Decisions under financial scarcity

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Chapter 4

Financial scarcity and financial avoidance: An eye-tracking experiment

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Financial Scarcity and Financial Avoidance: An Eye-Tracking Experiment

Financial scarcity is the subjective experience that financial resources are insufficient to meet demands (Shah et al., 2012). This experience can result in stress if the financial situation is seen as a threat that cannot adequately be dealt with (Van Dijk et al., 2022). In the present study, we investigated experimentally whether financial scarcity increases financial avoidance. Here, financial avoidance is the tendency to avoid dealing with one's finances (see Hilbert et al., 2022a) and can take different forms, such as avoiding financial information (Gigerenzer & Garcia-Retamero, 2017; Golman et al., 2017; Hertwig & Engel, 2016) or delaying financial decisions (Anderson, 2003). This research extends previous correlational findings showing that financial scarcity is associated with an increase financial avoidance over time (Hilbert et al., 2022a), that low economic status is associated with a general avoidance motivation (Gilbert et al., 2022), and that people generally tend to avoid to learn financial information if they expect it to be negative (Loewenstein et al., 2009).

Financial Scarcity and Financial Avoidance

Existing literature suggests that financial scarcity may increase financial avoidance via negative emotions, perceived lack of control over one's finances, and increased temporal discounting. First, dealing with one's finances when experiencing financial scarcity may trigger negative emotions like worry and shame (De Bruijn & Antonides, 2020; Plantinga, 2019). Research suggests that (financial) information eliciting such negative emotions may be avoided, particularly when people feel they cannot cope with it (Elliot, 2006; Sweeny et al., 2010). Therefore, when having too little money, people might avoid cues that remind them of their financial problems. Second, when resources are perceived to be lacking, one's financial problems seem difficult to solve (Shah et al., 2018). As such, a core aspect of financial scarcity is the perception of having little control over one's financial situation (Van Dijk et al., 2022). When experiencing financial scarcity, people thus feel that dealing with financial problems does not consistently lead to desired outcomes (Landau et al., 2015). For example, when receiving letters that are likely to contain bills, people might not open them because they feel that they do not have enough money to pay them. Thus, financial scarcity might lead to financial avoidance because people feel that they cannot resolve their financial problems anyways (Howell et al., 2014). Third financial scarcity increases discounting of future outcomes (Haushofer & Fehr, 2014; Hilbert et al., 2022b). Therefore, when experiencing financial scarcity, financial avoidance may be further intensified by weighing the immediate benefits of avoidance (feeling better) more strongly than any delayed outcome of acting (having less problems).

In line with this logic, previous longitudinal research spanning about two years has shown that financial scarcity and financial avoidance have a prospective association with each other (Hilbert et al., 2022a). That is, initial high levels of financial scarcity had a positive association with an increase in financial avoidance more than two years later, and vice versa. Although these findings can help to explain psychological poverty traps (see also Haushofer, 2019), more research is necessary to establish

the causal order of the effects. Therefore, we conducted a laboratory experiment in which we investigated whether induced financial scarcity indeed causes financial avoidance.

Eye Tracking and Avoidance

In the current study, we induced financial scarcity with the Household Task and examined financial avoidance by measuring gaze patterns with an eye-tracker. The benefit of eye-tracking is that it is an unobtrusive physiological measure, that allows to assess where people look at while they engage in task (Holmqvist et al., 2011). Thus, unlike more explicit avoidance measures like survey questions, it is less sensitive to experimenter effects and socially desirable responses. Importantly, previous research has shown that gaze patterns are indicative of where people direct their attention to (Carrasco, 2011, Findlay & Gilchrist, 2003; Wedel & Pieters, 2008). More specifically, it has been shown that fixations are indicative of where they focus their attention, and that attentional avoidance is associated with less fixations on the stimulus (see also Borozan et al., 2022).

To date, most eye-tracking research on avoidance has been conducted in clinical samples. For example, research shows that pations with anorexia nervosa avoid looking at pictures of food (Giel et al., 2011), patients with arachnophobia avoid looking at pictures of spiders (Rinck & Becker, 2006), and patients with social anxiety disorder are less likely to look others in the eye (Chen & Clarke, 2017; Weeks et al., 2019). When confronted with a stimulus that depicts the object of their phobia, patients generally show a gaze pattern in line with the hypervigilance-avoidance hypothesis (Pflugshaupt et al., 2005). Following this hypothesis, as compared with healthy controls, phobic patients fixate quicker on the feared stimulus in the orienting phase after stimulus presentation (hypervigilance), and subsequently, spend less time looking at the feared stimulus (avoidance). This reasoning indicates that after an orienting phase, top-down processes can regulate attention, and therewith gaze-patterns, away from aversive stimuli (see also Lang et al., 1997).

This is supported by findings in non-clinical samples. For example, participants presented with a political advertisement alongside a control stimulus avoided to look at the advertisement if it was inconsistent with their partisan ideology (Schmuck et al., 2020). Likewise, social media users who are not interested in politics spend less time looking at political posts (Bode et al., 2017) and smokers spend less time looking at health warnings on cigarette packages (Maynard et al., 2014). Together, these studies show that eye-tracking can be a valuable tool to measure attentional disengagement from aversive stimuli.

The Present Research

In the current study, we used an eye-tracking experiment to test whether financial scarcity leads to financial avoidance. To induce financial scarcity, participants engaged in a task called "Household Task" that simulated the management of a household's monthly finances. During the task, participants managed the finances of a household over several rounds by earning income and paying expenses. Participants' financial resources were either insufficient (financial scarcity condition) or sufficient

(financial abundance condition) to deal with the financial demands of the situation (Hilbert et al., 2022b). Specifically, between conditions, we manipulated financial scarcity by varying whether participants accumulated debts or savings. To assess financial avoidance, participants were presented simultaneously with two letters at the end of each round. One letter constituted the financial stimulus, indicating that an additional expense had to be paid (i.e., expense letter). The other letter was unrelated to participants financial situation and served as a control stimulus.

We chose the following two gaze measures to assess the extent to which participants avoided looking at the expense letter: First, we measured the time it took participants to first fixate on the amount that had to be paid stated on the expense letter. Here, we assumed that as an orienting response after stimulus onset, participants would first read the titles of the two letters. Then, after finding out that one letter was an additional expense, we expected that participants experiencing scarcity would avoid looking at the detailed information stating the amount that had to be paid. This reasoning is in line with prior research on scanpaths of print and online newspapers (Holsanova et al., 2006; Bucher & Schumacher, 2006), websites (Buscher et al., 2009), and printed advertisements (Lohse, 1997), suggesting that people first look at headlines and larger font sizes as an orientation for which content to further direct their attention to (see also, Rahal & Fiedler, 2019). Thus, Hypothesis 1a stated that compared to participants in the abundance condition, participants in the scarcity condition show a longer time to first fixation on the amount stated on the expense letter. Second, we assessed participants' total fixation duration on the whole expense letter. This was included as an overall measure for attentional disengagement. This measure is commonly used to assess the distribution of attention towards stimuli in research on financial decision-making (Borozan et al., 2022). Thus, Hypothesis 1b stated that compared to participants in the abundance condition, participants in the scarcity condition spend less time looking at the whole expense letter.

We also included a behavioral measure of financial avoidance. This entailed that participants could decide to either pay the additional expense directly or to delay its payment. Thus, Hypothesis 2 stated that, as compared to the abundance condition, participants in the scarcity condition are more likely to delay the payment of the additional expense.

We preregistered our hypotheses, method, and analysis plan (https://doi.org/10.17605/OSF.IO/SJRWC). All data, analysis codes, and materials are available on the Open Science Framework (OSF; https://doi.org/10.17605/OSF.IO/ZR49X).

Method

Participants and Design

We recruited 62 undergraduate students of Leiden University with normal or corrected eyesight as participants for the experiment (M_{age} = 23.03 years, SD_{age} = 3.09; 54 females, 8 males). We conducted a preregistered sequential analysis with adjusted alpha levels (Lakens, 2014) and decided to stop data

collection at this point in favor of collecting the full sample of 100 participants.[24] To retain a total false positive rate of five percent, the adjusted alpha level for all hypothesis tests was set to $\alpha = .031$ (for calculation of adjusted alpha levels, see open materials).

Participants were randomly assigned to one of two conditions of a mixed two-factorial design, with Financial Resources (scarcity, abundance) manipulated between participants and Rounds (one to six) of the Household Task as within factor. Financial avoidance was measured each round with the time to first fixation on the amount on the expense letter (for Hypothesis 1a) and the total fixation duration on the whole expense letter (for Hypothesis 1b), as well as the decision to pay the extra expense directly or delay the payment (for Hypothesis 2).

Setup and Apparatus

The experiment was programmed in E-prime (version 3.0). Participants completed the study on a laptop with a 15″ wide screen with full HD resolution in the video laboratory of Leiden University. Gaze data was assessed with a Tobii X2-60 eye-tracker. The tracker uses an unobtrusive infrared camera system mounted on the laptop screen, allowing for free head movements. Gaze data was sampled at a rate of 60hz, matching the refresh rate of the laptop screen.

In line with our pre-registered exclusion criteria, we excluded gaze data from the analyses case wise for each round if the valid gaze percentage was lower than 75%. This led to an exclusion of data for 70 rounds, which was 18.8% of the total rounds[25]. The total number of rounds with valid gaze data was 302, clustered in 58 participants.

Procedure

Participants first gave informed consent, after which they were seated approximately 60 centimeter in front of the laptop screen and the eye-tracker was calibrated. Then, they were introduced to the Household Task, which is a task where participants have to manage the finances of a household. The task can be used to manipulate financial scarcity in a setting of household finances (Hilbert et al., 2022b). Participants completed a practice round to familiarize themselves with the task.

The Household Task consisted of six rounds presented in random order. A round resembled a period of one month in which participants had to earn an income by doing a "monthly work shift", pay their regular monthly expenses, and respond to mail they received. Each round started with an overview of their expenses. The overview first showed the total amount of expenses, and then listed the expenses for four separate sub-categories (i.e., housing, education, shopping, other). After previewing their expenses, participants continued with an effort task, which represented their work shift. For this effort

[24] We had to stop recruitment of participants in March 2020 when campus was closed due to the outbreak of the COVID-19 pandemic. Before deciding whether to commence data collection or not, and without prior knowledge of the already collected data, we added the sequential analysis plan to our pre-registration. Based on the sequential analysis, we adjusted the alpha levels for all hypothesis tests. Based on the findings, we decided not to pick up data collection again when students returned to campus in summer 2021.

[25] Inclusion of these data points did not change the results in a meaningful way (see open materials on the OSF).

task, participants were presented with 15 sliders on their screen and were given 30 seconds to adjust the sliders such that the indicator was set to the middle position (adapted from Gill & Prowse, 2011). Participants received a fixed income for completing their work shift and a bonus income for each slider they adjusted correctly. Subsequently, they were shown their total income and asked to confirm the payment of their expenses of that round. Then, to measure financial avoidance in the form of attentional disengagement, participants were presented with an additional expense letter and a control stimulus letter for 15 seconds during which we assessed their eye movements. At the end of each round, participants made a binary decision on how to respond to each of the letters, one constituting the behavioral measure of financial avoidance and the other one being a filler task. Then, participants continued with the next round of the Household Task.

After six rounds, the Household Task ended and participants filled in a manipulation check measure and were informed about their earnings and debriefed. Participation took approximately 30 minutes. Participants received €4.00 or course credit as show-up fee and up to €3.00 of incentivized payment based on the final balance in the Household Task.

Financial Scarcity Manipulation

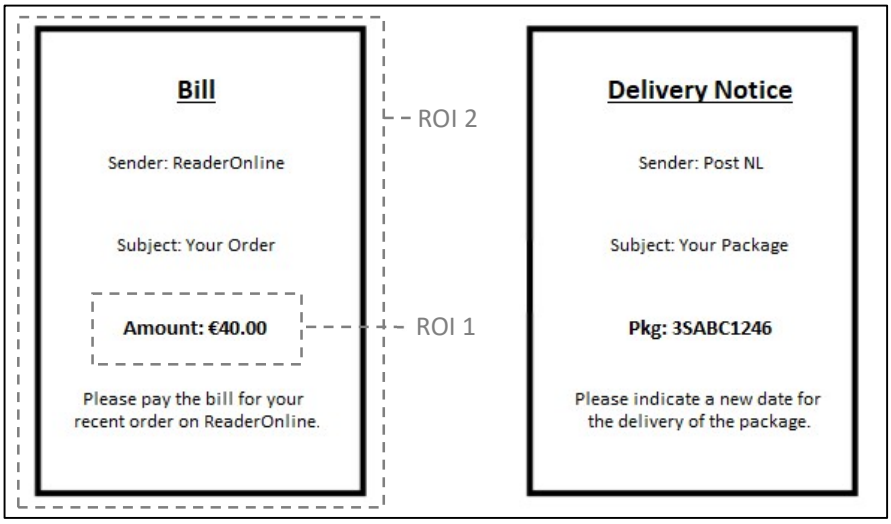
To manipulate financial scarcity, we varied participants' income in the Household Task between conditions. In the scarcity condition, participants had a fixed income of €880 while in the abundance condition, participants had a fixed income of €1204. In addition, participants received a bonus income of €5 for each slider they adjusted correctly[26]. Expenses were based on average expenses for Dutch students and ranged from €1040 to €1120 between rounds, equally across conditions. Each round, participants in the scarcity condition accumulated debts with an average change in balance of -€175 (*SD* = 8.27), and participants in the abundance condition accumulated savings with an average change in balance of +€137 (*SD* = 10.5).

Financial Avoidance Measures

Each round, after paying expenses and earning income, participants received two letters. One letter indicated that an additional expense had to be paid, the other letter served as a control stimulus (see Figure 1). The letters were displayed next to each other in randomized position and structured as follows: The header was written in bold, underscored, had a larger font size, and indicated whether the letter informed about a due payment (e.g., bill, invoice) or something non-financial (e.g., delivery notice, registration deadline). The first line stated the sender of the letter and the second line stated the subject of the letter. The third line was in bold and indicated the amount that had to be paid (for the additional expense) or other numerical information (for the control stimulus). Below that, a short sentence asked participants to react to the letter (e.g., please pay the bill).

[26] Participants were instructed that they would receive both a fixed income and a bonus income, but they were only shown their total income for each round.

Figure 1
Example Stimuli for Gaze Measurements



Note. The left letter shows an expense stimulus, the right letter shows an example for a control stimulus. ROI = region of interest.

Gaze Measures

The letters were displayed on screen for 15 seconds, during which we assessed participants' gaze data. Two regions of interest (ROIs) were defined to code the fixations of participants (Figure 1). The first ROI was the amount of money that had to be paid stated on the expense letter. As a measure for Hypothesis 1a, we calculated the time to first fixation on this ROI. To count as fixation on the ROI, the fixation duration had to be at least 100 milliseconds. The second ROI was the whole expense letter. As a measure for Hypothesis 1b, we assessed participants 'dwell time' on this ROI by calculating the relative total fixation percentage on the expense letter compared to all valid fixations on the screen (Maynard et al., 2014; Schmuck et al., 2020).

Behavioral Measure

Each round, after being presented with the two letters, participants made a binary decision about each of them. Regarding the expense letter, participants could choose to either "Pay the expense now" or to "Pay the expense later", constituting the measure for Hypothesis 2. If participants decided to pay the expense directly, the respective amount was deducted from their balance. If participants decided to pay the expense later, they were presented with it again at the end of the experiment. Delaying payment was not associated with a risk or cost. The decisions about the control letter were inconsequential for the outcome of the experiment (e.g., "Please pick a new date for the delivery of your parcel") and were included to avoid the experimental design steering the attentional focus on the expense letters over rounds. At the end of each round, participants were shown their updated balance.

Manipulation Check

To test whether the difference in balance between conditions successfully manipulated participants' experience of financial scarcity, we included a four-item self-report measure of financial scarcity at the end of the experiment. Participants reported their experience of financial scarcity throughout the task, with two positively coded items ("I worried about my financial situation", "I felt stressed about my financial situation") and two negatively coded items ("I felt I had enough money", "I felt I had control over my finances"). The items were adapted from Hilbert et al. (2022a) and assessed on a seven-point Likert-scale, ranging from 1 = *totally disagree* to 7 = *totally agree*. The measure showed high internal consistency (Cronbach's α = .87).

Results

Manipulation Check

Confirming that the manipulation was successful, participants in the scarcity condition reported a stronger experience of financial scarcity (n = 31, M = 5.98, SD = 0.89) compared to participants in the abundance condition (n = 31, M = 2.82, SD = 1.07, t[57.9] = 12.63, p < .001, g = 3.21).

Gaze data

Time to First Fixation

First, to test Hypothesis 1a, we fitted a linear mixed model (REML) with time to first fixation (in seconds) on the amount of the additional expense as dependent variable. All mixed models included random intercepts for participants, a fixed level-1 factor for the number of rounds and a fixed level-2 factor for the experimental condition. We also included a cross-level interaction between the two fixed effects for exploratory analyses. Random slopes were not included as this would have led to singularity issues. Overall, the total variance explained was r^2 = .06. The intra-class-correlation (ICC) was low, r = .05. The variance explained by the fixed effects was r^2 = .02. Not supporting Hypothesis 1a, the fixed effect of the experimental condition was not significant, F(1, 46.3) = 0.22, p = .638. The time to first fixation on the amount of the additional expense was not significantly higher in the scarcity condition compared to the abundance condition, γ = 0.22, SE = 0.46, 95%CI [-1.12, 0.68]. Also not significant were the fixed effect of Round, F(5, 222.2) = 0.54, p = .745, and the cross-level interaction, F(5, 222.2) = 0.25, p = .94.

Fixation Duration

Next, to test Hypothesis 1b, we fitted the same linear model with relative dwell time on the whole expense letter as dependent variable. Overall, the total variance explained in the final model was r^2 = .33. The intra-class-correlation (ICC) was moderate, r = .30. The variance explained by the fixed effects was r^2 = .05. Not supporting Hypothesis 1b, the fixed effect of the experimental condition was not significant, F(1, 54.2) = 0.60, p = .441. The fixation duration percentage on the amount of the extra expense was not significantly higher in the scarcity condition compared to the abundance condition, γ

= -1.34, *SE* = 1.73, 95%CI [-2.05, 4.73]. Also not significant were the fixed effect of Round, $F(5, 239.5) = 2.13$, $p = .063$, and the interaction of the two fixed effects, $F(5, 239.5) = 1.41$, $p = .221$.

Taken together, for the gaze data, there was no evidence that the experience of financial scarcity increased financial avoidance.

Behavioral Data

Next, to test Hypothesis 2, we fitted a logistic mixed model with a binomial dependent variable, indicating for each round whether participants decided to pay their additional expense directly or delayed their payment. The model contained the same predictors as the previous models. Overall, 58% of the total variance was explained ($r^2 = .58$), whereby 41% was explained by the fixed effects ($r^2 = .41$). The fixed effect for the experimental condition was significant, $\chi^2 (1) = 32.96$, $p < .001$.

Confirming Hypothesis 2, as compared to participants in the abundance condition, those in the scarcity condition were more likely to delay payment of their additional expense, $\gamma = 3.36$, *SE* = 0.59, exp(B) = 28.84, 95%CI [9.15, 90.85]. This indicates that each round, participants in the scarcity condition were 28.8 times more likely to delay payment of the additional expense than participants in the abundance condition. This was equivalent to a total *M* = 2.84 (*Median* = 3, *SD* = 1.70) of delayed payments in the scarcity condition and total *M* = 0.42 (*Median* = 0, *SD* = 0.85) of delayed payments in the abundance condition. The fixed effect of Rounds was not significant, $\chi^2 (5) = 8.66$, $p = .123$. Likewise, the interaction between the two fixed factors was not significant, $\chi^2 (5) = 5.35$, $p = .375$.

Thus, unlike the gaze data, the behavioral data did support the hypothesis that financial scarcity increases financial avoidance.

Discussion

Previous longitudinal research showed that when experiencing financial problems, people are more likely to avoid potentially negative financial information and delay making financial decisions (Hilbert et al., 2022a; see also Gilbert et al., 2022). Here, we experimentally investigated whether financial scarcity increases financial avoidance. That is, depending on experimental condition, participants either accumulated household debts or savings, which served as a manipulation of financial scarcity and financial abundance, respectively. Then, participants received an additional expense letter in their mail. We tested whether participants who experienced financial scarcity would attentionally disengage from the expense letter and delay their payment. We measured attentional disengagement with an eye-tracker in two ways: First, we assessed the time it took people to look at amount they had to pay stated on the expense letter. Second, we assessed the total time people spent looking at the expense letter compared to a control stimulus. Then, as a behavioral measure of financial avoidance, we gave participants the option to delay the payment of the bill without additional cost until the end of the experiment. The eye-tracking data did not support our hypothesis that financial scarcity leads to attentional disengagement. The behavioral data, however, supported our hypothesis that financial scarcity increases the likelihood to delay the payment of bills.

There are several methodological and theoretical considerations that might explain the null findings for the hypothesized effect of financial scarcity on attentional disengagement. First, it could be that the eye-tracking data was too noisy to reliably detect a true effect. This seemed particularly the case for the first hypothesis (H1a) regarding the time it took participants to first fixate on the amount of the expense letter. The size of this ROI was relatively small, which can lead to misclassifications of fixations (fixations on ROI being classified as outside, and vice versa) if the accuracy of the gaze measure is imperfect (Holmqvist et al., 2022). In addition, this gaze measure only consisted of a single fixation per round (six per participant), and varied considerably. This was represented in a very small amount of explained variance in gaze data and a low ICC, indicating that most of the variance in gaze data was random error. Thus, it is possible that the null result for H1a might be explained by noisy data. The data for the second hypothesis (H1b) was based on the percentage of all fixation durations on a much larger ROI, and varied less extremely. This was also represented in a moderate portion of explained variance in the gaze data by the predictors and a medium to large ICC (Bliese, 2000; James, 1982). Thus, it is less likely that the results for H1b are due to noisy data.

Second, it is possible that in the current experimental setup, financial scarcity indeed does not lead to attentional disengagement from one's financial problems. Here, participants had the option to delay paying their additional expense at no cost and could thereby effectively deal with the problem at hand (for the time being). This might have provided them with a sense of control over their problematic financial situation and led to the perception that the additional expenses were manageable. Crucially, previous research has shown that a threat leads to disengagement when threat-management resources are lacking (Howell et al., 2014) but not when the threat is perceived to be manageable (i.e., under control; Garrett et al., 2018). That is, the general tendency to avoid negative information (Sweeny et al., 2010) can be attenuated under controllable threat, as all information might be crucial to survival and therefore processed equally. Therefore, we think that the perception of (not) having control over one's finances might be a crucial moderator that influences whether one's financial problems are seen as an uncontrollable threat that should be avoided or a challenge that can be overcome. Future research could systematically investigate the potential moderating role of perceived lack of control for the effect of financial scarcity on financial avoidance, for example by introducing and varying an additional cost for the option to delay one's additional expenses.

The behavioral findings conceptually replicate and extend previous correlational research showing that the experience of financial scarcity is associated with an increase in financial avoidance over time (Hilbert et al., 2022a), that low economic status is associated with a general avoidance motivation (Gilbert et al., 2022), and that–regardless of one's financial situation–negative financial information is more likely to be avoided (Loewenstein et al., 2009). Here, we showed experimentally that financial scarcity increases financial avoidance behavior. In the current setup, financial avoidance behavior was operationalized by the option to delay paying one's expenses. Importantly, this option was not associated with additional costs (e.g., a late payment fee or interest rate) and therefore a sensible

choice. Our finding is thus in line with previous research showing that financial scarcity increases temporal discounting in situations where it might be rational (Hilbert et al., 2022b; see also Frankenhuis & Nettle, 2019). Yet, future research is needed to investigate whether financial scarcity also leads to financial avoidance when it would be costly.

Conclusion

When people have too little financial resources to meet demands, they can experience financial scarcity. Here, we tested whether the experience of financial scarcity during the Household Task would lead to financial avoidance, measured as attentional disengagement from expense letters with an eye-tracker and behavioral avoidance by delaying the payment of expenses. The experiment did not provide evidence in support of the hypothesis that financial scarcity affects how people distribute their attention, as there was no effect of participants' financial situation on their gaze pattern. However, financial scarcity increased the likelihood to delay paying one's expenses, when doing so was not associated with an additional cost. This finding extends previous correlational findings by establishing a causal order on the association between scarcity and avoidance.

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