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Motives and profiles of ICO investors

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A B S T R A C T

Research on initial coin offerings (ICOs) is nascent and assesses ICOs from the perspectives of ventures and regulators. Little is known about the equally important group of investors who provide their capital to ventures in ICOs. Using a primary dataset of 517 ICO investors, we identify and categorize the motivations to invest in ICOs using factor analysis. We find that investors are driven by ideological, technological, and financial motives. Regarding the relative importance of the motives, we find that technological motives are the most important motives to ICO investors, followed by financial and ideological motives. To further profile investors, we conduct a regression analysis to distinguish investors across different motives. For example, we show significant differences across motives with regard to investors' risk perception, sources of information, and demand for strict regulation. The implications of this study for both theory and practice are considerable.

1. Introduction

An initial coin offering (ICO) represents a novel mechanism of entrepreneurial finance that has substantially gained popularity since 2017. In an ICO (also referred to as a "token offering"), entrepreneurial ventures raise capital by selling tokens to a crowd of investors (Fisch, 2019). Tokens are cryptographically protected digital assets implemented on a blockchain (Li and Mann, 2018).[1] Thus, blockchain technology is at the core of the business models of these ventures. Blockchain technology is a novel and fast-evolving approach to recording and transmitting data across a network in an immutable manner using cryptographic and algorithmic methods (see Natarajan, Krause, & Gradstein, 2017). Blockchain technology is referred to as a revolutionary and disruptive technological innovation with vast potential (e.g., Elnaj, 2018; Swan, 2015). The funding of such highly innovative startups is among the premier topics in entrepreneurial finance (Block, Colombo, Cumming, & Vismara, 2018).

ICOs resemble crowdfunding in their approach since they raise funding from a crowd of investors via an open call on the internet. However, one distinguishing characteristic is the concept of selling tokens, which can provide value to investors via a utility or security function. For example, utility tokens can be used to redeem a product or service in the future or can be used as a medium of exchange among users on the venture's platform. In contrast, security tokens function as investment vehicles and entitle their holders to shares of ownership, dividends, and other financial benefits (e.g., Fisch, 2019; Li and Mann, 2018). During an ICO, investors can buy these tokens directly from the venture that issues them at a predefined price. Therefore, ICO investors provide the venture with early-stage financing that is available to the venture both directly and immediately. In addition, tokens can be traded on a secondary market after the conclusion of the ICO, irrespective of their primary utility or security function (e.g., Adkisson, 2018).

ICOs are controversial. Since they are loosely regulated, they enable startups to raise large amounts of capital while avoiding the costs of compliance and intermediaries. Conversely, the absence of regulation leads to increased investment risk due to misconduct (Cumming, Dannhauser, & Johan, 2015), for example, because tokens often have no current value and do not lead to any legal entitlement (e.g., Fisch, 2019; Huang, Meoli, & Vismara, 2019; SEC, 2017). This investment risk is particularly high for nonprofessional investors who do not have the expertise, the resources and the incentives to perform careful due diligence before investing. As a result, the US Securities and Exchange Commission (SEC) has designed a dedicated website to educate and warn individual investors about possible frauds in ICOs.[2]

While ICOs are frequently discussed among practitioners, the research on ICOs is nascent. The existing empirical studies mainly investigate the determinants of ICO success (e.g., Ante, Sandner, &

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[1] Technically, a blockchain is a specific type of distributed ledger technology (DLT), which is the base technology on which blockchains are built. As of 2019, most ICOs are blockchain-based, and blockchain is the most important DLT (Fisch, 2019). In line with most of the prior research, we therefore refer to the term "blockchain" instead of "DLT" throughout this manuscript. However, all of our arguments also apply to ICOs not based on a blockchain.

[2] See https://www.investor.gov/howeycoins (as of July 1st, 2019).

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Fiedler, 2018; Fisch, 2019; Masiak, Block, Masiak, Neuenkirch, & Pielen, 2019; Momtaz, 2019) and post-ICO performance (Benedetti & Kostovetsky, 2018; Lyandres, Palazzo, & Rabetti, 2018; Momtaz, 2018). Other studies assess and evaluate ICOs from regulatory, societal, and geographical perspectives (Cohney, Hoffman, Sklaroff, & Wishnick, 2018; Huang et al., 2019).

In contrast, the empirical research on investors, another crucial party involved in ICOs, is nonexistent. Thus far, studies have mostly relied on anecdotal evidence regarding the characteristics and motives of investors. For instance, a prominent assumption is that ICO investors primarily seek high returns on investment (e.g., Adkisson, 2018; Cohney et al., 2018; Madeira, 2018). While this assumption appears reasonable, it is unclear whether other motives may play an equally important role. Specifically, research in the related domain of crowdfunding shows that investors are often motivated by a diverse set of extrinsic and intrinsic motives, even though extrinsic motives are often found to be most important (e.g., Allison et al., 2015; Pierrakis, 2019). Relatedly, Vismara (2019) shows that sophisticated crowdfunding investors follow a market logic similar to that of institutional investors, while small investors also consider a community logic (Fisher, Kuratko, Bloodgood, & Hornsby, 2017). This finding suggests that different motivations to invest coincide with different investor characteristics, calling for the profiling of investors according to their investment motives.

Extending this research to the context of ICOs, our goal is to explore and profile ICO investors according to their motives. We assess three interconnected and salient research questions. What are ICO investors' motives to invest in ICOs? What is their relative importance? How can ICO investors be profiled based on their motives?

To answer these questions, we surveyed 517 ICO investors and conducted an exploratory factor analysis to identify the underlying investment motives. Building on self-determination theory (Deci & Ryan, 1985), we find that investors are driven by ideological, technological, and financial motives. Regarding their relative importance, we find that technological motives are more important to ICO investors than financial motives and ideological motives. We then use regression analysis to distinguish and profile the investors according to their motives, revealing significant differences among them. For example, a risk-prone attitude is positively correlated with technological motives, while a professional background in technology is negatively correlated with financial motives. Additionally, earlier ICO investments positively correlate with ideological motives, and the reading of a white paper carefully positively correlates with both ideological and technological motives.

From a theoretical perspective, our findings primarily contribute to the nascent research on ICOs (e.g., Fisch, 2019; Huang et al., 2019; Masiak et al., 2019; Momtaz, 2019). While this research has assessed ICOs from venture and regulatory perspectives, we assess ICOs from the investor perspective. In addition to identifying a very peculiar set of investment motives and ordering them according to their relative importance, our descriptive statistics and regression analyses enable the profiling of ICO investors for the first time. A better understanding of ICO investors is crucial to d interpreting the increase in ICOs and the associated economic effects.

Additionally, our findings more generally contribute to the research in entrepreneurial finance. Individual investors' motivations have been analyzed with regard to other means of entrepreneurial finance, such as crowdfunding (e.g., Gerber & Hui, 2013; Allison et al., 2015). We extend this research to the context of ICOs by showing that ICO investors are similarly motivated by intrinsic and extrinsic motives. Furthermore, our results indicate that, for ICO investors, intrinsic motives can be more important than extrinsic motives, which could be explained by the fact that ICOs are so far not very popular among professional investors. We highlight the importance of ideological motives in the context of ICOs, which have been parenthetically mentioned in crowdfunding research (Cummings, Rawhouser, Vismara, & Hamilton, 2019). Furthermore, our profiling provides nuanced insights into how investors' motives relate to different investor characteristics, a topic that has received little attention in prior research.

The practical implications of our study are multifold. Previous studies on equity crowdfunding have shown that the group of investors is highly heterogeneous (Gerber & Hui, 2013; Ryu & Kim, 2016; Vismara, 2019). Similarly, our findings inform ICO-conducting ventures about considerable heterogeneity among investors. Ventures trying to appeal to a broad set of investors should thus make sure to cater to this more nuanced set of motives when trying to attract funding. To policymakers interested in regulating ICOs, our findings can serve as the cornerstone for a more fine-grained approach to developing policies that take into account the differing sets of investment motives. The balance between the need for investor protection and the cost of capital formation is of paramount importance in this context since policymaking is still in its early stages (Huang et al., 2019), and an overly broad regulation might severely undermine the innovative potential of ICOs. As proposed by Hornuf and Schwienbacher (2017), the definition of regulation for new forms of early-stage finance depends on the availability of traditional alternatives. While traditional private equity deals, such as venture capital and business angel financing, are limited to a small group of sophisticated investors, equity crowdfunding and ICOs allow issuers to broadly solicit and advertise their securities to a new pool of small investors. The understanding of their behavior is central to the functioning of entrepreneurial financial markets because such investors are likely to differ from traditional early-stage investors. Additionally, a better understanding of investors is of major importance for policymakers in dealing with financial inclusion and the possibilities of disintermediated entrepreneurial finance. In the eyes of policymakers, financial innovations are intertwined with increased financial inclusion (Cumming, Meoli, & Vismara, 2018). By profiling different types of investors in ICOs, our paper highlights a different predisposition toward regulation.

2. Theoretical framework

2.1. Self-determination theory and investor motivations

Self-determination theory (SDT) (Deci & Ryan, 1985) is a theoretical framework that explains human motivation. SDT assesses whether an individual's behavior is self-determined and shows that individuals vary in their type of motivation, which concerns the underlying attitudes and goals that lead to a certain behavior. The most basic distinction is between intrinsic motivation (i.e., doing something because it is inherently interesting or enjoyable) and extrinsic motivation (i.e., doing something because it leads to a separable outcome) (Ryan & Deci, 2000). SDT has been applied to explore the motivations behind a diverse set of behavioral outcomes, such as educational, sports, and organizational behavior (for an overview, see Gagné & Deci, 2005). Additionally, SDT has recently been extended to the domain of entrepreneurial finance to explore individual motives[3] to engage in crowdfunding.

A first set of crowdfunding studies builds on SDT and shows that both extrinsic and intrinsic motivations shape an individual's decision to invest. For example, Gerber and Hui (2013) conduct semistructured interviews with crowdfunding investors and show that investors pursue both extrinsic motives (i.e., collecting rewards) and intrinsic motives (i.e., helping others, being part of a community, or supporting a cause). Allison et al. (2015) confirm these results using a sample of microloans. While the authors show that investors in crowdfunded prosocial microfinance are both intrinsically and extrinsically motivated, they also

[3] SDT does not emphasize a clear distinction between the terms “motivations” and “motives”. In line with prior research in entrepreneurial finance, we therefore use the terms synonymously.

show that this underlying motivation can be altered through intrinsic and extrinsic cues. Similarly, Bretschneider and Leimeister (2017) conduct a survey of 309 investors and show that crowdfunding investors are both intrinsically and extrinsically motivated. While these motivations are mainly egocentric, some investors also report prosocial motivations, which is in line with the findings of Allison et al. (2015). Finally, Ryu and Kim (2016) perform a cluster analysis of crowdfunding investors and show that groups of mainly extrinsically motivated and mainly intrinsically motivated investors exist, as well as groups that are mixtures of both. A second, less extensive set of crowdfunding studies explores the relative importance of intrinsic and extrinsic motivations for investments. While the findings are not entirely straightforward, extrinsic motives seem to be generally more important than intrinsic motives. Based on a survey of 630 investors, Pierrakis (2019) shows that individual investors are mainly extrinsically motivated, as the expectation of making a financial return is rated as substantially more important than intrinsic motives. Additionally, Vismara (2016) finds that the presence of rewards does not impact the chance of success of equity crowdfunding offerings. Considering that, in equity crowdfunding, rewards (e.g., a shirt or a plaque of appreciation) often have little objective value, the decision to invest is predominantly motivated by the opportunity to take an equity position in the issuing firm. Therefore, Pierrakis (2019) and Vismara (2016) conclude that financial returns are the main driver of investments in investment crowdfunding. In contrast, a working paper by Daskalakis and Yue (2017) finds that nonfinancial motives, such as interest and excitement, are more important drivers of investments in equity crowdfunding.

2.2. Individual motives to invest in ICOs

Building on these crowdfunding studies, we outline the peculiarities of the ICO context, which provide initial insights into the potential motives of ICO investors. Similar to the context of crowdfunding, we argue that ICO investors are likely driven by both intrinsic and extrinsic motives.

2.2.1. Intrinsic motives of ICO investors

Gerber and Hui (2013) outline that investors in crowdfunding can be motivated by supporting a cause that is analogous to their personal beliefs, which reflects ideological reasons. Similarly, we argue that ideological reasons are an important intrinsic motive of ICO investors.

Bitcoin's white paper (Nakamoto, 2008) is a cornerstone of blockchain technology and outlines two influential factors that have shaped the evolution of the blockchain sector from a technological and ideological point of view: (1) anonymity and (2) decentralization (Iansiti & Lakhani, 2017). First, Bitcoin's white paper proposes a method to enable anonymous transactions. This desire for anonymity, which is at least partially ideological in nature, characterizes most developments based on blockchain technology, including most ICOs (e.g., Kastelein, 2017). The pronounced interest in anonymity applies to ICO investors and venture teams. For example, information on venture teams is not as readily available as in other domains of entrepreneurial finance, as some teams choose to remain anonymous or to not provide too much personal information (Fisch, 2019). This desire for anonymity also affects ICO investors, as investments in ICOs are usually pseudonymous (i.e., it is possible to track the source of a transaction, but the source's identity remains unknown) (Kastelein, 2017). Second, Bitcoin's white paper focuses on enabling a higher degree of decentralization. Mostly, this refers to enabling transactions without intermediaries, thus reducing complexity in many processes or industries (Chambers, 2018). Therefore, blockchain technology has the potential to democratize a number of fields. Entrepreneurial finance, where the demand for democratization and disintermediation is high (Cumming et al., 2018), is one such field.

Similarly, crowdfunding research describes the personal interest of investors in the venture's product or business model as another intrinsic investment motive (e.g., Pierrakis, 2019; Ryu & Kim, 2016). Similarly, we assume that an interest in the product or business model behind the respective ICO and blockchain technology is another investment motive of ICO investors. The future success of an ICO venture largely depends on its ability to build on and use this technology (Cohney et al., 2018; Fisch, 2019). The high importance of technology is also reflected in the information provided by ICO ventures. For example, the revealing of source code and providing of white papers with a high degree of technological information are crucial (e.g., Cohney et al., 2018; Fisch, 2019). The highly technical environment implies that investors will benefit from technological knowledge to understand the technical background and application proposed by each project. This argument is supported by recent empirical evidence, which shows that the indicators of technological capabilities are important signals in the ICO context and help ventures to attract more funding (Fisch, 2019). ICO investors, therefore, seem to value the technology of ICO ventures.

2.2.2. Extrinsic motives of ICO investors

Studies on investors' motives in crowdfunding highlight the crucial importance of extrinsic motives (e.g., Allison et al., 2015; Gerber & Hui, 2013). Similar to crowdfunding, ICOs serve an investment function, as they constitute a mechanism to invest in innovative ventures by buying tokens. To some extent, the capital provision function is the core idea behind ICOs. Hence, ICOs represent future-oriented investment opportunities. As with other investment opportunities, achieving high investment returns is thus a major motivation of ICO investors (e.g., Adkisson, 2018; Benedetti & Kostovetsky, 2018; Cohney et al., 2018).

The tokens sold in ICOs are flexible and can function as investment vehicles by referring to tradeable assets in a form similar to that of securities. To this extent, ICOs resemble traditional initial public offerings in that they provide entrepreneurs with the opportunity to raise fresh capital in the primary market. Here, tokens resemble other kinds of traditional securities and entitle the holder to dividends or other financial benefits (e.g., Fisch, 2019; Sameeh, 2018). Ultimately, this leads to higher implicit returns on investment. Nevertheless, while traditional equity and debt securities come with specific and enforceable legal rights, tokens do not.

ICOs are also of interest for secondary market reasons. A particularity of tokens is indeed that they can be traded after an ICO is concluded (e.g., Benedetti & Kostovetsky, 2018; Lyandres et al., 2018). Indeed, as of 2019, a multitude of exchanges exist that enable investors to trade tokens against traditional currencies or other tokens. Hence, an increased post-ICO valuation of the token enables investors to sell the token to receive a return on their investment. Since the volatility of the price of tokens can be high, they are attractive for short-term investors because of hedging and arbitrage opportunities (e.g., flipping). This volatility may therefore attract investors looking for investment opportunities with a high risk-return profile. This function of tokens is frequently highlighted as a main feature of ICOs (e.g., Adkisson, 2018; Madeira, 2018), whereby confident investors are tempted by the prospect of identifying the “next Bitcoin” (Fisch, 2019; Mourdoukoutas, 2018). Previous studies have indeed shown that investors often overweight low probability events and exhibit a preference for investment opportunities with positive skewness, emphasizing the potential role of gambling in investment decisions (Kumar, 2009). An extrinsic motivation to invest in ICOs might therefore be in line with Markowitz (1952) conjectures that some investors might prefer to “take large chances of a small loss for a small chance of a large gain”.

3. Empirical approach

3.1. Survey and dataset

We surveyed ICO investors and collected information on (1) investment motives when investing in ICOs, (2) sociodemographic information, and (3) ICO investment behavior.

An established database of ICO investors does not exist. Consequently, it is very difficult to identify ICO investors. We thus relied on self-selection sampling and approached potential participants via an open online call. Specifically, we posted a link to our survey on a multitude of online platforms that frequently discuss ICOs and where ICO investors are likely present, such as Reddit (social news aggregator), Twitter, Facebook, LinkedIn, Telegram (messaging service), and Bitcointalk (forum dedicated to cryptocurrencies). The survey was initially posted in June 2018. Participants were able to participate until August 2018. As an incentive, we offered a detailed report of the results and a chance to win 0.5 Ether[4] as a reward for participation.

Over a period of 7 weeks, the survey was viewed 4119 times. A total of 719 individuals started the survey, and 541 individuals completed the survey. Since we were only interested in surveying ICO investors (i.e., individuals who had previously invested in at least one ICO), we excluded 19 respondents who stated that they had never invested in an ICO. Another 5 responses were excluded because of missing values. Hence, the final sample comprised 517 ICO investors.

The survey was conducted anonymously to fully comply with the latest data security legislation (EU-GDPR/18 General Data Protection Regulation). Additionally, previous research shows that anonymous surveys are particularly suitable when collecting sensitive information (e.g., financial information). This is because the responses are often more truthful, which is important for our research (e.g., Block, Fisch, Vismara, & Andres, 2019; Graham & Harvey, 2001). However, we were able to track the origin of each response if the respondent directly clicked on the survey link on a website. Specifically, 118 (22.8%) of the responses originated from Reddit, 143 (27.7%) from LinkedIn, and 73 (14.1%) from other sources such as Twitter and Facebook. We were unable to track the origin of 183 responses (35.4%).

Since we conducted a survey, we assessed the possibility of late-response bias. Late respondents resemble nonrespondents, and the results might be biased if late respondents are significantly different from early respondents (e.g., Armstrong & Overton, 1977; Block et al., 2019; Graham & Harvey, 2001). We divided our sample of 517 respondents into early respondents (first 129 respondents, 25% of the sample) and late respondents (last 129 respondents, 25% of the sample). No major group differences existed (Appendix, Table A1).

3.2. Variables and descriptive statistics

Table 1 outlines the definitions of the variables as well as the descriptive statistics. The selected variables are graphically illustrated in Fig. 1.

3.2.1. Measuring motives to invest in ICOs

The first group of variables captures investors' motives to invest in ICOs. We use a broad set of nine items that comprise both intrinsic and extrinsic motives. The items were inspired by previous research in the domain of crowdfunding (e.g., Pierrakis, 2019; Ryu & Kim, 2016). However, since an established and validated set of ICO investor motivations does not exist, we adapted existing extrinsic and intrinsic motives to the specific context of ICOs. We also talked to several ICO investors using informal interviews when developing the items.

To measure the importance of the motives, we asked respondents to rank each item on a 5-point Likert scale, ranging from 1 (“not important at all”) to 5 (“very important”). Our first set of items refers to ideological reasons and highlights the personal and/or societal utility that is attainable when investing in ICOs “use tokens in their intended utility function (e.g., governance, transactions)”, “social motives (e.g., sustainability, philanthropy)”, “disrupting established structures and/or industries (e.g., decentralization, anonymity)” and the ICO's technology and business (“personal enthusiasm for the technology of the ICO venture” and “personal enthusiasm for the business model or business idea of the ICO venture”). Furthermore, we include a second set of items to capture the extrinsic motives related to ICOs as a currency or investment vehicle (“future sale of the token at a higher price (shortly after the ICO)”, “future sale of the token at a higher price (at a later point in time)”, “gaining an equity stake in the ICO venture”, and “financial gains (e.g., dividends)”).

We describe the respective items and their importance in more detail in Section 4.2.

3.2.2. Sociodemographic characteristics

The second group of variables captures sociodemographic characteristics. Respondents were initially asked to indicate their age and gender. The average respondent was 32.9 years old (minimum 16; maximum > 65). The majority of respondents were male (95.4%). With regard to geographical distribution, the largest groups of respondents come from the US (14.7%), Germany (11.6%), and the Netherlands (9.5%). In sum, 52.6% of the respondents were European. The sample comprises respondents from 66 countries, indicating a considerable geographic spread.

The average level of education is rather high, as > 81.7% of respondents hold a bachelor's degree or higher. Regarding respondents' main fields of study, 32.3% indicated that they have an educational background primarily in business or economics, while 22.8% indicated that they have a background in computer sciences. The remaining respondents are scattered across different disciplines or did not study at all. A share of 48.9% of the respondents is currently working as an employee, while 36.4% of respondents are self-employed. The remaining group comprises students, retirees, and others. Moreover, 38.9% of the respondents have a professional background in the technology sector, while 15.7% have a background in finance. To assess the risk-taking attitude of investors, we asked respondents to rate how generally willing they are to take risks on a scale from 1 to 10. This measurement is taken from the German Socio-Economic Panel (DIW Berlin, 2016). With a value of 7.34, the average risk tolerance in our sample seems to be rather high.

Finally, we asked respondents to rate their investment knowledge outside of ICOs. The average value is 3.56, indicating a certain degree of experience. To delve into this topic more deeply, we asked respondents for their specific experience with different investment vehicles (not included in Table 1). A total of 41.6% of the respondents indicated that they had previously invested in investment funds, which was the most common investment vehicle mentioned. Investment funds were closely followed by stocks, in which 41.5% of the respondents had already invested. The overlap with crowdfunding is not as large as we expected it to be: 23.0% of the respondents indicated that they had previously engaged in crowdfunding. Finally, 19.1% of respondents indicated that they had no prior investment experience. Crowdfunding research often assumes that investors are novices (e.g., Schaef et al., 2018). Our findings suggest that this assumption may not be universally extendable to the context of ICOs.

3.2.3. ICO investment behavior

The final set of variables captures information on respondents' ICO investment behavior. Initially, we asked respondents about the date of their first investments. The first ICO ever took place in 2013, and 13 respondents indicated that they had indeed initially invested in 2013. We constructed a variable that captures the time elapsed since respondents' first investment as of 2018. The average value is 1.1, indicating that most respondents had first invested in an ICO in 2017.

We then asked respondents about the number of their ICO investments so far and constructed a continuous variable, with values ranging from 1 to 20. The average number of investments is 6.6. While 128 respondents had only invested in one ICO, 71 respondents had invested in 20 or more ICOs. This distribution is graphically illustrated in panel

[4] Ether is a widespread cryptocurrency, which is based on the Ethereum ecosystem. In August 2018, the value of 0.5 Ether was approximately 280 USD.

Table 1
Description of variables, coding, and descriptive statistics.

Variable	Coding	M	SD	Min	Max
Reasons to invest	In general, how important are the following motives in your decision to invest in ICOs? (1 = not important; 5 = very important)				
Utility	Use tokens in their intended utility function (e.g., governance, transactions)	3.38	1.23	1	5
Social	Social motives (e.g., sustainability, philanthropy)	2.90	1.26	1	5
Disruption	Disrupting established structures and/or industries (e.g., decentralization, anonymity)	3.87	1.15	1	5
Technology	Personal enthusiasm for the technology of the ICO venture	4.13	0.93	1	5
Business model	Personal enthusiasm for the business model or business idea of the ICO venture	4.23	0.83	1	5
Sale (short-term)	Future sale of the token at a higher price (shortly after the ICO)	3.31	1.33	1	5
Sale (long-term)	Future sale of the token at a higher price (at a later point in time)	4.24	0.93	1	5
Equity stake	Gaining an equity stake in the ICO venture	3.07	1.18	1	5
Financial gains	Financial gains (e.g., dividends)	3.69	1.15	1	5
Sociodemographics					
Age	Respondent age (in years)	32.86	8.66	16	65
Gender	Dummy variable that captures whether the respondent is male (=1) or not (=0)	0.95	–	0	1
Residence: US	Dummy variable that captures whether the respondent currently resides in the US (=1) or not (=0)	0.15	–	0	1
Residence: EU	Dummy variable that captures whether the respondent currently resides in Europe (=1) or not (=0)	0.53	–	0	1
Risk-taking	Q: Are you generally a person who is willing to take risks? (1 = not at all willing to take risks; 10 = very willing to take risks)	7.34	1.67	1	10
Level of education	Respondents' highest educational degree (1 = no schooling completed; 6 = doctorate degree)	4.10	1.09	1	6
Edu: Business	Dummy variable that captures whether the respondent's main field of study was business/economics (=1) or not (=0).	0.32	–	0	1
Edu: Computer sciences	Dummy variable that captures whether the respondent's main field of study was computer sciences (=1) or not (=0).	0.23	–	0	1
Occ: Self-employed	Dummy variable that captures whether the respondent is currently self-employed (=1) or not (=0)	0.36	–	0	1
Occ: Employee	Dummy variable that captures whether the respondent is currently an employee (=1) or not (=0)	0.49	–	0	1
Prof: Technology	Dummy variable that captures whether the respondent's professional background is mainly in technology (=1) or not (=0)	0.39	–	0	1
Prof: Finance	Dummy variable that captures whether the respondent's professional background is mainly in finance (=1) or not (=0)	0.16	–	0	1
Investment knowledge	Q: Please rate your overall investment knowledge (outside the cryptosphere). (1 = no knowledge; 5 = very good)	3.56	0.96	1	5
ICO investment behavior					
First investment	Number of years since the respondent's initial ICO investment	1.09	1.01	0	5
No. of ICO investments	Q: How many ICOs did you invest in so far? (continuous variable from 1 to 20 or more)	6.65	6.57	1	20
Investments (in USD)	Q: In total, how much did you invest in ICOs so far? (categorical, 1 ≤ 250 USD; 8 ≥ 100,000 USD)	4.17	2.19	1	8
Afraid of fraud	Q: Are you afraid of fraud when investing in ICOs? (1 = very much; 5 = not at all)	2.60	0.54	1	5
Need for regulation	Q: Level of agreement with the statement: “ICO regulation should be more strict” (1 = strongly disagree; 5 = strongly agree)	3.50	1.18	1	5
Read white paper	Q: Do you usually read the ICO's white paper before investing? (1 = no; 4 = I read the white paper and try to understand every detail)	3.09	0.78	1	4

Notes: $N = 517$. Reference group for residence dummies = rest of the world. Reference group for education dummies = no education/other education. Reference group for occupation dummies = student/retiree/other. Reference group for professional background dummies = other.

(a) of Fig. 1. We asked respondents about the total amount of money they had invested in ICOs. We used a categorical variable, ranging from 1 (invested < 250 USD) to 8 (invested > 100,000 USD). The results reveal a very equal distribution across the eight categories: 11.4% of the respondents invested < 250 USD, 12.2% invested between 5001 and 10,000 USD, and 8.3% invested > 100,000 USD. This distribution, which is illustrated in panel (b) of Fig. 1, indicates that it is difficult to characterize the average investor in ICOs with regard to the amount invested.

The amount of reliable information on ICOs is often low, a considerable potential for fraud exists, and policy development is in its early stage (Huang et al., 2019). We therefore asked respondents about their perception of fraud via the following question: “are you afraid of fraud when investing in ICOs?” (1 = very much; 5 = not at all). With a mean value of 2.60, respondents seem to be slightly afraid of fraud. A total of 76 respondents (14.7%) are very afraid, and 205 (39.7%) are afraid of fraud. In contrast, 26 respondents (5.0%) stated that they are not afraid of fraud at all. Relatedly, we asked respondents to indicate their level of agreement with the following statement: “ICO regulation should be more strict” (1 = strongly disagree; 5 = strongly agree). Similarly, investors are slightly in favor of more regulation (mean = 3.50), as illustrated in panel (c) of Fig. 1.

A white paper is a document in which a venture provides information to the public and constitutes an important component of a venture's ICO campaign (e.g., Cohney et al., 2018; Fisch, 2019). However, a white paper can only serve its function if it is actually read. Anecdotal evidence suggests that investors often do not read white papers (May, 2017). We therefore asked respondents whether or not they usually read the ICO's white paper before investing. Possible answers were “no” (coded as 1), “I skim the white paper” (coded as 2), “I read the white paper and try to understand its general content” (coded as 3), and “I read the white paper in detail and try to understand everything” (coded as 4). The mean value of 3.1 indicates that white papers are generally read by our respondents. Specifically, only 16 (3.1%) respondents stated that they generally do not read white papers, while 163 (31.5%) indicated that they “read the white paper in detail and try to understand everything”. This distribution is further illustrated in panel (d) of Fig. 1.

4. Results

4.1. Factor analysis to identify groups of investment motives

We conduct an exploratory factor analysis to categorize and

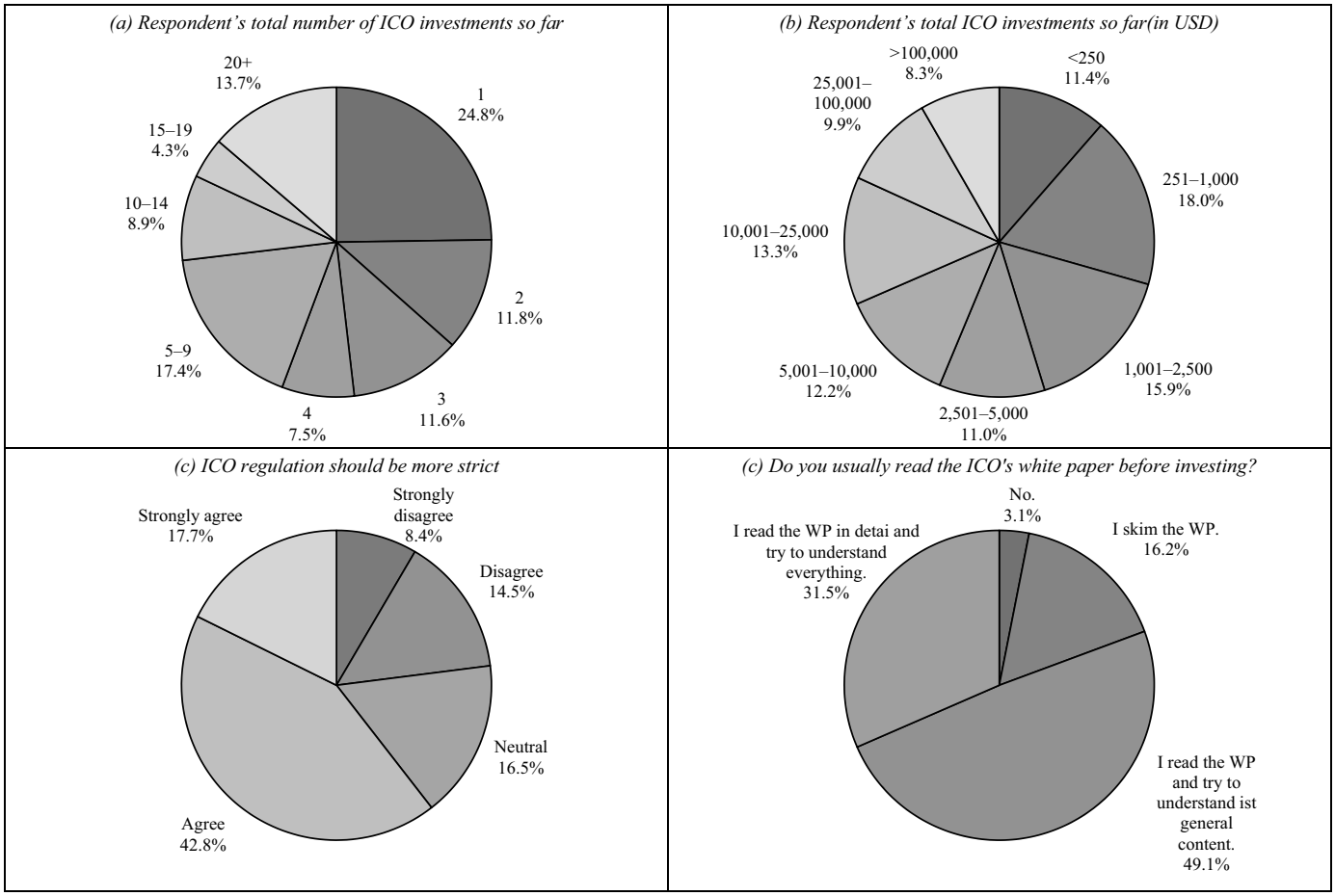

Fig. 1. Illustration of selected responses (N = 517 ICO investors).

aggregate investment motives. Factor analysis provides internally consistent factors and focuses on the constructs underlying the individual items.

Specifically, we conduct a principal component factor analysis with varimax rotation. The results indicate a three-factor solution according to the latent root criterion (i.e., three factors have eigenvalues > 1) (e.g., Block, Fisch, Hahn, & Sandner, 2015; Thomä & Bizer, 2013). To assign items to specific factors, we employ a threshold of 0.50 for the varimax-rotated factor loadings. Table 3 depicts the rotated factor loadings and extracted variances. Eight of the 9 items load unambiguously onto one of the three factors and are thus assigned to only one factor. Item 6 does not meet the minimum threshold for either factor and shows a considerable cross-loading. We thus omitted that item from our factor analysis (Osborne, Costello, & Kellow, 2008).[5]

The three factors account for 55.3% of the total variance among respondents' answers. A major assumption of factor analysis is that the factor variables are correlated. To test this assumption, we use Bartlett's test of sphericity (626.08, $p < 0.01$), which indicates that the variables used in the factor analysis are correlated and not independent of one another. The Kaiser–Meyer–Olkin measure (KMO = 0.66) also indicates a sufficient fit of the data. Hence, both measures indicate that the dataset is appropriate for factor analysis.

In the following subsections, we describe each factor in detail. We label the factors as follows: (1) ideological motives, (2) technological motives, and (3) financial motives. While ideological and technological motives reflect an intrinsic motivation, financial motives reflect an extrinsic motivation of ICO investors.

4.1.1. Factor 1: Ideological motives

Factor 1 has the largest eigenvalue and explains the most variance (26.4%) of the extracted factors. The factor reflects an intrinsic investment motivation and comprises the items "use tokens for their intended utility function", "social motives", "disrupting established structures and/or industries", and "future sale of the token at a higher price (at a later point in time)". We label this factor "ideological motives" because all items can be related to the underlying ideology that characterizes the blockchain sector and the field of ICOs.

As outlined in Section 2, two of the major drivers behind the development of blockchain technology, specifically cryptocurrencies, are the desire to enable anonymous transactions and a higher degree of decentralization (Iansiti & Lakhani, 2017). Both motives are at least partially ideology-driven and were initially outlined in Bitcoin's white paper (Nakamoto, 2008). Since then, the potential of blockchain technology has been clarified, extended, and widely discussed (e.g., Elnaj, 2018; Swan, 2015). However, blockchain technology is affected by a considerable degree of uncertainty, and it is currently unclear whether blockchain technology will actually live up to its potential (Natarajan et al., 2017). High scores in Factor 1 point to investors believing in the (future) potential and ideology of blockchain technology in spite of the present uncertainties. This view is substantiated by the considerable negative factor loading of the extrinsic motive "future sale of the token at a higher price (at a later point in time)". This finding also indicates that investors intend to hold on to tokens to realize the investments' future potential instead of selling them shortly. This implies a longer time horizon of investors, as the potential of most blockchain projects

[5] However, the item is considered when estimating the factor scores, which we use as the dependent variable in our regression analyses (Section 4.3).

and the changes intended cannot be immediately realized. In particular, ICOs might underline blockchain projects at very early stages, and it is often unclear whether and how these projects will eventually succeed. For some tokens, this might affect the possibility of developing a liquid secondary market.

4.1.2. Factor 2: Technological motives

Factor 2, labeled "technological motives", explains 16.2% of the variance and comprises the items "personal enthusiasm for the technology of the ICO venture" and "personal enthusiasm for the business model/idea". Both items have high positive factor loadings and show a clear intrinsic motivation of ICO investors.

In the past, new players in entrepreneurial finance have emerged due to technological advances (Block et al., 2018). Similarly, ICOs only suit ventures that (intend to) use blockchain technology, a creative yet complex and highly technological innovation (Natarajan et al., 2017; Swan, 2015). Hence, technology is at the heart of most ventures that conduct an ICO and the ventures' technology, and the ventures' technological capabilities can serve as a crucial indicator of their future success (Fisch, 2019). Investors with high factor scores rate ICOs' technological background as crucial to their investment decisions. Since technology is at the core of most ICOs, it cannot be disconnected from the business itself.

4.1.3. Factor 3: Financial motives

Factor 3 explains 12.7% of the variance and represents more traditional financial motives. The factor comprises the items "gaining an equity stake in the ICO venture" and "financial gains", such as dividends. This factor reflects an extrinsic motivation to invest in ICOs.

First and foremost, ICOs are a means of new venture finance (Fisch, 2019). It is thus unsurprising that one set of motives refers to ICOs as an investment, for example, to realize portfolio diversification or financial returns. Hence, ICOs function as a securities investment.

While tokens sold in ICOs function as a venture's initial financing, most tokens can be sold in a secondary market after the ICO's conclusion (e.g., Benedetti & Kostovetsky, 2018; Lyandres et al., 2018). Interestingly, this factor does not comprise the items pertaining to the sale of tokens in the secondary market but refers to ICOs as a more traditional form of securities investment. Therefore, individuals with high factor scores treat ICOs as a security, which is different from the speculative notion that is often portrayed in the media (e.g., Adkisson, 2018; Madeira, 2018).

4.2. The relative importance of investment motives

In addition to identifying groups of motives, we are interested in the relative importance of the motives. Prior research has indicated that investors in crowdfunding often consider extrinsic motives to be more important than intrinsic motives (e.g., Pierrakis, 2019; Vismara, 2016).

Table 3 enables initial insights into the importance of investment motives. Investors rate the ability to sell the token at a higher price as the overall most important reason to invest in ICOs (mean = 4.24). A total of 242 respondents (46.8%) rated this item as "very important", while only 11 (2.1%) rated it as "not important at all". The second most important reason to invest in ICOs is a personal enthusiasm for the business model/idea (4.21) and technology (4.11). These results suggest that high investment returns through the sale of tokens are indeed a major motivation of ICO investors. In line with the prior research on crowdfunding, the most important reason to invest in ICOs is extrinsically motivated. However, the results also show that the business model/idea is nearly as important as the future sale of the token, as the difference in importance is not statistically significant. This also indicates that investors seem to be simultaneously driven by multiple motives.

In contrast to the sale of a token at a later point in time, the sale of the token shortly after the ICO is less important to investors (3.30). Investors rate gaining an equity stake in a company (3.05) as even less important. This low importance of gaining an equity stake might distinguish ICOs from more traditional forms of finance, such as IPOs and equity crowdfunding. However, this low importance is not entirely surprising, as pure security tokens (which can entitle the token holder to an equity share) were comparatively rare when the survey was conducted (Fisch, 2019). Respondents rated social motives as least important (2.90). Since two out of the three least important motives reflect extrinsic motivations, it is difficult to make a general assessment of the overall importance of intrinsic and extrinsic motives. This is also reflected in the considerable variance in the responses, as illustrated in Table 3.

In addition to assessing the importance of the items used in our survey, we assess the importance of each factor. Table 4 reveals that ICO investors consider technological motives to be most important (mean importance = 4.16). Financial motives rank second (mean importance = 3.36), and ideological motives rank third (mean importance = 2.98). This result is surprising, as it differs from those of prior (crowdfunding) research by indicating that intrinsic motives seem to be at least partially more important to ICO investors than extrinsic motives. Our findings highlight that the ICO context might be unique in this regard. This could be explained by the fact that the share of professional investors in ICOs is still low and that the nature of ICOs differs from that of other financing instruments (e.g., crowdfunding). In particular, the characteristics of blockchain technology (e.g., decentralization, peer-to-peer transactions, transparency, irreversibility, and computational logic) play a considerable role in ICOs. In other words, the technology itself is not only the core of the financing vehicle but also inseparable from the process of the actual investment in a venture. If an investor wants to invest in an ICO, the investor must be familiar with, for instance, tokens, digital wallets, trading exchanges, and cryptocurrencies. Hence, technological motives may be more prominent in the context of ICOs.

Finally, Table 4 includes the share of ICO investors who consider the respective motive as most important. While, as discussed above, technology factors are on average considered important (4.16), the results displayed in the final column indicate that 37.9% of the respondents rate financial motives as most important. While technological factors are broadly relevant for investors, more than one-third of investors are attracted to ICOs mostly because of the prospects of financial returns. On the other hand, ideological motives rank last. Nevertheless, they are rated as the most important motives to invest in ICOs by 27.9% of the respondents. This means that, while some investors appear insensitive to ideological motives (e.g., social motives are considered "not important at all" by 17.4% of the respondents), others care passionately about them. Overall, these results indicate that ICOs blend different types of investors together.

4.3. Regression analysis to profile investors according to their investment motives

We build on the results of the factor analysis and conduct a regression analysis to identify the correlates of high scores across different motives. This allows us to further investigate the heterogeneity in investors' motives by enabling an identification and comparison of the correlates of different motives.

The three factors identified by the exploratory factor analysis constitute the dependent variables. The factor scores were generated by a regression-based approach, which weights the items by their respective factor loadings. The regression approach maximizes the validity of the predicted scores, as it produces the highest correlations between factor scores and factors (e.g., DiStefano, Zhu, & Mindrila, 2009). Importantly, every item is used to predict the factor scores (including item 3), so no information provided by the respondents is omitted when predicting the factor scores and, subsequently, when profiling investors.

The correlations and variance inflation factors are displayed in Table A2 (Appendix). As a result of the factor analysis, it is found that the factors are uncorrelated. Additionally, the correlations and variance inflation factors indicate that multicollinearity should not bias our estimates. The results of the OLS regression analysis are displayed in Table 5.

4.3.1. Factor 1: Ideological motives

The high scores in ideological motives correlate with an earlier first ICO investment. This suggests that ideology is one of the main drivers behind the development of ICOs and indicates that initial investors were particularly attracted by ideological motives. Additionally, the potentials of blockchain technology were more abstract and not as well developed and understood when ICOs were initially introduced. Hence, ideological reasons may have been one of the most important drivers in the early development of ICOs. Interestingly, investors with high scores in ideological motives also correlate with higher risk aversion and fear of fraud. Ideological reasons may overlay these investment risks and bring these individuals to invest in ICOs, even though they would otherwise shy away from the high investment risk associated with them. The high scores in ideological motives also correlate with the fact that ICO investors read white papers more carefully. This is unsurprising, as a white paper is the main document in which ICOs outline the ideological background and intended contributions of their project. Furthermore, investors must rely primarily on white papers to detect possible fraud. Since ideologically motivated investors appear to be relatively risk-averse, they read white papers more carefully.

4.3.2. Factor 2: Technological motives

The high scores in technological motives correlate with high values in risk-taking. This indicates that these individuals are confident in blockchain technology and its potentials. As of 2019, it is still unclear whether blockchain technology will become the major and radical technological innovation that is often postulated, as not all technological problems have been solved (Natarajan et al., 2017). Specifically, ICOs often do not have a working product or prototype and provide very preliminary technological solutions (Shifflett & Jones, 2018). However, investors with a strong technological motivation are not discouraged by this present uncertainty, as reflected in their higher degree of risk tolerance. Additionally, reading white papers very carefully correlates with high scores in technological motives. This underlines the important role of white papers as a primary source of information in ICOs. Specifically, the technological information presented in a white paper seems to be of crucial interest to this group of investors (Fisch, 2019). This finding also contradicts anecdotal evidence that questions the role of white papers and suggests that investors often do not read white papers (May, 2017). However, this result could also be attributed to potential selection bias: less-informed investors that were mainly driven by hype may have been less likely to read white papers and may have already left the market in mid-2018 due to a sharp decline in cryptocurrency valuations.

4.3.3. Factor 3: Financial motives

The high scores in financial motives correlate with a more conservative approach to investing in ICOs. While they correlate with a higher number of overall ICO investments, they also correlate with lower amounts of money invested. Both characteristics indicate a strategy of portfolio diversification via ICO investments. An additional finding is that these investors seem to be more afraid of fraud and of the opinion that the regulation of ICOs should be stricter. This reinforces the argument that stricter regulation is primarily sought by investors with a financial motivation who demand a safe environment for their investments. Moreover, these investors are less often from Europe, indicating that ICOs may be a less prominent investment vehicle in Europe compared to the rest of the world. The results further indicate that financial motives are less appealing to investors with technology backgrounds. Interestingly, financially motivated investors also show a negative correlation with a professional background in finance. This may be an indicator of a possible “hype effect” surrounding ICOs. Financially motivated ICO investors appear to have neither a technological nor a financial background, invest only small amounts of money in several ICOs, are more afraid of fraud and may target short-term profit. The short-term investment horizon of these investors is also reflected by the relatively high factor loading of “future sale of the token shortly after the ICO” on financial motives (Table 2). In other words, this indicates that the ICO market may be driven by herding behavior to some extent, similar to the context of crowdfunding (Ante et al., 2018; Vismara, 2016; Vismara, 2018). Similar to crowdfunding, ICOs are shown prominently in media, which may lead to social contagion processes. These financially oriented ICO investors may simply follow others, without considering all the facts, such as reading white papers, or their own (financial) background and aim at high-profit margins (e.g., Simonsohn & Ariely, 2008).

5. Conclusion

5.1. Discussion

A feature of ICOs is that investors follow ideological motives when investing in them. This notion may differentiate ICOs from more traditional forms of entrepreneurial finance such as venture capital. However, there is a parallelism with crowdfunding and its potential to democratize finance in terms of providing financing and investment opportunities (Cumming, Meoli, & Vismara, 2019). While the prior crowdfunding research has not focused on assessing or depicting ideological investor motivations in detail, several studies mention personal, ideology-driven investor motives (e.g., Gerber & Hui, 2013). In contrast to crowdfunding research, however, our findings indicate that ideological motives play a role in the ICO context. Supporting our findings, recent evidence has suggested that shared ideologies are among the drivers of the diffusion of Bitcoin (Bogusz & Morisse, 2018).

This finding parallels the research in the domain of open-source software. Henkel (2008) and Lakhani and Wolf (2005) show that a “free software ideology” is a similarly important driver in the development of software. Stewart and Gosain (2006) develop a framework for the “open-source software ideology” and show that adherence to this ideology has crucial implications for the effectiveness of development

Table 2
Factor analysis of motives for investing in ICOs.

Variable	Factor 1	Factor 2	Factor 3
Interpretation	Ideology motives	Technology motives	Financial motives
1. Use tokens in their intended utility function	**0.64**	0.21	0.28
2. Social motives	**0.57**	0.32	0.24
3. Disrupting established structures/industries	**0.54**	0.28	0.17
4. Personal enthusiasm for the technology	0.21	**0.80**	−0.04
5. Personal enthusiasm for the business model/idea	−0.01	**0.85**	0.08
6. Future sale of the token shortly after the ICO	−0.48	−0.10	0.45
7. Future sale of the token at a later point in time	**−0.56**	0.28	−0.24
8. Gaining an equity stake in the ICO venture	0.24	0.03	**0.74**
9. Financial gains	−0.02	0.05	**0.78**
Variance explained	26.4%	16.2%	12.7%
Cronbach's α	0.54	0.67	0.60

Notes: $N = 517$ ICO investors. Principal component analysis, varimax-rotated factor loadings. Kaiser–Meyer–Olkin measure: 0.662, Bartlett's test of sphericity: 626.08, $p < 0.01$. Factor loadings assigned to the respective factors are highlighted in bold.

Table 3
Reasons to invest in ICOs and their importance.

Variable	Importance										Mean	Rank
	(1)		(2)		(3)		(4)		(5)			
Utility	48	9.3%	88	17.0%	98	19.0%	186	36.0%	97	18.8%	3.38	6
Social	90	17.4%	118	22.8%	117	22.6%	139	26.9%	53	10.3%	2.90	9
Disruption	27	5.2%	50	9.8%	69	13.4%	189	36.6%	182	35.2%	3.87	4
Technology	12	2.3%	31	6.0%	31	6.0%	257	49.7%	186	36.0%	4.11	3
Business model	10	1.9%	15	2.9%	31	6.0%	259	50.1%	202	39.1%	4.21	2
Sale (short-term)	47	9.1%	136	26.9%	72	13.9%	139	26.9%	123	23.8%	3.30	7
Sale (long-term)	11	2.1%	25	4.8%	36	7.0%	203	39.3%	242	46.8%	4.24	1
Equity stake	59	11.4%	110	21.3%	150	29.0%	140	27.1%	58	11.2%	3.05	8
Financial gains	28	5.4%	64	12.4%	94	18.2%	194	37.5%	137	26.5%	3.67	5

Notes: $N = 517$ ICO investors. Importance rated on a 5-point Likert scale (1 = not important at all; 5 = very important).

Table 4
Motives to invest in ICOs and their importance.

Factor	Mean importance	Rank	Most important factor for
Factor 1: Ideological motives	2.98	3	144 (27.9%)
Factor 2: Technological motives	4.16	1	177 (34.2%)
Factor 3: Financial motives	3.36	2	196 (37.9%)

Notes: $N = 517$ ICO investors. Importance rated on a 5-point Likert scale (1 = not important at all; 5 = very important). Factor 1 comprises items 4 (reverse coded), 7, 8, and 9; Factor 2 comprises items 1 and 2; Factor 3 comprises 5 and 6 (as described in Table 1).

teams. The notion of open-source is also present in ICOs, in which revealing source code is a de facto standard that the majority of ventures follow (Fisch, 2019).

Additionally, our findings resemble those of the entrepreneurship research on founder identities. Building on social identity, Fauchart and Gruber (2011) identify the existence of three basic types of founder identities that shape an individual's funding decisions and have a major impact on the entrepreneurial process. In particular, they distinguish Darwinian identities (i.e., traditionally business-oriented and focused on profitability), communitarian identities (i.e., motivated by the interest of a community), and missionary identities. They describe that missionary founders believe that firms can be powerful agents of social change and are mainly motivated by founding a company with a particular mission (e.g., political, social, or environmental). Hence, ideological motives seem to play an important role not only for founders but also for providers of entrepreneurial finance.

5.2. Implications for theory and practice

From a theoretical perspective, our exploratory findings primarily contribute to the nascent research on ICOs (e.g., Ante et al., 2018; Fisch, 2019; Huang et al., 2019). Our study is the first to assess this topic from the perspective of ICO investors and identifies a nuanced set of investment motives, which is crucial to understand and interpret the increase in ICOs and the associated economic effects. In addition, our descriptive statistics and analyses enable us to profile ICO investors. Most importantly, it seems to be very difficult to identify average ICO investors, as the heterogeneity among investors is considerable.

Our findings further and more generally contribute to the research in entrepreneurial finance. We extend the prior research, mainly in the

Table 5
Profiling ICO investors according to investment motives.

	Model 1		Model 2		Model 3	
Dependent variable	Ideological motives		Technological motives		Financial motives	
Variables	Coeff.	(SD)	Coeff.	(SD)	Coeff.	(SD)
Sociodemographics						
Age	−0.009	(0.005)*	0.010	(0.005)*	0.000	(0.005)
Gender	−0.301	(0.207)	−0.202	(0.211)	0.056	(0.208)
Residence: US	0.051	(0.137)	0.162	(0.140)	−0.151	(0.138)
Residence: EU	−0.027	(0.100)	−0.014	(0.101)	−0.340	(0.100)***
Risk-taking	−0.063	(0.027)**	0.066	(0.027)**	0.041	(0.027)
Level of education	−0.058	(0.041)	−0.030	(0.041)	−0.032	(0.041)
Education: Business	0.052	(0.108)	−0.037	(0.110)	−0.127	(0.108)
Education: Computer sciences	0.037	(0.124)	0.163	(0.126)	0.015	(0.125)
Occupation: Self-employed	0.057	(0.143)	0.072	(0.146)	0.025	(0.144)
Occupation: Employee	0.121	(0.132)	0.181	(0.135)	−0.117	(0.133)
Professional background: Technology	0.011	(0.137)	−0.164	(0.139)	−0.349	(0.137)**
Professional background: Finance	0.217	(0.108)**	−0.127	(0.109)	−0.244	(0.108)**
Investment knowledge	0.082	(0.050)	0.045	(0.051)	−0.058	(0.050)
ICO investments						
First investment	0.145	(0.044)***	0.007	(0.044)	−0.053	(0.044)
No. of ICO investments	−0.001	(0.008)	−0.002	(0.008)	0.018	(0.008)**
Investments (in USD)	−0.013	(0.026)	0.008	(0.026)	−0.057	(0.026)**
Afraid of fraud	0.079	(0.041)*	−0.007	(0.041)	−0.077	(0.041)*
Need for regulation	0.015	(0.039)	0.008	(0.039)	0.097	(0.039)**
Read white paper	0.234	(0.057)***	0.215	(0.058)***	0.018	(0.057)
R^2	0.106		0.073		0.099	
R^2 (adj.)	0.072		0.038		0.065	

Notes: $N = 517$ ICO investors. OLS regression with the factor scores obtained from the factor analysis as the dependent variable. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Reference group for residence dummies = Rest of the world. Reference group for education dummies = no education/other education. Reference group for occupation dummies = student/retiree/other. Reference group for professional background dummies = other.

related domain of crowdfunding (e.g., Gerber & Hui, 2013; Allison et al., 2015), to the context of ICOs by showing that ICO investors are similarly motivated by intrinsic and extrinsic motives. Speaking to the relative importance of the criteria, our results further show that ICO investors consider intrinsic motives to be more important than extrinsic motives. This finding has interesting implications and indicates that ICOs are not yet seen as a purely financial investment. An explanation for this might be that professional financial investors have not yet started to adopt ICOs as an investment vehicle because of their novelty, the high risk involved, and/or the strong technological component. It will be interesting to see whether extrinsic motivations become more important as ICOs gain more widespread adoption.

Relatedly, the research on crowdfunding often assumes that the average crowdfunding investor makes small contributions and is a less experienced investor (Schaef et al., 2018). Similarly, anecdotal evidence suggests that the average sum invested in ICOs is indeed relatively low (e.g., Lympo, 2018), while some sources suggest a simultaneously high degree of centralization in the distributions of tokens (e.g., Azaraf, 2018). It is also unclear whether ICOs can be characterized as being funded by novice investors. Recent evidence has suggested that institutional investors, who are typically more professional than private investors, seem to have begun to invest in ICOs (Kastelein, 2017; Kharif & Russo, 2018). Our results indicate that ICO investors do not necessarily make small donations or are not necessarily inexperienced.

The understanding of the investment motives in ICOs is of major importance for policymakers dealing with financial inclusion. Because of its novelty and the significant differences in regulation between countries, more research is needed to understand how this investment vehicle will alter the process of entrepreneurial financing. Recently, Cumming et al. (2019) have examined a large body of public comments submitted by stakeholders in response to the new equity crowdfunding regulations proposed by the SEC in 2013. The protection of small investors investing alongside sophisticated investors has been found to be a primary concern for regulators and public commenters. Hornuf and Schwienbacher (2017) point out that the appropriateness of the regulation for new forms of early-stage finance is contextually determined by the availability of traditional early-stage financing alternatives, such as business angels and venture capitalists. Although ICOs provide entrepreneurs with less costly access to external financing because of the loose regulatory setting and limited accreditation standards, Huang et al. (2019) find that a well-developed digital regulation environment is more likely to accommodate the special needs in the ICO market. Accordingly, the evidence from our study points to the need to tailor the level of regulation according to the types of investors. A uniform regulation regarding ICOs may not be equally attractive to and protect all types of ICO investors. While stricter regulation is not necessary for ideological investors, it is required by investors motivated by the prospects of financial returns. As such, our findings can serve as the cornerstone for a more fine-grained approach to developing policies that take into account the differing sets of investment motives. This is especially important since ICO policymaking is still in its early stages, in which overly general regulation might severely undermine the innovative potential of ICOs. This carries important ecosystemic consequences, as a fine-grained regulated digital economy is more likely to encourage start-ups to propose and generate new digital services and business models, as it reduces systemic risk.

Our findings also inform ICO-conducting ventures that there is considerable heterogeneity among investors with regard to why they invest in ICOs. Blockchain entrepreneurs, therefore, need to structure their campaigns differently if they want to attract different sets of investors. We argue, for instance, that white papers are more important to technologically motivated investors. The highlighting of the utility function of tokens or the societal goals of the projects, such as their sustainability or philanthropy, will attract ideologically motivated investors. This, however, might cause investors who rate financial motives as being most important to miss out. To attract such types of investors, entrepreneurs should highlight the scalability of their business models since financially motivated investors typically aim to quickly cash out. Finally, ventures that are trying to appeal to a broad set of investors should make sure to cater to this broad set of motives when trying to attract funding.

5.3. Limitations and future research

This study is not without limitations. One set of limitations refers to our survey methodology. First, we rely on self-selection sampling. While we tried to spread the questionnaire across different outlets to obtain a diverse set of responses and while we performed a late-response test, we cannot rule out the potential for our study being affected by sampling bias. We are not aware of any other study that focusses on or surveys ICO investors, so there are no other findings that we could compare our results to assess potential bias. Second, our survey was conducted between June and August 2018. Because the ICO sector is fast-paced, we cannot rule out that the behavior of investors has changed considerably since 2017. The high value of risk-taking in our sample might be influenced by the fact that risk-averse investors already left the market by mid-2018 after the market considerably declined. Similarly, we do not know whether our findings can be generalized to future ICO investors, as the composition and motives of ICO investors might change in the future. Future studies might thus draw different samples or larger samples or simply repeat our investigation to see whether motives and investor profiles change.

Furthermore, our study cannot uncover or investigate causal relationships. While our regression analysis provides an initial approach to profile investors, more sophisticated approaches are necessary. For example, future research could investigate differences across respondents in a more theory-driven way by building upon our findings and trying to validate our findings using methods that allow for greater causal inferences. Relatedly, our set of investor motives is based on SDT and the prior research in the domain of crowdfunding. However, our items to capture these motives may not encompass all existing investor motivations. Additionally, the internal consistency of our factors is not very high. Thus, future research could build on our motivations and identify further motives of ICO investors. For example, qualitative approaches may be particularly suitable to uncover such motives. Additionally, it would be interesting to assess the relationship between investment motives in ICOs and those in other means of entrepreneurial finance. For example, a nuanced comparison of investment motives among ICOs, crowdfunding, and venture capital investments could provide interesting and novel insights. Such a comparison of investors could provide important insights into the complementarities and differences between various forms of entrepreneurial finance.

Additionally, we assess ICO investors that are isolated from the ventures in which they invest. However, the characteristics of the investment target are likely to influence an individual's investment behavior. Knowing how investment motives and target selection interact is crucial to fully understand the ICO process. Future research should thus try to combine data on ICO ventures, which have been frequently used in past studies, with data on investors. A matched dataset of ventures and investors could enable a significantly improved understanding of ICOs.

Finally, different investment motives might coincide with a preference for different token types (Fisch, 2019). For example, ICO investors mainly driven by technological motives might tend to invest in utility tokens that they can later use. In contrast, financially motivated investors might tend to invest in security tokens, as they are tied more directly financial benefits. While we did not capture whether investors primarily invest in a specific token type, a deeper investigation of the interrelationships between token types and investment motives provides an avenue for future research.

Declaration of Competing Interest

None.

Appendix A

Table A1
Assessing a potential late response bias.

Investment motives	(1) Early respondents (N = 129)	(2) Late respondents (N = 129)	t-Test (1) vs. (2)
	Mean	Mean	
Personal enthusiasm for the technology	4.26	4.10	0.16
Personal enthusiasm for the business model/idea	4.22	4.16	0.06
Future sale of the token shortly after the ICO	3.02	3.12	−0.11
Future sale of the token at a later point in time	4.28	4.17	0.11
Gaining an equity stake in the ICO venture	3.05	3.05	0.00
Financial gains	3.58	3.59	−0.01
Use tokens in their intended utility function	3.61	3.32	0.29*
Social motives	3.05	2.69	0.36**
Disrupting established structures/industries	4.00	3.84	0.16

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2
Correlations and variance inflation factors.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	VIF
Motives to invest																						
(1) F1: Ideological																						1.12
(2) F2: Technological	0.00																					1.08
(3) F3: Financial	0.00	0.00																				1.11
Sociodemographics																						
(4) Age	−0.06	**0.09**	−0.03																			1.18
(5) Gender	**−0.09**	−0.05	−0.02	−0.01																		1.07
(6) Residence: US	0.03	0.08	−0.01	0.05	−0.04																	1.32
(7) Residence: EU	−0.05	−0.06	**−0.14**	0.05	**0.10**	**−0.44**																1.41
(8) Risk-taking	−0.07	**0.11**	0.05	**−0.09**	0.07	0.00	−0.05															1.12
(9) Level of education	−0.06	−0.01	−0.04	**0.11**	0.05	0.00	0.05	−0.02														1.10
(10) Edu: Business	−0.02	−0.03	**−0.09**	0.06	−0.02	−0.03	0.06	0.07	**0.11**													1.43
(11) Edu: Comp. sci.	0.07	0.05	−0.02	0.03	0.08	0.01	0.00	−0.06	−0.05	**−0.38**												1.52
(12) Occ: SE	−0.02	0.01	0.03	**0.19**	0.01	0.03	**−0.12**	**0.09**	0.08	0.07	−0.04											2.65
(13) Occ: Employee	0.04	0.05	−0.07	0.02	0.00	0.03	0.07	−0.06	0.04	−0.02	0.04	**−0.74**										2.46
(14) Prof: Technology	−0.01	−0.03	**−0.12**	0.00	0.07	0.02	0.00	**0.09**	0.04	**0.42**	−0.21	**0.11**	−0.06									1.40
(15) Prof: Finance	**0.11**	0.00	−0.04	0.05	−0.03	−0.03	−0.02	−0.05	−0.07	**−0.30**	0.51	−0.06	0.10	**−0.34**								1.56
(16) Inv. Knowledge	0.08	**0.09**	−0.05	0.08	−0.04	0.07	**−0.18**	**0.20**	**0.15**	**0.19**	−0.07	**0.16**	−0.08	**0.25**	−0.07							1.28
ICO investments																						
(17) First investment	**0.14**	0.03	−0.07	0.02	0.01	0.00	−0.01	0.06	−0.01	**−0.10**	0.03	0.04	−0.01	−0.02	0.02	0.08						1.11
(18) No. of ICO inv.	−0.01	0.01	0.04	0.07	0.01	**−0.11**	−0.07	**0.13**	0.02	0.04	−0.01	0.16	**−0.11**	0.06	0.00	**0.10**	**0.15**					1.63
(19) Inv. (USD)	0.00	0.04	−0.06	**0.14**	0.08	−0.05	−0.07	**0.14**	0.05	0.02	−0.01	0.24	**−0.16**	0.08	−0.03	**0.17**	**0.22**	**0.60**				1.74
(20) Afraid of fraud	0.08	−0.02	**−0.12**	−0.05	0.06	−0.02	0.08	0.01	−0.06	0.04	0.03	0.01	−0.02	0.05	−0.05	−0.07	0.02	**0.10**	**0.09**			1.13
(21) Need regulation	−0.01	0.00	**0.10**	0.02	0.00	**−0.17**	**0.14**	−0.04	**0.13**	0.05	−0.06	−0.10	0.08	0.04	0.02	0.08	**−0.10**	−0.05	−0.07	**−0.25**		1.19
(22) Read white paper	**0.19**	**0.19**	0.01	0.01	−0.07	0.05	**−0.09**	0.06	0.02	0.02	0.03	0.10	−0.05	0.07	−0.01	**0.18**	0.02	0.02	**0.09**	0.01	0.04	1.13

Notes: $N = 517$. Significant coefficients ($p < 0.05$) in bold.

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