leadership: Evidence from teaching financial literacy," *Journal of business ethics*, 118, 127–137.

Saleh, F. (2021): "Blockchain without waste: Proof-of-stake," *Review of Financial Studies*, 34, 1156–1190.

Stix, H. (2021): "Ownership and purchase intention of crypto-assets: survey results," *Empirica*, 48, 65–99.

Teichmann, F. M. J. and M.-C. Falker (2021): "Money laundering via cryptocurrencies - potential solutions from Liechtenstein," *Journal of Money Laundering Control*, 24, 91–101.

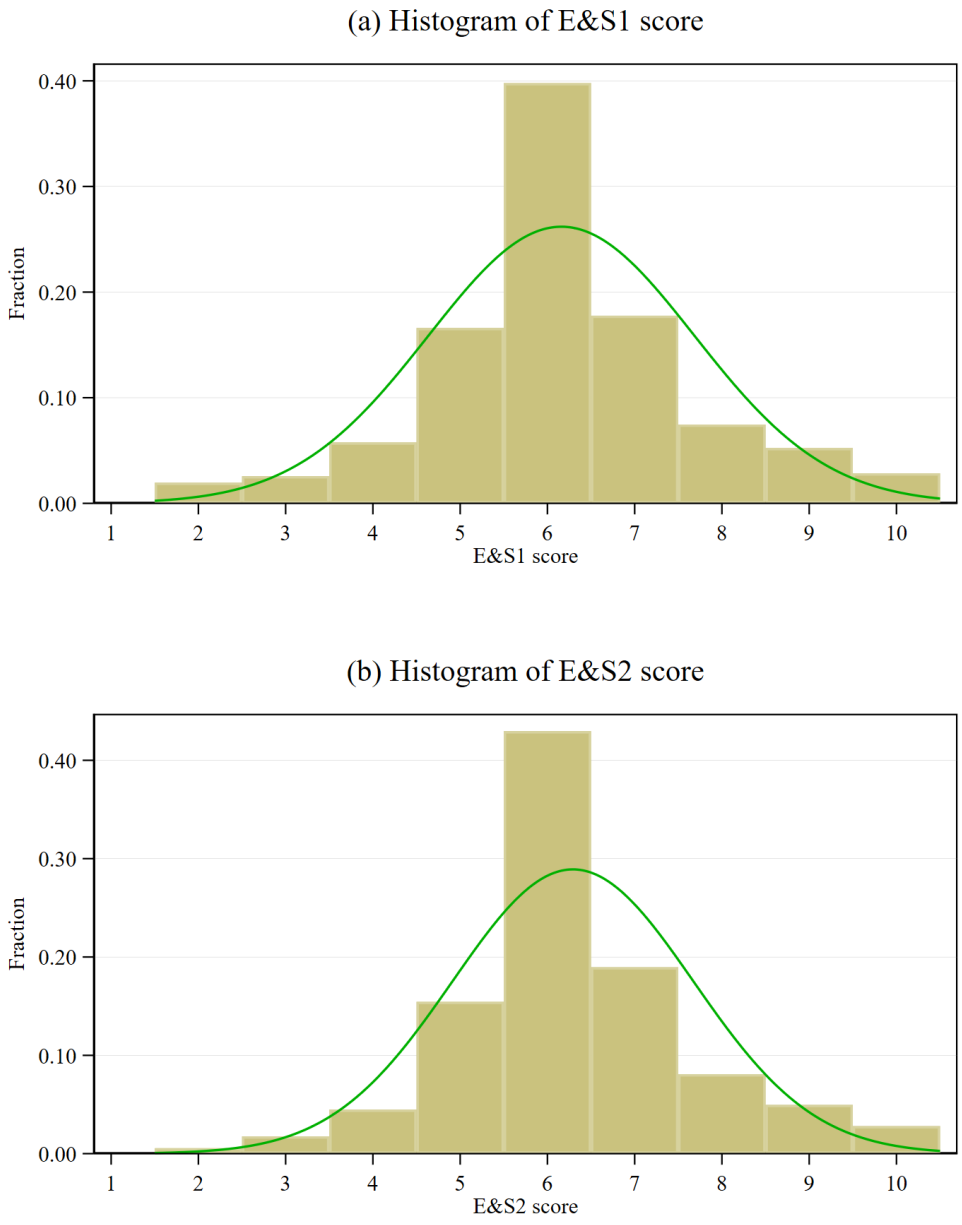
Tomz, M., G. King, and L. Zeng (2021): "RELOGIT: Stata module to perform Rare Event Logistic Regression," Tech. rep., Statistical Software Components, Boston College Department of Economics.

Wendl, M., M. H. Doan, and R. Sassen (2023): "The environmental impact of cryptocurrencies using proof of work and proof of stake consensus algorithms: A systematic review," *Journal of Environmental Management*, 326, 116530.

Xi, D., T. I. O'Brien, and E. Irannezhad (2020): "Investigating the investment behaviors in cryptocurrency," *Journal of Alternative Investments*, 23, 141–160.

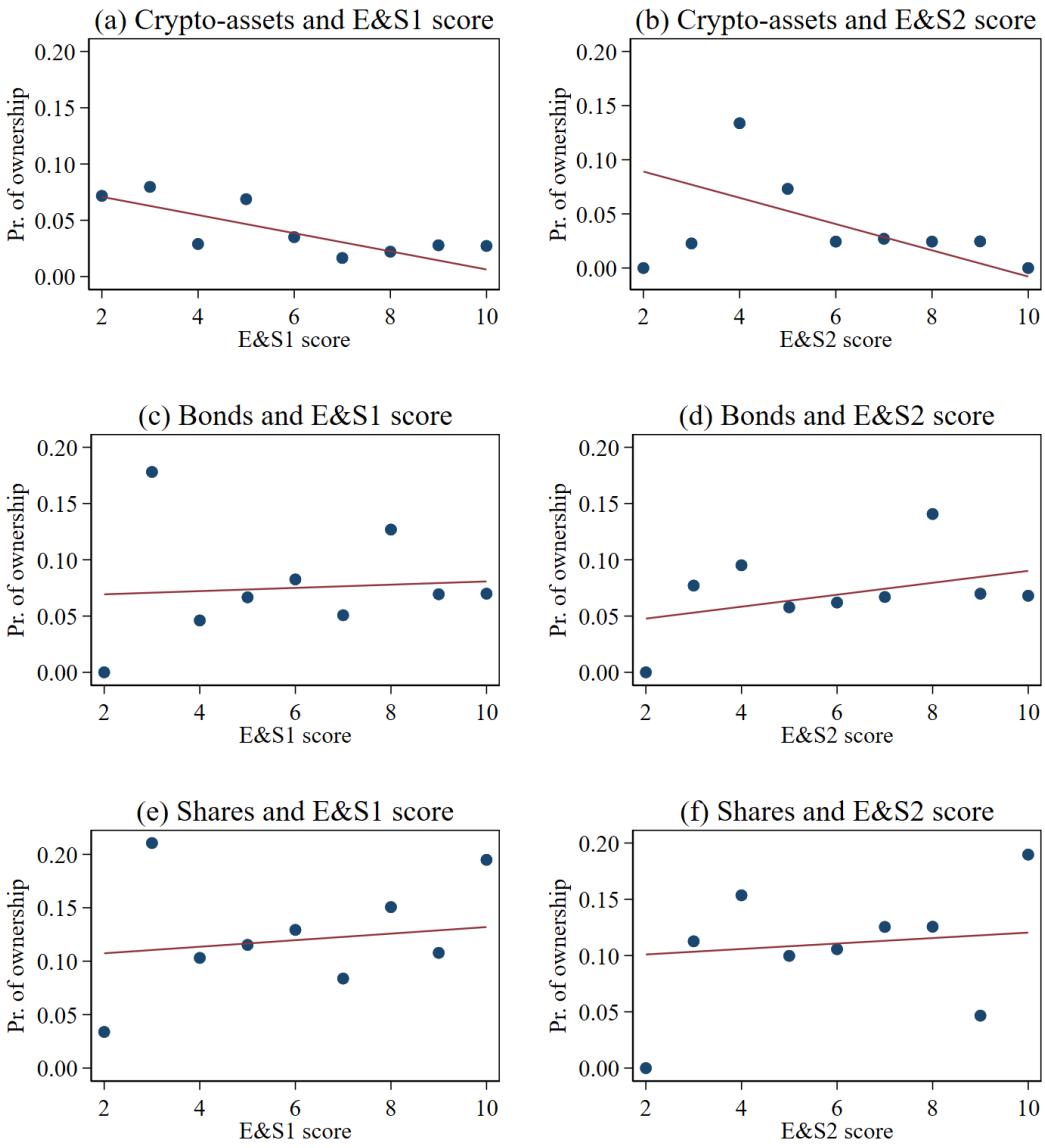
Figures and Tables

Figure 1: Distribution of E&S attitudes



Note: This graph shows the distribution of two E&S attitudes overlaid by the normal density curve (green solid line).
Source: ASFL 2019

Figure 2: Correlation between environmental and social attitudes and holdings of different assets



Note: This graph shows binned scatter plots (i.e., reduced form scatter plot) of E&S attitudes and holdings of different assets. The probability to hold a certain asset is shown on the vertical axis, while the E&S scores are shown on the horizontal axis.
Source: ASFL 2019

Table 1: Descriptive statistics

Variable	N	Mean	SD	Min	Max
Crypto-assets ownership	1,402	0.03	0.18	0	1
Bonds ownership	1,398	0.07	0.25	0	1
Stocks/shares ownership	1,404	0.11	0.31	0	1
Attitudes for enviro. issues (E)	1,274	2.28	1.15	1	5
Attitudes for social issues (S1)	1,198	3.82	1.01	1	5
Attitudes for social issues (S2)	1,363	3.97	0.97	1	5
E&S1 (E + S1)	1,126	6.17	1.52	2	10
E&S2 (E + S2)	1,250	6.25	1.42	2	10
Objective fin. literacy	1,418	5.32	1.64	0	7
Confidence in own fin. knowledge	1,382	3.27	0.98	1	5
Risk attitude score	1,418	1.57	0.82	1	4
Primary education	1,382	0.14	0.35	0	1
Secondary education	1,382	0.76	0.43	0	1
Tertiary education	1,382	0.10	0.30	0	1
Individual monthly net income	1,188	1,642.25	812.35	0	5,250
Gender: female	1,418	0.52	0.50	0	1
Age	1,418	49.08	18.20	16	97

Note: Summary statistics computed using survey weights. There are three main regions (Region of East Austria, Region of South Austria, and Region of West Austria), which are equally represented in the survey.

Source: ASFL 2019

Table 2: Results on E&S attitudes for financial assets (OLS and Lewbel (2012) IV method)

	Crypto-assets				Bonds				Shares			
	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV
E&S1	-0.008*	-0.026**			-0.004	-0.010			0.006	0.010		
	(0.005)	(0.012)			(0.005)	(0.015)			(0.009)	(0.029)		
E&S2			-0.010**	-0.028*			0.003	0.001			0.012	0.024
			(0.005)	(0.015)			(0.006)	(0.015)			(0.009)	(0.034)
Objective fin. literacy	0.013**	0.014**	0.016***	0.017***	0.001	0.001	0.002	0.002	0.016*	0.016*	0.016**	0.015*
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.009)	(0.009)	(0.008)	(0.009)
Confidence in own fin. knowledge	0.013*	0.013*	0.013*	0.013*	0.013	0.013	0.012	0.012	0.019	0.020	0.022**	0.022**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.008)	(0.008)	(0.012)	(0.012)	(0.011)	(0.011)
Risk attitude score	0.056***	0.054***	0.058***	0.053***	0.044***	0.044***	0.049***	0.048***	0.128***	0.129***	0.127***	0.130***
	(0.014)	(0.014)	(0.014)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)	(0.018)	(0.018)	(0.017)	(0.019)
Secondary education	0.004	0.004	0.003	0.002	0.032*	0.032*	0.024	0.024	0.042	0.042	0.027	0.028
	(0.016)	(0.016)	(0.014)	(0.015)	(0.018)	(0.018)	(0.016)	(0.017)	(0.030)	(0.030)	(0.026)	(0.026)
Tertiary education	-0.025	-0.023	-0.029	-0.024	0.075*	0.076*	0.064	0.064	0.092*	0.091*	0.062	0.059
	(0.026)	(0.027)	(0.024)	(0.026)	(0.043)	(0.043)	(0.041)	(0.040)	(0.055)	(0.054)	(0.050)	(0.047)
Individual monthly income	-0.000	-0.000	-0.000	-0.000	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	-0.008	-0.003	0.004	0.008	-0.004	-0.003	-0.017	-0.016	0.011	0.010	-0.005	-0.007
	(0.012)	(0.013)	(0.013)	(0.014)	(0.016)	(0.017)	(0.015)	(0.015)	(0.020)	(0.022)	(0.019)	(0.019)
Age	-0.001**	-0.001**	-0.001**	-0.001**	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.057	0.195**	-0.053	0.211**	-0.256***	0.128	-0.277***	0.057	-0.538***	0.045	-0.538***	-0.044
	(0.048)	(0.077)	(0.042)	(0.093)	(0.058)	(0.089)	(0.062)	(0.093)	(0.077)	(0.175)	(0.072)	(0.207)
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.100		0.110		0.116		0.117		0.212		0.205	
N	902	902	1,000	1,000	904	904	998	998	903	903	1,000	1,000
F-statistics		11.429		16.093		11.593		16.614		11.590		16.284
Breusch-Pagan test		25.004		55.105		24.883		56.325		24.841		54.704
p-value		0.005		0.000		0.006		0.000		0.006		0.000
Hansen J-test		8.887		8.495		9.554		11.947		12.954		7.791
p-value		0.448		0.485		0.388		0.216		0.165		0.555
Pagan-Hall test		112.554		138.939		133.875		171.490		289.830		322.216
p-value		0.000		0.000		0.000		0.000		0.000		0.000

Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set. All RHS covariates (i.e., instruments) in the IV models have been generated according to the Lewbel (2012) methodology which is implemented within the Stata 'ivreg2h' estimation command (Baum and Lewbel, 2019).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

Table 3: Results on E&S attitudes for crypto-assets (OLS)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Attitudes for enviro. issues (E)			-0.004	-0.011**	-0.005	-0.012**
			(0.005)	(0.005)	(0.005)	(0.005)
Attitudes for social issues (S1)			-0.011		-0.013	
			(0.008)		(0.008)	
Attitudes for social issues (S2)				-0.004		-0.007
				(0.007)		(0.007)
E&S1	-0.008*					
	(0.005)					
E&S2		-0.010**				
		(0.005)				
Objective fin. literacy	0.013**	0.016***			0.013**	0.015***
	(0.006)	(0.005)			(0.006)	(0.006)
Confidence in own fin. knowledge	0.013*	0.013*			0.013*	0.013*
	(0.007)	(0.007)			(0.007)	(0.007)
Risk attitude score	0.056***	0.058***	0.058***	0.060***	0.056***	0.059***
	(0.014)	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)
Secondary education	0.004	0.003	0.018	0.021	0.004	0.004
	(0.016)	(0.014)	(0.017)	(0.015)	(0.016)	(0.014)
Tertiary education	-0.025	-0.029	0.002	0.001	-0.024	-0.029
	(0.026)	(0.024)	(0.024)	(0.021)	(0.026)	(0.024)
Individual monthly income	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	-0.008	0.004	-0.014	-0.002	-0.008	0.004
	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)	(0.013)
Age	-0.001**	-0.001**	-0.000	-0.001**	-0.001*	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.057	-0.053	0.023	0.005	-0.053	-0.058
	(0.048)	(0.042)	(0.047)	(0.040)	(0.048)	(0.042)
Fixed effects	YES	YES	NO	NO	YES	YES
R^2	0.100	0.110	0.080	0.087	0.101	0.110
N	902	1,000	914	1,016	902	1,000
Wald test on E=S			0.768	0.844	0.856	0.339
p-value			0.381	0.358	0.355	0.560

Note: Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

Table 4: Results on E&S attitudes for bonds (OLS)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Attitudes for enviro. issues (E)			0.002	0.002	0.001	0.002
			(0.006)	(0.006)	(0.007)	(0.006)
Attitudes for social issues (S1)			-0.011		-0.011	
			(0.008)		(0.009)	
Attitudes for social issues (S2)				0.004		0.005
				(0.010)		(0.011)
E&S1	-0.004					
	(0.005)					
E&S2		0.003				
		(0.006)				
Objective fin. literacy	0.001	0.002			0.002	0.002
	(0.006)	(0.005)			(0.006)	(0.005)
Confidence in own fin. knowledge	0.013	0.012			0.012	0.012
	(0.009)	(0.008)			(0.009)	(0.008)
Risk attitude score	0.044***	0.049***	0.047***	0.050***	0.045***	0.049***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Secondary education	0.032*	0.024	0.037**	0.031*	0.032*	0.025
	(0.018)	(0.016)	(0.018)	(0.016)	(0.018)	(0.016)
Tertiary education	0.075*	0.064	0.085**	0.074*	0.076*	0.063
	(0.043)	(0.041)	(0.042)	(0.041)	(0.043)	(0.042)
Individual monthly income	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	-0.004	-0.017	-0.008	-0.019	-0.004	-0.017
	(0.016)	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)
Age	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.256***	-0.277***	-0.216***	-0.251***	-0.250***	-0.280***
	(0.058)	(0.062)	(0.051)	(0.061)	(0.058)	(0.065)
Fixed effects	YES	YES	NO	NO	YES	YES
R^2	0.116	0.117	0.114	0.113	0.117	0.117
N	904	998	916	1,014	904	998
Wald test on E=S			1.463	0.044	1.246	0.097
p-value			0.227	0.834	0.265	0.755

Note: Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

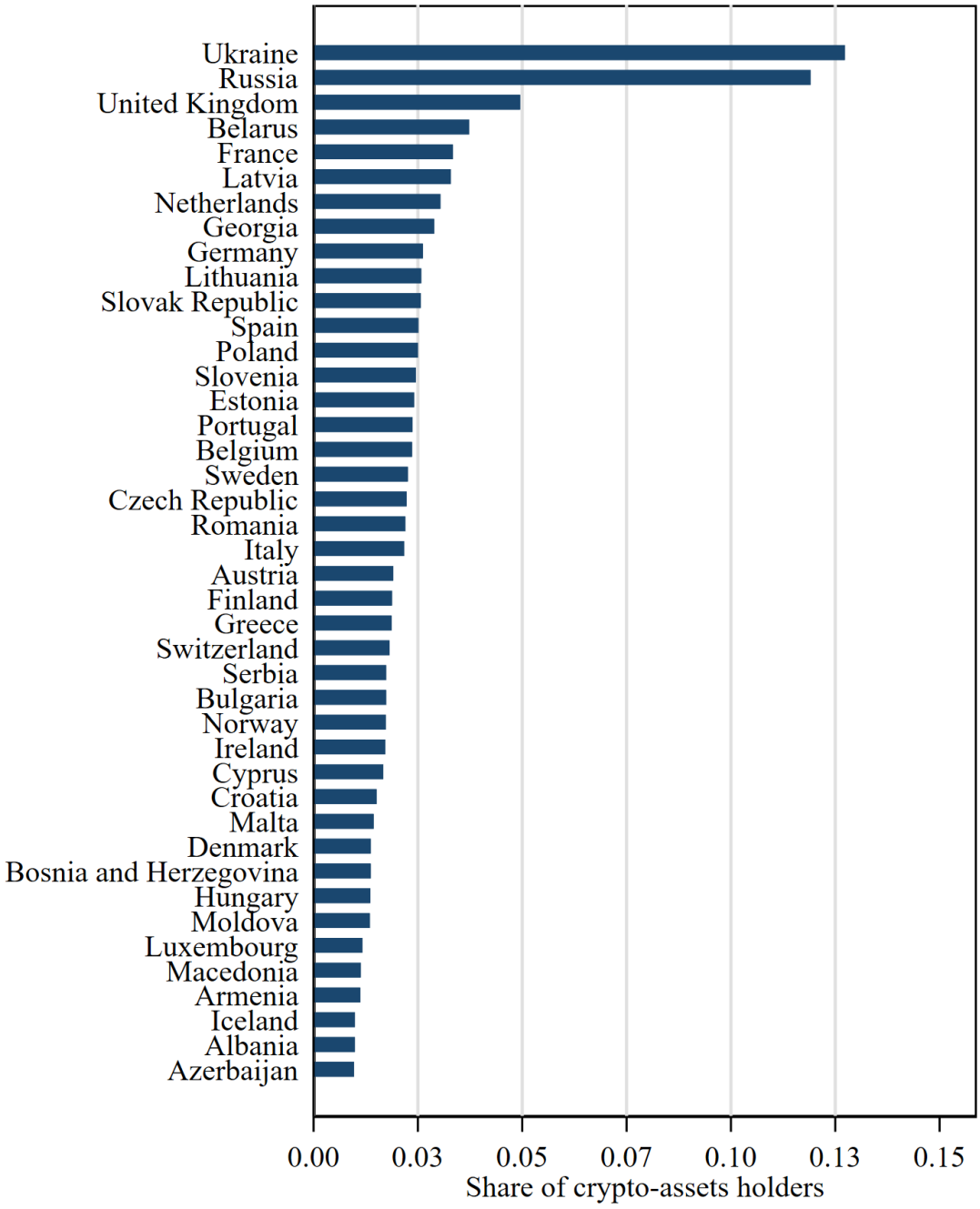
Table 5: Results on E&S attitudes for shares (OLS)

	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Attitudes for enviro. issues (E)			0.012	0.011	0.012	0.012
			(0.010)	(0.010)	(0.011)	(0.010)
Attitudes for social issues (S1)			-0.000		-0.003	
			(0.010)		(0.011)	
Attitudes for social issues (S2)				0.016		0.013
				(0.012)		(0.013)
E&S1	0.006					
	(0.009)					
E&S2		0.012				
		(0.009)				
Objective fin. literacy	0.016*	0.016**			0.017**	0.016**
	(0.009)	(0.008)			(0.009)	(0.008)
Confidence in own fin. knowledge	0.019	0.022**			0.019	0.022**
	(0.012)	(0.011)			(0.012)	(0.011)
Risk attitude score	0.128***	0.127***	0.131***	0.130***	0.128***	0.127***
	(0.018)	(0.017)	(0.018)	(0.017)	(0.018)	(0.017)
Secondary education	0.042	0.027	0.058**	0.047*	0.042	0.027
	(0.030)	(0.026)	(0.029)	(0.024)	(0.029)	(0.026)
Tertiary education	0.092*	0.062	0.121**	0.093**	0.093*	0.062
	(0.055)	(0.050)	(0.052)	(0.047)	(0.054)	(0.050)
Individual monthly income	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	0.011	-0.005	0.001	-0.013	0.011	-0.005
	(0.020)	(0.019)	(0.021)	(0.019)	(0.020)	(0.019)
Age	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.538***	-0.538***	-0.418***	-0.433***	-0.532***	-0.539***
	(0.077)	(0.072)	(0.065)	(0.069)	(0.077)	(0.074)
Fixed effects	YES	YES	NO	NO	YES	YES
R^2	0.212	0.205	0.198	0.189	0.213	0.205
N	903	1,000	915	1,016	903	1,000
Wald test on E=S			0.930	0.145	1.432	0.006
p-value			0.335	0.703	0.232	0.938

Note: Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

Appendix

Figure A.1: Share of population holding crypto-assets across Europe



Source: Based on data from https://triple-a.io/crypto-ownership/

Table A.1: Description of variables used in empirical analysis

Variable	Description
Crypto-assets ownership	Dummy variable equal to 1 if an individual currently owns crypto-assets (including initial coin offerings), and 0 otherwise.
Bonds ownership	Dummy variable equal to 1 if an individual currently owns bonds, and 0 otherwise.
Stocks/shares ownership	Dummy variable equal to 1 if an individual currently owns stocks / shares, and 0 otherwise.
Attitudes for enviro. issues (E)	Environmental attitudes score ranging from 1 to 5 (higher score means stronger attitudes); based on the survey question: *"I think it is more important for investors to choose companies that are making a profit than to choose companies that are minimising their impact on the environment"*. Ranking of categories aligned with social attitudes scores for reasons of comparability.
Attitudes for social issues (S1)	Social attitudes score ranging from 1 to 5 (higher score means stronger attitudes); based on the survey question: *"I prefer to use financial companies that have a strong ethical stance"*.
Attitudes for social issues (S2)	Social attitudes score ranging from 1 to 5 (higher score means stronger attitudes); based on the survey question: *"I am honest even if it puts me at a financial disadvantage"*.
E&S1 (E + S1)	Combined environmental/social score by summing E and S1 variables.
E&S2 (E + S2)	Combined environmental/social score by summing E and S2 variables.
Objective fin. literacy	Financial literacy score ranging from 0 to 7; based on correct answers to 7 financial literacy survey questions (time value of money, interest paid on loan, interest plus principal, compound interest, risk and return, definition of inflation, diversification), see OECD (2018) for details
Confidence in own fin. knowledge	Self-rated knowledge of financial matters ranging from 1 "very low" to 5 "very high".
Risk attitude score	Willingness to take investment risk ranging from 1 "never" to 4 "always".
Education	Dummy variables set for the three main education categories: no or primary education, secondary education, tertiary education.
Individual monthly net income	Individual monthly net income in euros. "Continuous" income is generated as mid points from very detailed income intervals asked to respondents: 0-450; 450-600; ..., 4,800-5,100; 5,100 and above. Hence, measured income is top-coded.
Gender	Dummy variable equal to 1 if female, and 0 otherwise.
Age	Age in years.
Region	Dummy variables set for the three main regions: Region of East Austria, Region of South Austria, and Region of West Austria.

Source: Own processing based on the ASFL 2019 questionnaire

Table A.2: First-stage regression results (OLS)

	Crypto-assets		Bonds		Shares	
	(1)	(2)	(3)	(4)	(5)	(6)
	E&S1	E&S2	E&S1	E&S2	E&S1	E&S2
Objective fin. literacy	0.041	0.075**	0.038	0.071**	0.037	0.073**
	(0.046)	(0.032)	(0.046)	(0.032)	(0.046)	(0.032)
Confidence in own fin. knowledge	-0.022	-0.024	-0.021	-0.025	-0.020	-0.023
	(0.072)	(0.059)	(0.072)	(0.059)	(0.072)	(0.059)
Risk attitude score	-0.098	-0.279***	-0.098	-0.277***	-0.096	-0.279***
	(0.080)	(0.064)	(0.080)	(0.064)	(0.080)	(0.064)
Secondary education	0.018	-0.066	0.018	-0.061	0.016	-0.070
	(0.208)	(0.179)	(0.207)	(0.179)	(0.207)	(0.179)
Tertiary education	0.093	0.279	0.095	0.311	0.097	0.278
	(0.277)	(0.261)	(0.276)	(0.262)	(0.277)	(0.262)
Individual monthly income	0.000	-0.000	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	0.277**	0.231**	0.274**	0.225**	0.279**	0.226**
	(0.118)	(0.104)	(0.118)	(0.104)	(0.118)	(0.104)
Age	0.001	0.006*	0.001	0.006*	0.001	0.006*
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Region of South Austria	-0.273**	-0.407***	-0.273**	-0.400***	-0.269**	-0.403***
	(0.132)	(0.120)	(0.132)	(0.120)	(0.132)	(0.120)
Region of West Austria	-0.167	-0.333***	-0.155	-0.323***	-0.150	-0.325***
	(0.131)	(0.107)	(0.131)	(0.107)	(0.131)	(0.107)
Constant	5.992***	6.239***	6.004***	6.264***	5.999***	6.257***
	(0.463)	(0.382)	(0.463)	(0.382)	(0.463)	(0.382)
R^2	0.020	0.087	0.020	0.086	0.020	0.085
N	902	1000	904	998	903	1000

Note: Regressions estimated using survey weights. Standard errors are reported in parentheses. Dummy variables for 'Primary education' and 'Region of East Austria' categories are the reference categories of the respective dummy variables sets.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

Table A.3: Robustness of results on E&S attitudes for crypto-assets (OLS, nonlinear effects of age and income)

	(1)	(2)	(3)	(4)	(5)	(6)
E&S1	-0.008*	-0.008*	-0.008*			
	(0.005)	(0.005)	(0.005)			
E&S2				-0.010**	-0.010**	-0.010**
				(0.005)	(0.005)	(0.005)
Objective fin. literacy	0.013**	0.013**	0.013**	0.016***	0.016***	0.016***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Confidence in own fin. knowledge	0.013*	0.013*	0.014**	0.013*	0.013*	0.014**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Risk attitude score	0.056***	0.056***	0.056***	0.058***	0.058***	0.058***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Secondary education	0.004	0.003	0.004	0.003	0.002	0.006
	(0.016)	(0.015)	(0.016)	(0.014)	(0.013)	(0.015)
Tertiary education	-0.025	-0.025	-0.024	-0.029	-0.030	-0.025
	(0.026)	(0.027)	(0.026)	(0.024)	(0.025)	(0.024)
Individual monthly income	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Individual monthly income squared		-0.000			-0.000	
		(0.000)			(0.000)	
Gender: female	-0.008	-0.008	-0.008	0.004	0.004	0.004
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)
Age	-0.001**	-0.001**	-0.001	-0.001**	-0.001**	-0.003
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.002)
Age squared			0.000			0.000
			(0.000)			(0.000)
Constant	-0.057	-0.057	-0.049	-0.053	-0.056	-0.020
	(0.048)	(0.050)	(0.062)	(0.042)	(0.045)	(0.060)
Fixed effects	YES	YES	YES	YES	YES	YES
R^2	0.100	0.100	0.100	0.110	0.110	0.111
N	902	902	902	1,000	1,000	1,000

Note: Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

Table A.4: Robustness of results on E&S attitudes for crypto-assets (comparison of OLS, probit, and rare-events logit models)

	(1) OLS	(2) Probit	(3) Rare-events logit	(4) OLS	(5) Probit	(6) Rare-events logit
E&S1	-0.008*	-0.002	-0.006			
	(0.005)	(0.002)	(0.006)			
E&S2				-0.010**	-0.003*	-0.009*
				(0.005)	(0.002)	(0.005)
Objective fin. literacy	0.013**	0.004**	0.014*	0.016***	0.005***	0.018***
	(0.006)	(0.002)	(0.007)	(0.005)	(0.002)	(0.007)
Confidence in own fin. knowledge	0.013*	0.008**	0.018*	0.013*	0.006*	0.015*
	(0.007)	(0.004)	(0.009)	(0.007)	(0.003)	(0.008)
Risk attitude score	0.056***	0.016***	0.040***	0.058***	0.013***	0.042***
	(0.014)	(0.005)	(0.009)	(0.014)	(0.005)	(0.009)
Secondary education	0.004	0.003	-0.000	0.003	0.006	0.012
	(0.016)	(0.014)	(0.046)	(0.014)	(0.012)	(0.053)
Tertiary education	-0.025	-0.008	-0.029	-0.029	-0.003	-0.017
	(0.026)	(0.016)	(0.051)	(0.024)	(0.013)	(0.055)
Individual monthly income	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	-0.008	-0.001	-0.005	0.004	0.004	0.009
	(0.012)	(0.005)	(0.015)	(0.013)	(0.005)	(0.014)
Age	-0.001**	-0.001***	-0.001***	-0.001**	-0.000***	-0.002***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Region of South Austria	-0.028**			-0.034***		
	(0.011)			(0.011)		
Fixed effects	YES	YES	YES	YES	YES	YES
R^2	0.100			0.110		
Pseudo R^2		0.272			0.305	
ROC curve		0.888			0.901	
N	902	902	902	1,000	1,000	1,000

For probit and rare-events logit models we report marginal effects (calculated at the means of explanatory variables). Rare-events logit models are estimated using 'relogit' Stata estimation command (Tomz et al., 2021). Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set.

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

Source: ASFL 2019

Table A.5: Robustness of results on E&S attitudes for financial assets (OLS and Lewbel (2012) IV method, discretised measures of E&S attitudes)

	Crypto-assets				Bonds				Shares			
	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV	(M1) OLS	(M1) IV	(M2) OLS	(M2) IV
E&S1 (dummy)	-0.026*	-0.072**			-0.026	0.002			0.038	0.139		
	(0.016)	(0.031)			(0.021)	(0.050)			(0.043)	(0.113)		
E&S2 (dummy)			-0.026**	-0.029			-0.013	-0.006			0.011	0.101*
			(0.011)	(0.022)			(0.022)	(0.036)			(0.040)	(0.059)
Objective fin. literacy	0.013**	0.014**	0.015***	0.015***	0.001	0.001	0.002	0.002	0.016*	0.014	0.017**	0.015*
	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.009)	(0.009)	(0.008)	(0.008)
Confidence in own fin. knowledge	0.014*	0.013*	0.013*	0.013*	0.013	0.013	0.012	0.012	0.019	0.020	0.022*	0.023**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.008)	(0.008)	(0.012)	(0.012)	(0.011)	(0.011)
Risk attitude score	0.056***	0.056***	0.061***	0.061***	0.044***	0.045***	0.047***	0.048***	0.128***	0.130***	0.124***	0.126***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.018)	(0.018)	(0.017)	(0.017)
	(0.016)	(0.016)	(0.014)	(0.014)	(0.018)	(0.018)	(0.016)	(0.016)	(0.030)	(0.030)	(0.027)	(0.026)
Tertiary education	-0.025	-0.024	-0.031	-0.031	0.076*	0.075*	0.065	0.065	0.091*	0.089	0.065	0.063
	(0.026)	(0.026)	(0.024)	(0.024)	(0.043)	(0.043)	(0.041)	(0.041)	(0.054)	(0.054)	(0.050)	(0.051)
Individual monthly income	-0.000	-0.000	-0.000	-0.000	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender: female	-0.009	-0.008	0.003	0.003	-0.005	-0.006	-0.016	-0.016	0.011	0.008	-0.002	-0.007
	(0.013)	(0.013)	(0.013)	(0.013)	(0.016)	(0.016)	(0.015)	(0.015)	(0.020)	(0.021)	(0.019)	(0.019)
Age	-0.001**	-0.001**	-0.001**	-0.001**	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.101**	0.042***	-0.113***	0.038***	-0.276***	0.066***	-0.257***	0.064***	-0.512***	0.092***	-0.462***	0.094***
	(0.039)	(0.008)	(0.036)	(0.007)	(0.055)	(0.010)	(0.049)	(0.009)	(0.077)	(0.014)	(0.068)	(0.010)
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.097		0.107		0.116		0.117		0.212		0.202	
N	902	902	1000	1000	904	904	998	998	903	903	1000	1000
F-statistics		18.450		36.060		18.277		36.552		18.254		35.497
Breusch-Pagan test		61.007		138.296		59.716		139.821		59.675		136.405
p-value		0.000		0.000		0.000		0.000		0.000		0.000
Hansen J-test		16.696		16.032		10.769		10.602		6.089		6.510
p-value		0.054		0.066		0.292		0.304		0.731		0.688
Pagan-Hall test		107.512		125.785		130.304		159.564		282.677		332.055
p-value		0.000		0.000		0.000		0.000		0.000		0.000

Regressions estimated using survey weights. Robust standard errors are reported in parentheses. Dummy variable for 'Primary education' category is the reference category of the respective dummy variables set. All RHS covariates (i.e., instruments) in the IV models have been generated according to the Lewbel (2012) methodology which is implemented within the Stata 'ivreg2h' estimation command (Baum and Lewbel, 2019).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: ASFL 2019

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