

CRYPTOCURRENCES AND HONESTY

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Abstract

How can you steal something that technically “isn’t there”? A valid thought, when it comes to electronic payments and currencies, but no place is safe if fraud is involved. In order to extend current research on dishonesty, with the help of the modern context of cryptocurrencies, the self-concept maintenance theory was adapted and extended with effort as a form of moral reminder. This theory was tested in an experimental setup. Non-effort and effort participants completed cryptocurrency tasks, a questionnaire, and an anonymous dice-in-a-cup task, in order to test the hypothesis, that effort would lead to a reduction of dishonesty. Results revealed no significant influence of effort on dishonesty, which was related to the small sample size of the study. Nonetheless, tendencies were made visible, that the level effort in the study was not enough to influence one’s honesty. Therefore, a psychological, deeper feeling of effort would potentially have led to a stronger connection of the participants to the created objects and thus to a reduction of dishonesty.

Introduction

How can you steal something that technically “isn’t there”? A valid thought, when it comes to electronic payments and currencies, but no place is safe if fraud is involved (Akintoye & Araoye, 2011). Especially Bitcoin, the first and most popular cryptocurrency is affected, leading to actions such as “delay attacks”, or “ransomware payments” purposefully deceiving individuals for often large amounts of money (Apostolaki, Zohar, & Vanbever, 2017; Higbee, 2018).

Bitcoin, created in 2009, pioneered the cryptocurrency market (Hileman & Rauchs, 2017). The currency has gained more and more in attraction since its release, leading to a current value of around \$3500 per Bitcoin from being valued at less than \$200 in 2013 (Bitcoin Price Chart, 2019). While the scientific literature on the topic is recent and manifold, it is mainly concerned with its technical or economic aspects, such as security measures or its economical facets (Krombholz, Judmayer, Gusenbauer, & Weippl, 2016; Ciaian, Rajcaniova, & Kancs, 2016). Nonetheless, it lacks a deeper understanding of why people behave dishonestly in this context.

Fraud, on the other hand, has a long history in research, ranging from money laundering to scientific fraud. Deceptive behaviors of these kinds used to be explained by so-called "cost-benefit models". In these models, the tendency to behave dishonestly is portrayed as an economic trade-off between the costs and the benefits (Bolton & Hand, 2002; Allingham & Sandmo, 1972). More recent models include a variety of psychological variables in order to explain the behavior. The so-called "self-concept maintenance theory" depicts dishonest behavior as a complex struggle between keeping a positive self-concept and the benefits of dishonesty (Mazar, Amir, & Ariely, 2008).

In Bitcoin and many other cryptocurrencies, the currency is created by a certain group of users. These so-called "miners", in a simplistic manner, confirm payments across the domain of Bitcoin by solving cryptographic "puzzles". When they do so, they are rewarded with a fixed amount of the currency. As only one miner or group of miners can receive this amount, they invest time and money by buying equipment for their operations, while also actively creating more Bitcoins (Johnson, Laszka, Grossklags, Vasek, & Moore, 2014). A second group can be defined as Bitcoin users, who do not mine, thus do not actively take part in the creation of additional currency. These can be, for example, traders or people who use the currency to pay for transactions (Hileman & Rauchs, 2017).

Therefore, the question arises, if these two groups do not only use cryptocurrencies differently but also if there is a difference in their tendency to behave dishonestly. Those theoretical implications, being based on the self-concept maintenance theory and additional research on dishonesty, are explained in depth in the following section. The assumptions are then tested in an experimental setup.

Theory

Self-concept maintenance theory

The self-concept maintenance theory depicts the choice between being honest or dishonest as a decision between obtaining a certain gain and keeping a positive self-concept.

A person's self-concept is defined as one's own view of oneself as a person. Actions or behaviors, in general, are judged by their influence on the self-concept, either supporting one's view or harming it. These views are highly personal and therefore differ from person to person. An example would be the view of a policeman, or woman, to be a righteous person inside and outside of work. Thus, he or she might wait in front of a yellow traffic light, even if crossing it may save four minutes, as the loss of time is less harmful to the person's self-image than the violation.

Individuals, in order to maintain equity between the two aforementioned factors, make use of the mechanism's "categorization" and "attention to standards". The first mechanism refers to the transformation of one's perception of the dishonest action into a personally acceptable one, the latter being the consideration of one's moral standards.

While a high tendency to categorize the dishonesty of the situation will lead to an increase in the use of dishonest actions, being attentive to one's moral standards will reduce this tendency. Expanding on the mechanisms, Mazar et al. (2008) differentiated the two mechanisms based on their origins. The categorization mechanism is influenced mainly by external factors, such as the malleability and the magnitude of dishonesty.

On the contrary, one's attention to moral standards is believed to be shaped by internal awareness or salience. These internal factors, as shown in the research, can be enhanced by the mere exposure to moral or ethical norms, such as religious or commitment reminders (Mazar et al., 2008).

An action or situation has a high level of malleability if it is reinterpretable in a self-serving manner. This reinterpretation would be the case, if a colleague steals another

colleague's lunch out of the fridge at work, as it is "only food". Nonetheless, that colleague would, most likely, never directly take the money it took to pay for the lunch straight out of the colleague's wallet. This example shows, that it is harder for individuals to transform objects that have a direct monetary value, such as currency, than it is to transform objects that have no direct value, like one's lunch. This malleability will increase the general magnitude or strength of the dishonesty, augmenting the tendency to categorize.

Nonetheless, as powerful as the mechanism of categorization seems, it has an inherent limit to it, being justifiable only to a certain threshold. In other words: Someone may rob a fridge, but not a bank, even though the possible gain is much higher.

While Mazar et al. (2008) only mentioned an upper limit, i.e. the avoidance of dishonesty if the reward is too high, Shalvi, Handgraaf, and De Dreu (2011) proposed also a lower limit, in other words: the tendency to avoid dishonesty if the reward is too low.

This assumption was tested by using an anonymized dice-in-a-cup task, making the rolled dice only visible to the participant. Each rolled number on the dice, except 6, was connected to a certain monetary gain. Hence a rolled one would equal to a gain of \$1, but a rolled 6 would equal to a won amount of 0. Additionally, an option for the participants to "opt out" was included, giving them the choice to avoid the dishonest situation or the potential loss completely and receive a fixed amount instead. Supporting the assumptions people tended to report a roll of 4 most often and avoided to choose small or large gains, rather choosing a "middle of the way" option, avoiding both the upper as well as the lower limit of dishonesty.

Value and honesty

As mentioned earlier, the current research will try to tackle the problem of dishonesty in the cryptocurrency setting by differentiating between miners and non-miners. Norton, Mochon, and Ariely (2012) explored the effects of creating objects, on individuals, which they coined "Ikea effect". Participants tended to experience a higher perception of value towards the object if they successfully created it on their own, even if they were uninterested in the work. If, however, the creation was unsuccessful, or individuals were simply endowed with the object, the Ikea effect did not occur. Moreover, these effects occurred for both hedonistic objects, namely Ikea boxes and utilitarian objects, such as origami sets.

In the current study, the perception of value will be considered a form of a moral reminder, making individuals realize the amount of work put into the creation of cryptocurrencies, in a salient way. Therefore, they will be more likely to update their self-concept and thus decrease their own tendency to behave dishonestly.

The present experiment The theoretical constructs, which were implemented in the current experiment are displayed in Appendix B. In order to assess the constructs a questionnaire was deployed later in the experiment.

Hence, to answer the research question on the influence of work or more precisely effort, the following hypothesis was formulated. Individuals, who mine cryptocurrencies will perceive a certain value towards the object. This perception of value is expected to lead to a lower tendency of being dishonest. A conceptual model of the hypothesis can be seen in Figure 1.

H1. Participants in the effort condition are more honest than participants in the non-effort condition.

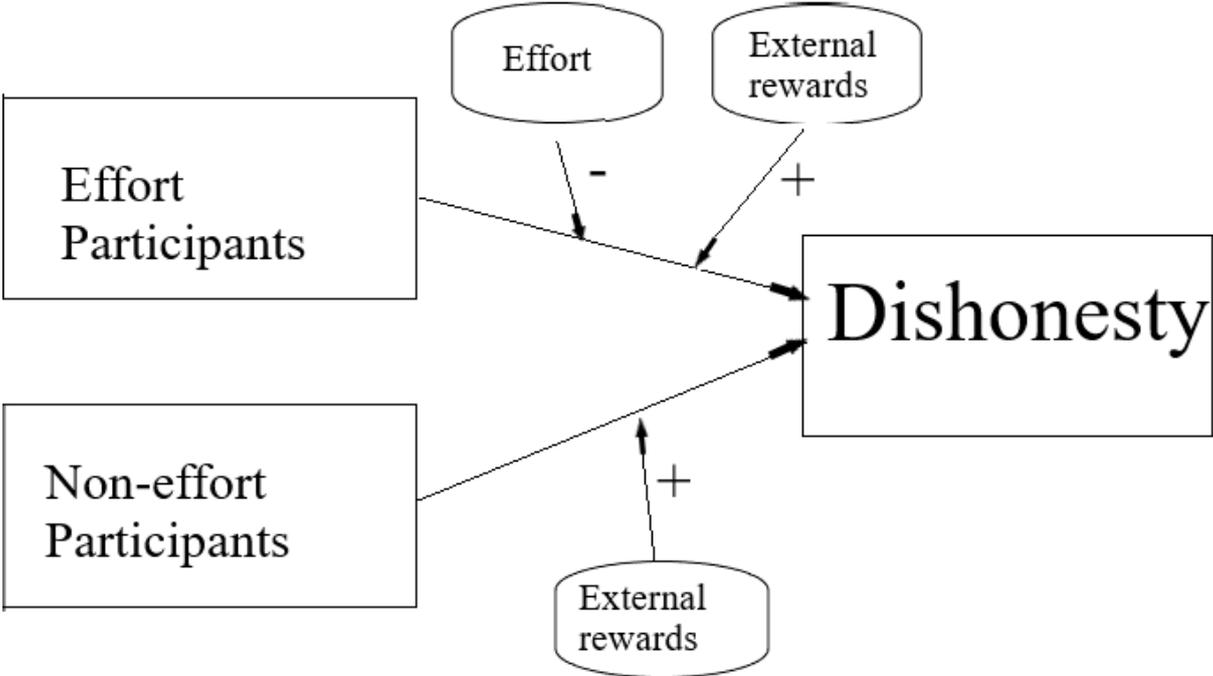


Figure 1. Conceptual model of the hypothesis

Methods

Participants

21 participants took part in the current study. 14 participants were female and 7 male with an average age of 21.47 and a standard deviation of 1.50. The participants reacted to an advertisement for an experiment, that studied how people implement information about cryptocurrencies, and that it would be possible to win between one and six Euros. Each participant was randomly placed in one of two conditions.

Materials

The experiment took place in an office room with a chair, a desk and a computer with a screen, mouse, and keyboard. All cameras were removed from the room, in order to prevent the feeling of being supervised. Furthermore, a sealed cup with a peeking-hole was placed on the desk. For the manipulation, two command line programs were created. The first program simulated the mining of cryptocurrencies, for the effort condition. Lastly, a graphical user interface (GUI) was used to simulate a cryptocurrency wallet for the transfer of a cryptocurrency. An example screenshot of the program can be seen in Figure 2.

Procedure

After a potential participant responded to the advertisement they were invited by the researcher. Individuals were excluded when they had mined or used cryptocurrencies in the past, as these potential participants could notice that the experiment only simulated transactions and mining. Each experiment was conducted with one person at a time.

After the participants arrived, they received information about the study and the procedure. Once again, they were told, that the purpose of the experiment was to test how well people implement instructions about cryptocurrencies. Moreover, they received an informed consent form and were told, that they could stop at any time and withdraw from the experiment completely, without any given reason. Afterward, each participant was brought to the experimental room and left alone by the researcher.

In the room, the participants would read a text that explained how cryptocurrencies work in general. The same text also introduced a fictitious fixed price cryptocurrency (FFPC), with a value of one euro per unit, to the participants. Afterward, the participants conducted either an effort (effort condition) or a non-effort task (control condition). In the effort condition, the participants simulated the mining of the FFPC by entering a command line code to start the mining process, while performing an unrelated wallet simulation afterward. In the control

condition, participants did not simulate mining of the FFPC but were exclusively asked to execute the wallet simulation tasks. The researcher was able to see the input in the command line program by the means of a text file on his computer. Participants were made aware of this connection during their wallet task.

In the next step, the participants of both conditions performed an anonymous dice-in-a-cup paradigm task. They were given a sealed cup and could see the rolled dice through a small hole. This rolled dice was only visible to the participant, but not to the researcher. The participants were informed they could check the dice, to confirm that the dice were not rigged. Then they were asked to roll the dice and receive the number of eyes on the first dice roll in simulated FFPC. To receive the FFPC, the participants had to open a simulation of an FFPC wallet, and then transfer the amount to the account of the researcher. Since the rolled dice was only visible to the participant, they were able to cheat without being detected.

Following the dice-in-a-cup-task, participants had to answer a questionnaire about both their tasks and the tested hypothesis. When the participants completed the questionnaire, they were instructed to walk to the researcher in the next room. The researcher would debrief the participants and explain, that the experiment assessed if people would be more honest when they had mined the currency, that they would receive. Moreover, they were informed that it was not possible to assess if a specific participant was dishonest and that all participants would receive 6 euro. Lastly, the participants were told again, that they could withdraw from the experiment completely.

```
C:\WINDOWS\system32\cmd.exe
INFO [19:55:40] Transaction submitted

goffpc account default balance
INFO [19:55:40] Balance 0xSgDtKXhsNEk4xrzoYA45hBCXnZP4XJqasbybN02

Account 0xSgDtKXhsNEk4xrzoYA45hBCXnZP4XJqasbybN02
Balance 31.06 FFPC

goffpc transaction new --recipient 0xTyJs6XsUAn74IjXp9Fj1VBgSJ15BbhYo7d8k0Anm
Please enter Amount: 6

Confirm transaction

Recipient:      0xTyJs6XsUAn74IjXp9Fj1VBgSJ15BbhYo7d8k0Anm
Amount:        6.00 FFPC
Transaction fee: 0.06 FFPC

Confirm y/n: _
```

Figure 2. Screenshot of the command line program

Results

External rewards A majority of participants in both conditions mentioned, that they were aware of the possibility of being dishonest ($M_{\text{effort}} = 0.90$, $SD_{\text{effort}} = 0.31$; $M_{\text{control}} = 0.90$, $SD_{\text{control}} = 0.31$). Hence, no significant group differences were measured ($t(19) = 0.06$, $p = .94$). In both conditions the awareness had a positive correlation with the rolled number in the dice roll task, which was significant for the non-effort condition ($r_{\text{effort}} = 0.40$, $p_{\text{effort}} = .10$; $r_{\text{control}} = 0.55$, $p_{\text{control}} = .05$).

Moral reminders In order to answer the hypothesis, namely the influence of effort on the participants' decision to behave honest or dishonest, an independent sample t-test was used. Test results showed no significant differences between both groups ($M_{\text{effort}} = 4.09$, $SD_{\text{effort}} = 1.70$; $M_{\text{control}} = 3.9$, $SD_{\text{control}} = 1.85$), disconfirming the hypothesis ($t = 0.24$, $p = .80$).

Dishonesty To assess if participants behaved dishonestly, based on an expected $\frac{1}{6}$ chance of each dice roll, an X^2 test was used. In the effort condition ($X^2(5) = 1.54$, $p = .90$) the number 6 was rolled most often and in the control condition ($X^2(5) = 2.00$, $p = .84$) it was the same number. Table 1 shows the distribution of the dice rolls of both groups.

The chi-square test revealed, that these differences within each group were not significant whatsoever. To compare the distribution of rolls between both groups a Kolmogorov-Smirnov test was deployed. The test revealed no significant differences between both groups ($z = 0.27$, $p = 1.00$).

Table 1

Frequencies of transferred dice rolls

Effort or non-effort	Observed N	Expected N	Residual
Effort			
1	1	1.8	-0.8
2	1	1.8	-0.8
3	2	1.8	0.2
4	2	1.8	0.2
5	2	1.8	0.2
6	3	1.8	1.2
Total	11		

Control	1	1	1.7	-0.7
	2	2	1.7	0.3
	3	1	1.7	-0.7
	4	2	1.7	0.3
	5	1	1.7	-0.7
	6	3	1.7	1.3
Total		10		

Self-concept The participants in both groups updated their self-concept similarly to that of the other condition, resulting in a non-significant difference between groups ($t(19) = -0.85, p = 0.40$). Moreover, while the participants did not update their self-concept significantly, it was positively correlated with the effort condition's roll numbers and negatively with those of the control condition ($r_{\text{effort}} = 0.44, p_{\text{effort}} = .17; r_{\text{control}} = -0.18, p_{\text{control}} = .60$).

Potential covariates Additionally, effort participants experienced a “neutral” feeling of accomplishment after the mining, which had no significant correlation with their rolled dice number ($M = 4.09; r = 0.43, p = .18$). Furthermore, it was revealed, that both groups experienced a similar level of effort during the transfer task ($t(19) = -1.33, p = .19$). Surprisingly, the mining task was seen as equally difficult, for the participants of the effort condition, as the transfer task ($t(10) = 1.41, p = .17$). Supporting the findings of Mazar et al. (2008), that the opinion about other people had no influence on honesty, there was no significant effect found in the current research. This was the case for both the belief, that participants were honest when they transferred FFPC and the belief, that participants used the first dice roll in the questionnaire ($F_{\text{effort}} = 2.23, p_{\text{effort}} = .17; F_{\text{control}} = 0.05, p_{\text{control}} = .95$).

Discussion

While this article is being finished, the value of and the news about Bitcoin experienced a new peak, giving more and more exposure to cryptocurrencies in general. While the news about the rising value mostly seem positive, there are also more and more stories about large scale scams and frauds (Whittaker, Shu, & Shu, 2019). While the current study was by no means as “large scale”, it does offer an insight into the correlation of dishonesty and cryptocurrencies. Even though the experiment of the study mostly resulted in non-significant

results, disconfirming the hypothesis and connections to prior research, there are still useful cues to be found.

These inconclusive findings can be explained by a variety of restrictions. Firstly, the small sample size potentially led to more skewed data and in general lower representativeness of the sample. This aspect is highly visible in the distribution of dice rolls, where a majority of participants reported a rolled 6, but statistical tests revealed no significant differences. Furthermore, it was mentioned by multiple participants in the effort condition, that the mining of the cryptocurrency was perceived as equally simple as the transfer option, which was supported by the analysis of the questionnaire. Hence, an inclusion of more difficult tasks would be an important contribution to producing a stronger feeling of effort. Another predicament was the perceived realism of the study. Most of the participants, in both conditions, mentioned a somewhat low perception of realism for the transfer and mining of FFPC. While there were aspects included to increase the perception, namely an informational text about the fictitious currency and the connection of the researcher with the participant via a text file, this deemed not to be enough. In later feedback sessions multiple participants mentioned, that they felt technically involved due to the text code nature of the experiment, it may be useful to build upon this aspect. Another possible improvement for this problem may be the use of an actual cryptocurrency software, such as a wallet or even a miner. Problems for the latter are in the large amount of hardware, which is needed to run such programs effectively.

Continuing with a comparison to the research of Mazar et al. (2008), the participants in the effort condition did mention, that they felt slightly less honest, compared to yesterday than those of the control condition. While the differences between those groups were non-significant, a correlational analysis of the self-concept maintenance item showed, that participants of the effort condition did update their concepts more actively, in the sense, that they reported feeling less honest in general, than the participants, who did not take part in the mining process. This would support the thought, that a feeling of value does serve as a certain kind of moral reminder, narrowing the malleability of the situation. Adding to the restrictions of the current study and Mazar's model, it is important not to forget the influence of the external reward, the money the participants could receive. In her study Mazar mentioned, that at a certain point this reward will outweigh the maintenance of a positive self-concept, resulting in the use of dishonest actions to obtain it. In the current experiment, it became visible, that the awareness of receiving money was significantly related to higher dice rolls, in

the non-effort condition. Hence an external motivation for those participants to, mention a higher, but dishonest, dice roll was made visible. Nonetheless, as in both studies, the monetary reward was relatively small, it would be of interest to what extent effort is able to outweigh it. One may argue in the favor of Norton et al. (2012), that large companies have been built upon the "need" to do it yourself, hence, that putting effort into something adds personal value to it. The "endowment effect" builds upon this effect, hypothesizing, that individuals are valuing things more if they associate a psychological feeling of ownership towards them. Often this means giving up professional work for one's mediocre self-made product (Franke, Schreier, & Kaiser, 2010). Hence, in our case, the construct of value may as well be mostly influenced by the endowment effect, which seemingly was not strong enough in the current study, as the external motivation outweighed the internal. A reason for this effect not occurring in the current research could be due to the small knowledge in society about cryptocurrencies in general. In the research of Norton et al. (2012), objects were used, that are widely known in western society, such as Ikea furniture. Therefore, individuals had already a certain value assigned to them, whether it was of hedonistic or utilitarian nature. On the contrary, the only thing participants knew about FFPC was its value of 1€ per unit, hence it had no additional value for them. Therefore, an extension, or even a creation in general, of a feeling of ownership during the experiment would be an improvement. This could be done by including rewards, that speak to the participants not only in a utilitarian nature like money does but in a more personal way.

Comparing the results with the experiment of Fischbacher and Föllmi-Heusi (2013), who also used the anonymous dice-in-a-cup, the current excluded two important options, that may have resulted in a different outcome. While in the current study each roll equaled to the same number of rewards received, in Fischbacher's study, a rolled six would equal to a reward of 0 CHF. Especially, due to this difference in the studies, one may believe, that participants would lie less if there was no "pressure" to lie, as each roll will reward something and not result in a gain of nothing. Due to the small sample size, it is hard to say, if a rolled six would still have been the highest number rolled or if participants would also opt for the same rolled number, as in the mentioned study.

While the outcome of the current study was not quite as conclusive as expected, it can still serve as a building stone for future research. When considering the parts of the study which were close to or statistically significant, namely the weak influence of effort, the strong external motivation and the problems with the experimental setup, a new potential model can

be designed. This model would see the endowment effect as the main contributor on one's honesty and not the experienced effort in general, as some form of psychological connection to an object is need to express value towards it. Furthermore, it can be expected, that this internal motivation is able to outweigh the current external motivation of 6€. Hence, it can be a goal for future research, to find out the extent, to which effort as an internal motivation can outweigh money as external motivation.

Another possible future research topic would be the influence of one's perceived relationship towards the financier of the experiment. In the current study, most of the participants expected the university to pay the reward, but 5 participants believed, that it would be paid by the research assistant in the next room and 5 believed that it would be paid by another researcher of the university. As these numbers are too small to make any conclusions, a future focus on them would be of great interest.

While no one can foresee what the future will bring, surely both dishonesty and cryptocurrencies will be part of it. Therefore, only further research will shed light on possible connections and implications of both areas.

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Appendix A

Constructs of the questionnaire

Self-Concept Maintenance Theory

FFPC Transferred

The number of transferred FFPC (FFPC Transferred) is the dependent variable of the current study.

Label	Question	Answer	Condition
H_FT1	How many FFPC did you transfer to the research assistant?	1 – 6	Both

Awareness Dishonesty Opportunity

One item assessed whether participants were aware they could be dishonest (Mazar, Amir, & Ariely, 2008).

Label	Question	Answer	Condition
H_ADO1	Were you aware that you could transfer a different amount of FFPC than the number you rolled with the dice?	1 – 7	Both

Perceived Privacy

Two items assessed whether the participants believed that their roll of the dice was private and that the research could not find out, without the help of the participants, which dice they rolled (Jacobsen, Fosgaard, & Pascual-Ezama, 2018).

Label	Question	Answer	Condition
H_PP1	Only I saw which number I rolled with the dice.	1 – 7	Both
H_PP2	The research assistant can find out, without my help, which number I rolled with the dice.	1 – 7	Both

Participants Dishonesty Assumptions

Two items assessed whether participants believed that other participants would be dishonest when rolling the dice (Mazar et al., 2008).

Label	Question	Answer	Condition
H_PDA 1	Other participants are honest when they transfer the FFPC	1 – 7	Both
H_PDA 2	Other participants transfer the exact number of FFPC according to their first roll of the dice.	1 – 7	Both

Financing Source

Three items assessed the beliefs of the participants in how far they believed the experiments was financed by the research assistant in the next room, an assistant professor of the university, or the university itself.

Label	Question	Answer	Condition
	The following questions are about the moment when you transferred the FFPC to the research assistant in the next room. Please try to remember your thoughts in this situation when you answer the questions below.		
H_HM 1	I believed that the money I will receive is financed by the research assistant in the next room.	1 – 7	Both
H_HM 2	I believed that the money I will receive is financed by the university.	1 – 7	Both
H_HM 3	I believed that the money I will receive is financed by a researcher of the university.	1 – 7	Both

Relationship with financier

One item assessed the relationship between the participant and the perceived financier of the study, and to measure relationship, we used the Inclusion of Other in Self Scale (Aron, Aron, & Smollan, 1992).

Label	Question	Answer	Condition
H_SCC 1	Please circle the picture below which best describes your relationship with the person or organization that according to you financed this experiment.	Inclusion of other in self	Both

Self-Concept Change

One item assessed whether participants updated their Self-Concept (Self-Concept Change; Mazar et al., 2008).

Label	Question	Answer	Condition
H_SCC 1	Compared to yesterday, how do you feel?	Considerably less honest - 3 – 3 Considerable more honest	Both

IKEA effect**Liking FFPC**

Four items assessed whether participants liked FFPC. Whether participants like their creation can influence how much they value it (Franke & Schreier, 2010).

Label	Question	Answer	Condition
I_LF1	I like FFPC	1 – 7	Both
I_LF2	I think it is safe to transfer money with FFPC	1 – 7	Both
I_LF3	I'm not interested in FFPC	1 – 7	Both
I_LF4	I don't trust FFPC	1 – 7	Both

Relationship with FFPC

One item assessed the relationship between the participant and FFPC, and to measure relationship, we used the Inclusion of Other in Self Scale (Aron et al., 1992).

Label	Question	Answer	Condition
H_RF1	Please circle the picture below which best describes how you relate yourself with FFPC.	Inclusion of other in the self	Both

Feeling of Accomplishment

One item assessed whether the participants had a feeling of accomplishment after the mining (Walasek, Rakow, & Matthews, 2017).

Label	Question	Answer	Condition
I_FA1	I had a feeling of accomplishment after the mining	1 – 7	Effort

Perception of Accomplishment Cue

One item assessed whether participants perceived the cue to induce accomplishment.

Label	Question	Answer	Condition
I_PAC 1	What is your estimate of how many transactions were verified with the mining?	1 – 250, 251 – 500, 501 – 750, 751 – 1000, 1001 – 1250, 1251 – 1500, 1501 – 1750, 1751 – 2000, 2000 – 2250, 2501 – 2500, I don't know	Effort
	For the following questions, please choose the answer that seems to be the most accurate and complete.		
I_PAC 2	What is the task of cryptocurrency miners?	Multiple Choice	Both
	<ul style="list-style-type: none"> a) To solve a difficult mathematical task. b) To verify transactions. c) To find new cryptocurrency tokens. d) To collect information about transactions. 		
I_PAC 3	How much FFPC were transferred to the wallet?	Multiple Choice	Both

	a) 0.11 FFPC b) 0.12 FFPC c) 0.13 FFPC d) 0.14 FFPC		
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Perception of Miners

Two items assessed how the participants perceived miners of cryptocurrencies. The first items assessed how the participants perceived their relationship with the miners (Relationship with Miners), and to measure the relationship, we used the Inclusion of Other in Self Scale (Aron et al., 1992). The second items assessed whether participants perceived miners as honest.

Label	Question	Answer	Condition
I_PM1	Please circle the picture below which best describes your relationship with miners of cryptocurrencies.	Inclusion of other in self	Both
I_PM2	How honest are miners of cryptocurrencies according to you?	-3 - 3	Both

Perceived Utility

Two items assessed the perceived utility of FFPC and cryptocurrencies in general.

Label	Question	Answer	Condition
I_PU1	I think cryptocurrencies are unusable	1 – 7	Both
I_PU2	I think FFPC is useful	1 – 7	Both

Perceived Effort

Two items assessed the perceived effort for mining and transferring FFPC (Norton, Mochon, & Ariely, 2012).

Label	Question	Answer	Condition
I_PE1	How difficult was it to transfer the FFPC?	Very difficult -3 – 3 Very easy	Both
I_PE1	How difficult was it to mine the FFPC?	Very difficult -3 – 3 Very easy	Effort

Procedure Realism Check

FFPC Procedure Realism

Five items assessed in how far the participants perceived the procedure as realistic (Procedure Realism Check). In detail, one item assessed the realism of the mining, one item assessed the realism of transferring the FFPC, and three items assessed whether participants believed they would be paid, depending on the FFPC they transferred to the research assistant.

Label	Question	Answer	Condition
R_FPR 1	I believe the transfer of FFPC was real	1 – 7	Both
R_FPR 2	I believe the mining of FFPC was real	1 – 7	Effort

	The following questions are about the moment when you transferred the FFPC to the research assistant in the next room. Please try to remember your thoughts in this situation when you answer the questions below.		
R_FPR 3	I believed that I will receive money for my participation in the experiment.	1 – 7	Both
R_FPR 4	I believed that my reward dependent on how much FFPC I transferred to the research assistant.	1 – 7	Both
R_FPR 5	I believed that I was allowed to keep the money that I received after the experiment.	1 – 7	Both

Participant Exclusion Check

Potential participants were excluded from participating when they had transferred or owned cryptocurrencies. Two items assessed whether the exclusion worked, two items assessed whether participants did own or transfer cryptocurrencies.

Label	Question	Answer	Condition
R_PEC 1	Did you transfer cryptocurrencies before this experiment?	y, n	Both
R_PEC 2	Do you currently own or have you owned cryptocurrencies in the past?	y, n	Both

Experiment Appeal

Two items assessed how appealing the experiment was.

Label	Question	Answer	Condition
R_APP1	I think the experiment was boring	1 – 7	Both
R_APP2	I liked the experiment	1 – 7	Both

Demographics

Age

Very young children (below 8) cheat if they have the opportunity to do so (Buccioli & Piovesan, 2011; Jacobsen et al., 2018). When people get older, they tend to be more honest (Friesen & Gangadharan, 2013; Jacobsen et al., 2018). From the age of 5, children show that they are affected by the IKEA effect (Marsh, Kanngiesser, & Hood, 2018).

Label	Question	Answer	Condition
D_AGE1	What is your age?	Number	Both

Gender

Women tend to cheat less than men. Related to risk-taking? When women are paired with men, they start to become more dishonest, similar to men (Jacobsen et al., 2018).

Label	Question	Answer	Condition
D_GEN1	What is your gender?	M, F, Other	Both

Educational Level

One item assessed the highest degree that a participant received (Educational Level).

Label	Question	Answer	Condition
D_EDU1	What is the highest educational degree that you have received?	None, high school, bachelor, master, PhD	Both

References Appendix A

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Appendix C: Questionnaire

Questionnaire for Learning About and Working with Cryptocurrencies

Dear participant, below you will find a list of questions. Please answer each question before you look at the following question.

Introductory questions

What is your age? _____

What is your gender? Male Female Other

What is the highest educational degree that you have received?

None Primary school High school Bachelor Master PhD

How many FFPCs did you transfer to the research assistant? 1 2 3 4 5 6

Were you aware that you could transfer a different amount of FFPC than the number you rolled with the dice? Yes No

Blue items are items asked only to effort participants

After answering all questions above you can turn to the next page.

Below you will see a list of statements. Please indicate how much you agree or disagree with the statements.

	Strongly disagree	Disagree	Disagree	Neutral	Agree somewhat	Agree	Strongly agree
Only I saw which number I rolled with the dice.	<input type="checkbox"/>						
The research assistant can find out, without my help, which number I rolled with the dice.	<input type="checkbox"/>						
Other participants are honest when they transfer the FFPC.	<input type="checkbox"/>						
Other participants transfer the exact number of FFPC according to their first roll of the dice.	<input type="checkbox"/>						
I like FFPC	<input type="checkbox"/>						
I think it is safe to transfer money with FFPC	<input type="checkbox"/>						
I'm not interested in FFPC	<input type="checkbox"/>						
I don't trust FFPC	<input type="checkbox"/>						
I believe the transfer of FFPC was real	<input type="checkbox"/>						
I believe the mining of FFPC was real	<input type="checkbox"/>						
I think cryptocurrencies are unusable	<input type="checkbox"/>						
I think FFPC is useful	<input type="checkbox"/>						
I had a feeling of accomplishment after the mining	<input type="checkbox"/>						

After answering all questions above you can turn to the next page.

Question(s) about difficulty

	Very difficult	difficult	Somewhat difficult	Neutral	Somewhat easy	Easy	Very easy
How difficult was it to transfer the FFPC?	<input type="checkbox"/>						
How difficult was it to mine the FFPC?	<input type="checkbox"/>						

Questions about the transfer of FFPC

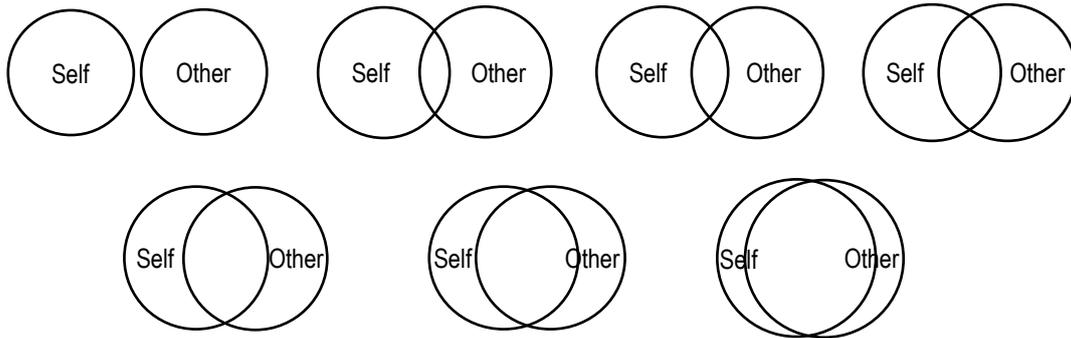
The following questions are about the moment when you transferred the FFPC to the research assistant in the next room. Please try to remember your thoughts in this situation when you answer the questions below.

	Strongly disagree	Disagree	Disagree	Neutral	Agree somewhat	Agree	Strongly agree
I believed that the money I will receive is financed by the research assistant in the next room.	<input type="checkbox"/>						
I believed that the money I will receive is financed by the university.	<input type="checkbox"/>						
I believed that the money I will receive is financed by a researcher of the university.	<input type="checkbox"/>						
I believed that I will receive money for my participation in the experiment.	<input type="checkbox"/>						
I believed that my reward dependent on how much FFPC I transferred to the research assistant.	<input type="checkbox"/>						
I believed that I was allowed to keep the money that I received after the experiment.	<input type="checkbox"/>						

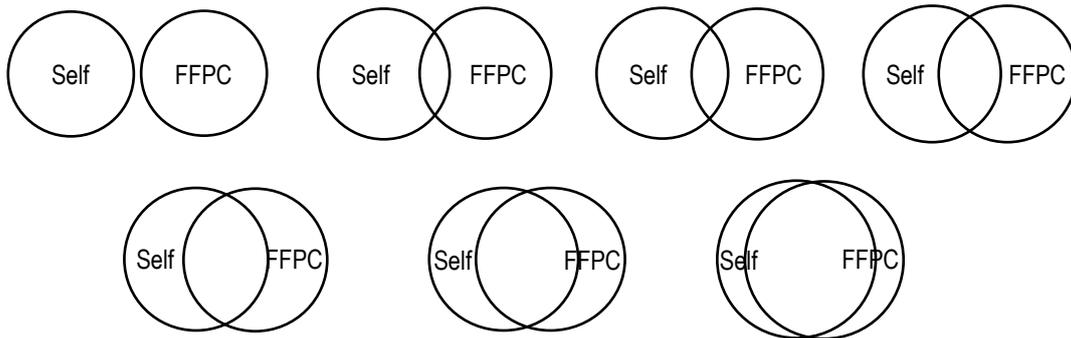
After answering all questions above you can turn to the next page.

Questions about relationships

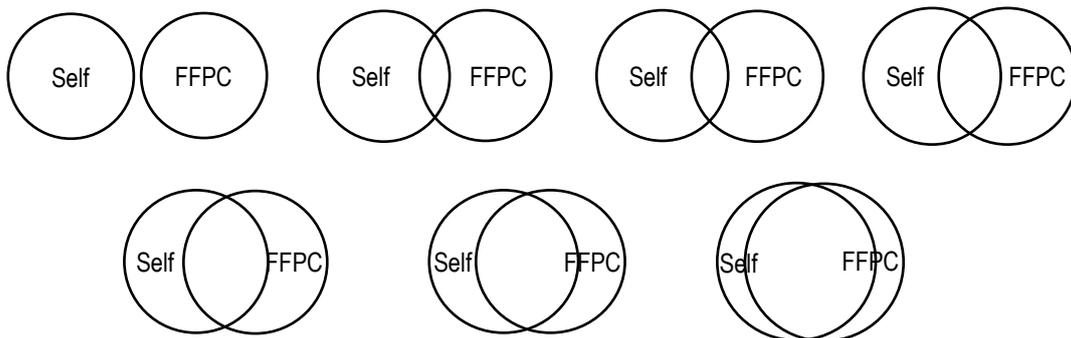
Please circle the picture below which best describes your relationship with the person or organization that, according to you, financed this experiment.



Please circle the picture below which best describes how you relate yourself with FFPC.



Please circle the picture below which best describes your relationship with miners of cryptocurrencies.



After answering all questions above you can turn to the next page.

Question about miners

- How honest are miners of cryptocurrencies according to you?
- | | |
|--------------------------|--------------------|
| <input type="checkbox"/> | Very dishonest |
| <input type="checkbox"/> | Dishonest |
| <input type="checkbox"/> | Somewhat dishonest |
| <input type="checkbox"/> | Neutral |
| <input type="checkbox"/> | Somewhat honest |
| <input type="checkbox"/> | Honest |
| <input type="checkbox"/> | Very honest |

Questions about information that you remember

What is your estimate of how many transactions were verified with the mining?

- 1 – 250 251 – 500 501 – 750 751 – 1000 1001 – 1250 1251 – 1500
 1501 – 1750 1751 – 2000 2000 – 2250 2501 – 2500 I don't know

For the following questions, please choose the answer that seems to be the most accurate and complete.

What is the task of cryptocurrency miners?

- To solve a difficult mathematical task.
 To verify transactions.
 To find new cryptocurrency tokens.
 To collect information about transactions.

How much FFPC were transferred to the wallet?

- 0.11 FFPC
 0.12 FFPC
 0.13 FFPC
 0.14 FFPC

Questions about experience with cryptocurrencies

Did you transfer cryptocurrencies before this experiment? Yes No

Do you currently own or have you owned cryptocurrencies in the past? Yes No

After answering all questions above you can turn to the next page.

Question about feelings of honesty

Compared to yesterday, how do you feel?

- Considerably less honest
- Less honest
- Somewhat less honest
- Neutral
- Somewhat more honest
- More honest
- Considerably more

Question about the experiment

Please indicate how much you agree or disagree with the statements.

I think the experiment was boring

I liked the experiment

- Strongly disagree
- Disagree
- Disagree
- Neutral
- Agree somewhat
- Agree
- Strongly agree

After answering all questions above you can turn to the next page.

End of the questionnaire

You have reached the end of the questionnaire. Thank you for your participation! Please take the finished questionnaire and give it to the research assistant in the next room.