Decisions under financial scarcity

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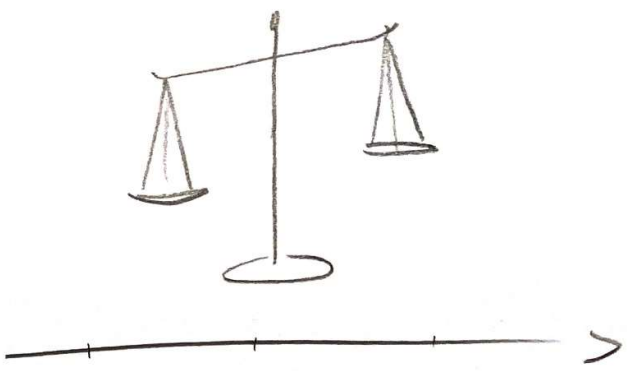

Chapter 2

Financial scarcity increases discounting of gains and losses: Experimental evidence from a household task

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Financial Scarcity Increases Discounting of Gains and Losses: Experimental Evidence from a Household Task

Having too little financial resources to meet demands greatly impacts people's lives. This situation of financial scarcity can result in the accumulation of debts (Gennetian & Shafir, 2015) and, in turn, seriously affect physical and psychological well-being (Drentea & Lavrakas, 2000; Sweet et al., 2013). In addition to these consequences for well-being, financial scarcity can also alter cognitive processes and decision-making (for an overview, see Sheehy-Skeffington & Rea, 2017). That is, financial scarcity evokes a mindset that is specifically geared toward dealing with current pressing financial concerns (Mullainathan & Shafir, 2013; Shah et al., 2018). An important aspect of this "scarcity mindset" is a strong focus on the immediate outcomes of one's decisions and actions (Haushofer & Fehr, 2014). In the present research, we aimed to show experimentally that financial scarcity increases temporal discounting of gains and losses.

Financial Scarcity

In line with previous research, we define financial scarcity as the subjective experience that available financial resources are insufficient to meet demands. (Shah et al., 2012). Here, demands constitute household expenses that have to be paid. Literature on financial scarcity suggests that his experience affects decision-making in (at least) two ways.

First, the experience of financial scarcity influences how people distribute their attention (Shah et al., 2012, 2019). That is, it directs attention to current pressing financial concerns. Based on this shift in attentional focus, we predict that financial scarcity leads to a preference for options that are optimal in the short-term over options that are optimal in the long-term. This might promote decisions where money can be earned quickly, while foregoing larger gains in the future. For example, people might prefer to keep financial resources available for present use rather than allocating these to more distant financial goals (e.g., investing it in retirement plans or long-term savings accounts). Likewise, this might promote decisions where due payments are delayed instead of paid directly. For example, people might be more likely to prefer paying in installments over paying in full immediately. In both cases, the attentional focus on the problem of having scarce resources at present might lead to decisions that have positive consequences in the short term but (larger) negative consequences in the long term. Thus, due to a shift of attentional focus towards pressing concerns, we predict that financial scarcity increases temporal discounting.

To focus one's attention in troublesome circumstances is generally an adaptive strategy because it can help to solve the problem at hand (Frankenhuis & Nettle, 2019). To illustrate, when making utility judgments under financial scarcity, people are more likely to focus their attention on the most relevant characteristics of their options and become less susceptible to irrelevant framing cues (Shah et al., 2015). In the context of temporal discounting, this attentional shift toward the present might thus constitute an adaptive (optimal) response to pressing financial concerns at present. However, it is also possible that the focus on the present might lead to attentional neglect (i.e., tunnel vision) of important

information or future consequences (Tomm & Zhao, 2016). This would suggest that the attentional shift towards the present might also constitute a maladaptive (sub-optimal) response in which future problems are disregarded. The current research contributes to clarifying this open question in the literature.

Second, and related to the attentional effect, financial scarcity elicits rumination and worries about money (De Bruijn & Antonides, 2020). Scarcity literature states that these processes consume mental resources, and thereby leave fewer resources available for other cognitive processes. For example, research shows that financial scarcity impedes cognitive functioning (Mani et al., 2013; but see Wicherts & Scholten, 2013). In addition, scarcity has been shown to reduce activity in the dorsolateral prefrontal cortex, which is an area that is responsible for goal-directed planning (Huijsmans et al., 2019). When making financial decisions, the mental tax of dealing with insufficient financial resources might impair the ability to plan ahead. If the ability to oversee future consequences is impaired, the likelihood might increase to make decisions favoring both small but immediate earnings and the delay of due payments. So, in addition to the attentional mechanism, cognitive load and the impeded ability to make plans and follow long-term goals might also play a mechanistic role for the effect of financial scarcity on increased discounting.

Temporal Discounting

Temporal discounting is defined as the devaluation of future outcomes which can be quantified with a discount rate (for an overview, see Frederick et al., 2002). When people devaluate future outcomes (i.e., have a high discount rate), they weigh outcomes that are attained sooner more heavily than outcomes that are attained later. When these outcomes are positive, such as receiving money, a high discount rate leads to a preference for immediate smaller gains over delayed larger gains. When outcomes are negative, such as paying money, a high discount rate leads to a preference for delayed larger losses over immediate smaller losses (for an overview on time preferences for receiving and paying money, see Green et al., 2014).

Research indeed suggests that financial scarcity is related to increased discounting. Yet, most of the studies are either correlational or conducted in the field, which hinders clear causal inferences. For example, a large correlational study (80,000 participants in 76 countries) showed that both across and within countries, people with less money had higher discount rates (Falk et al., 2018). In addition, a set of four studies showed that lower childhood SES was related to stronger discounting during adulthood (Amir et al., 2018). In our own research program, we conducted an online study with 300 participants and found that the subjective experience of financial scarcity was positively correlated with higher discount rates (see online supplement for working paper, open data, and open materials; https://doi.org/10.17605/OSF.IO/3BX2D).

In addition, several field studies showed a positive relation between a problematic financial situation, as a proxy for financial scarcity, and increased discounting. In two studies, it was found that present bias – a specific form of temporal discounting with inconsistent time preferences – was higher

before payday compared to after payday (Bos et al., 2016; Carvalho et al., 2016). Furthermore, a quasi-experimental study conducted in Singapore showed that the relief of several debt accounts reduced present bias of members of chronically indebted households (Ong et al., 2019). Likewise, a study conducted in Nepal found that unbanked citizens showed less discounting when they were provided with saving accounts (Carvalho et al., 2016).

Although these studies indicate that the attenuation of experienced financial scarcity is associated with less discounting, they do not provide strict evidence for a causal relation between these variables. It could be argued that a scarcity mindset leads to an attentional focus on immediate outcomes and impairs cognitive capacities needed for long-term planning, thereby increasing discount rates. Yet, it is also possible that decisions where future outcomes are heavily discounted lead to financial problems in the long run[1]. In addition, it is possible that other variables affect both financial scarcity and temporal discounting. Thus, experimental studies are needed to establish whether and how financial scarcity and temporal discounting are causally related.

Currently, only a few experiments have tested the effect of financial scarcity on temporal discounting. In one set of studies, participants with little resources in an experimental task were more likely to borrow resources from future rounds of that task, even if it was costly (Shah et al., 2012, 2018). Another study showed that the risk of financial exploitation by others increased discount rates (Haushofer et al., 2018). Research also showed that a negative income shock (i.e., unexpectedly losing a large amount of money) led to stronger discounting (Haushofer & Fehr, 2019). Together, these studies provide initial support for our contention that financial scarcity increases temporal discounting. It should be noted that these studies concerned discounting of gains. None of them investigated the effect of scarcity on discounting of losses. This is remarkable, as many decisions made in a context of financial scarcity concern losses (e.g., to overdraw a bank account or to postpone payment of bills). To our knowledge, there is only a single study that tested the effect of financial scarcity on the discounting of losses (Bickel et al., 2016). Although this study showed that financial scarcity increased discounting for both gains and losses similarly, the hypothetical scenarios used as experimental manipulation differed not only on financial scarcity, but also on several other aspects[2]. Therefore, it remains unclear whether the obtained effect on the discounting of gains and losses were caused by induced financial scarcity, other aspects on which the scenarios differed, or a combination of both.

The Present Research

In one pilot study and five experiments, we introduce a new experimental paradigm and tested the overall hypothesis that financial scarcity increases temporal discounting. First, we examined the

[1] In fact, both mechanisms being active at the same time have been coined as poverty trap (Gennetian & Shafir, 2015).

[2] In the experimental condition, participants were asked to imagine that they had been fired from their job, had to move to a city they did not like, and that they had to move in with a relative. In the control condition, participants were asked to imagine that they were being promoted and that they had the opportunity to move to an area that they liked, if they wanted to move.

effectiveness of the paradigm in a pilot study. Next, we used the paradigm in two experiments that tested our overall hypothesis in the domain of gains (Experiments 1 and 2) and losses (Experiment 2). Then, in Experiments 3–5, we tested the hypothesis that a financial scarcity mindset would also increase discounting of gains when the available resources were constant across conditions. For all studies, we report all measures, manipulations, and exclusion criteria. All data, analysis codes, and materials are available on the Open Science Framework (OSF; https://doi.org/10.17605/OSF.IO/3BX2D). Sample sizes were determined before data collection. No additional data were collected after the data had been analyzed.

Pilot Study: An Experimental Paradigm to Study Financial Scarcity

To examine the impact of financial scarcity on temporal discounting, we introduce a new experimental paradigm, which we coined the Household Task[3]. During the task, participants manage the finances of a household by earning an income and paying expenses. While expenses are the same for all participants, it is randomly determined whether they have an income that is higher, equal, or lower than their expenses. Consequently, based on their condition, participants accumulate debts, have a neutral balance, or accumulate savings. The random variation in available financial resources allows for an experimental test of the impact of financial scarcity on participants' discount rates. In this pilot study, we tested whether the Household Task successfully induces the experience of financial scarcity. Furthermore, we examined whether the induced experience of financial scarcity was independent from participants' actual income and their experienced financial scarcity in their real lives.

Method

Participants and Design

We recruited 150 British participants (M_{age} = 35.70 years, SD_{age} = 11.78; 84 females, 65 males, 1 participant indicated "other" as their gender) via the online platform *Prolific Academic*. Participants were randomly assigned to one of three conditions of a one-factorial between-participants design (Financial Resources: debts, control, savings) with the experience of financial scarcity as the main dependent variable. We hypothesized that participants in the debts condition would score higher on the financial scarcity measure than participants in the other two conditions. For all studies, we conducted sensitivity power analyses for our respective samples and designs, with the significance level at $\alpha = .05$ and a power level of $1-\beta = .80$, using G*Power (Faul at al., 2007). For our main hypothesis, the minimum effect size to consider the observed effect as relevant is $\eta^2 = .06$.

Procedure

After participants gave informed consent and read the general instructions, they were introduced to the Household Task and completed a practice round. The Household Task consisted of six rounds, and each round resembled a one-week period. Each round started with an overview of the

[3] Thereby, we build on the experimental design of Haushofer and Fehr (2019).

expenses. The overview first showed the total amount of expenses, and then listed the expenses for four separate sub-categories (housing, transportation, shopping, other). Expenses were based on average expenses of British households (Office for National Statistics, 2020), and ranged from £463 to £467 between rounds. The order of the rounds was randomized.

After participants had previewed their expenses of a round, they continued with an effort task, which represented their "weekly work shift". In this effort task, participants were presented with ten strings on their screen. Each string consisted of ten random numbers and (upper and lower case) letters. Participants were given two minutes to type as many of these strings in backward order as possible. After two minutes, their work shift ended and they were automatically forwarded to the next page. Participants received a fixed income for completing the task and a bonus income for each string they correctly typed backwards[4]. Participants were shown their income and asked to confirm the payment of their expenses of that round. Subsequently, they were shown their updated balance and continued with the next round. After six rounds, the Household Task ended and participants were shown their final balance.

Following the Household Task, participants filled out a set of questionnaires to measure their subjective experience of financial scarcity during the task. At the end, participants gave their demographic information, were informed about their earnings, and were thanked and debriefed.

The average completion time of the study was 25 minutes. Participants received incentivized payment based on the outcome of the task. They started the study with an initial endowment of £4.00. This endowment could be increased or reduced with an amount of up to £1.25 based on participants' final balance. Participant payments thus ranged from £2.75 to £5.25.

Manipulation of Financial Resources

In line with financial scarcity theory (Mullainathan & Shafir, 2013; Shah et al., 2012), we simulated a situation in which participants have too little resources to meet their needs. That is, we manipulated whether participants would accumulate debts or savings in the Household Task. Moreover, a control condition was included in which neither debts nor savings were accumulated. In the debt, control, and savings condition, participants received a fixed income of £275, £455, or £635 per round, respectively. In all three conditions, participants could receive a bonus income of £2 for each string they typed correctly backwards[5]. This resulted in a maximum bonus income of £20 per round. The expenses were the same for the three conditions and were on average £465 per round. For participants solving half of the strings correctly, this would lead, per round, to a change of -£180 in the debts condition, a change of £0 in the control condition, and a change of +£180 in the savings condition. Thus, over six

[4] We chose this type of task because it does not require prior knowledge, is easily measurable, and has little room for learning while being relatively boring and pointless, making sure that the task entails a cost of effort for the participants (see Abeler et al., 2011).

[5] 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.

rounds, participants could accumulate debts, accumulate savings, or none of both. Participants completed the Household Task with a mean balance of -£1,043.73 (*SD* = 20.29) in the debts condition, a mean balance of +£40.66 (*SD* = 16.57) in the control condition, and a mean balance of +£1,117.49 (*SD* = 20.53) in the savings condition.

Dependent Variables

As a main dependent variable for the pilot, we measured participants' subjective experience of financial scarcity during the Household Task. To do so, we used a measure that is based on appraisals of financial scarcity and consists of 11 items (for a list of all items, see online supplement on the OSF). Following research on the experiential correlates of financial scarcity, these items concern the appraisal of having too little financial resources (Shah et al., 2012), a lack of control over one's finances (Hilbert et al, 2022b), whether participants felt capable of dealing with their financial situation (Hilbert et al., 2022b), whether they were worried about their finances (De Bruijn & Antonides, 2020), whether they felt positive or negative about their finances, and whether they were stressed (Haushofer & Fehr, 2014). All items were framed to assess participants' experience during the Household Task specifically and were measured on a seven-point Likert-scale, ranging from 1 = *strongly disagree* to 7 = *strongly agree*. The items showed very high internal consistency (Cronbach's $\alpha = .96$).

Then, we asked participants about their actual financial situation to test whether the effectiveness of our manipulation was dependent upon participants' real-life finances. Therefore, we used the Psychological Inventory of Financial Scarcity (PIFS; Van Dijk et al., 2022) to assess how much financial scarcity participants experienced concerning their real-life finances, regardless of the results of the Household Task. The PIFS measures appraisals of insufficient resources and lack of control, in addition to rumination, worry, and short-term focus. The PIFS consists of twelve items measured on a seven-point Likert-scale, ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

In addition, as an objective measure of participants' real-life finances, we included a single item to assess participants' yearly net income (with the income brackets: *less than £10k*, *£10k – £20k*, […], *£90k – £100k*, *£100k – £150k*, *more than £150k*).[6]

Results and Discussion

We conducted a one-way between-participants ANOVA with Financial Resources (debts, control, savings) as predictor and experienced financial scarcity as dependent variable. As hypothesized, Financial Resources had an effect on experienced financial scarcity, $F(2, 147) = 133.34$, $p < .001$, $\eta^2 = .65$. Planned contrasts revealed that participants in the debts condition experienced more financial scarcity ($n = 49$, $M = 6.17$, $SD = 0.96$) than those in the control condition ($n = 51$, $M = 3.43$, $SD = 1.22$), $t(147) =$

[6] We also included several items that asked participants for detailed feedback on the Household Task. Those items were not intended for hypothesis testing are and thus not reported here. In addition, we also measured participants' experience of control over their finances and over their life in general, which were included for a different project (for a full list, see open materials on the OSF).

12.00, $p < .001$, $g = 2.48$. Furthermore, participants in the control condition experienced more financial scarcity than those in the savings condition ($n = 50$, $M = 2.57$, $SD = 1.21$), $t(147) = 3.77$, $p < .001$, $g = 0.70$. The results indicate that the Household Task effectively induces the experience of financial scarcity.

Next, we explored whether the extent to which participants experienced financial scarcity regarding their real-life finances affected the impact of our experimental manipulation. Therefore, we added participants' scores on the PIFS as a covariate to a one-way ANCOVA with Financial Resources (debts, control, savings) as predictor and experienced financial scarcity as dependent variable. Financial Resources remained a significant predictor of experienced financial scarcity, $F(2, 144) = 131.22$, $p < .001$, $\eta^2 = .65$. Participants' PIFS-scores had no relationship with experienced financial scarcity in the task, $F(1, 144) = 0.28$, $p = .599$, $\eta^2 = .00$. Moreover, there was no interaction effect between Financial Resources and the PIFS on experienced financial scarcity, $F(2, 144) = 1.07$, $p = .347$, $\eta^2 = .02$. Thus, there was no evidence indicating that the effectiveness of our manipulation was altered by the level of financial scarcity people experience in their real lives.

Last, we explored whether the effectiveness of our experimental manipulation was dependent upon participants' actual income. Therefore, we added participants' real-life income as a covariate to a one-way ANCOVA with Financial Resources (debts, control, savings) as predictor and experienced financial scarcity during the task as dependent variable. Seven participants decided not to disclose their income and their data were excluded from this analysis. Financial Resources remained a significant predictor of experienced financial scarcity, $F(2, 137) = 130.63$, $p < .001$, $\eta^2 = .66$. Participants' income was not associated with experienced financial scarcity, $F(1, 137) = 0.04$, $p = .847$, $\eta^2 = .00$. Moreover, there was no interaction effect between Financial Resources and income on experienced financial scarcity during the task, $F(2, 137) = 1.73$, $p = .181$, $\eta^2 = .03$. Thus, there was no evidence indicating that the effectiveness of our experimental manipulation was altered by participants' real-life income.

Taken together, these results show that having debts in the Household Task effectively induces the experience of financial scarcity. Importantly, our experimental manipulation was strong and independent of participants' real-life financial situation. Thus, we conclude that the Household Task is a suitable experimental paradigm to further investigate the effects of financial scarcity on temporal discounting.

Experiment 1: Financial Scarcity and Temporal Discounting of Gains

In Experiment 1, we tested the hypothesis that financial scarcity increases temporal discounting in the domain of gains. More specific, we hypothesized that participants in the debts condition have a higher discount rate than those in the control or savings condition. We preregistered our hypothesis, method, and analysis plan on the OSF (https://doi.org/10.17605/OSF.IO/XZJ3Q).

Method

Participants and Design

We recruited 210 British participants via the online platform *Prolific Academic*, whereof 209 completed the experiment (M_{age} = 33.98 years, SD_{age} = 12.27; 145 females, 64 males). Participants were randomly assigned to one of the three experimental conditions (Financial Resources: debts, control, savings) of our one-factorial design. Participants' indifference point in the temporal discounting task was the main dependent variable. Four participants were excluded from the analyses because they switched back and forth between immediate and delayed outcomes multiple times, which makes it impossible to calculate a single indifference point.[7] Thus, the final sample consisted of 205 participants. For our main hypothesis, the minimum effect size to consider the observed effect as relevant is $\eta^2 = .05$.

Procedure

The procedure was very similar to the pilot study. Participants first completed the Household Task and then filled in our dependent measures. For the Household Task, we shortened the time participants had available for each work shift to 1 minute and 40 seconds to increase the difficulty of the task[8]. Following the Household Task, participants completed a temporal discounting measure. At the end, participants gave their demographic information, were informed about their payment, and were thanked and debriefed. The average completion time of the study was 23 minutes. Participants received incentivized payment based on the outcome of the Household Task. They started the study with an initial endowment of £3.00 as show-up fee. Based on the outcome of the task, they could earn or lose an additional amount of up to £1.25. This resulted in a payment range of £1.75 to £4.25.

Dependent Variable: Temporal Discounting Task

After participants finished the last round of the Household Task, they continued with an adapted version of a validated temporal discounting measure (Hardisty & Weber, 2009). Participants learned that they would receive a tax return of £250, added to their balance in the Household Task. Subsequently, they were presented with 10 hypothetical binary choices regarding this tax return. That is, participants were asked whether they would prefer to receive a varying amount of money in a year instead of the £250 today (£410, £390, £370, £350, £330, £310, £290, £270, £250, £230). We calculated the indifference point as the amount of money at which preferences switch from the delayed larger reward to the immediate smaller reward. For example, if someone preferred receiving £310 in a year over £250 today but did not prefer receiving £290 in a year over receiving £250 today, their indifference point would be set to £300 (see also, Hardisty & Weber, 2009; Joshi & Fast, 2013). Thus, the indifference

[7] This exclusion criterion is missing in our preregistration form. However, we uploaded an addendum to the form time stamped prior to data collection on the OSF.

[8] In addition, we made minor adjustments to some of the expenses based on the feedback from participants in the pilot study (e.g., we decreased the weekly costs for clothes and increased the weekly costs for groceries). These changes did not influence the total amount of income and expenses per week or the overall payoff structure for participants in this study.

point is the size of the delayed reward for which one is indifferent to receiving £250 immediately[9]. A higher indifference point measures increased discounting because it requires a higher "premium" for the delayed option to be equally valued. Additionally, we asked participants for their indifference point directly in an open question (i.e., "I would be equally happy with receiving £250 right now and receiving £___ in a year."). The analysis with this additional measure yielded similar results as the analysis with the main dependent variable (see open materials on the OSF). Upon completion of the temporal discounting task, the tax return of £250 was added to participants' final balance in the Household Task.

Results and Discussion

As hypothesized, Financial Resources had an effect on temporal discounting, $F(2, 204) = 6.26$, $p = .002$, $\eta^2 = .06$. Planned contrast analysis showed that the indifference point was higher in the debts condition ($n = 67$, $M = 353.13$, $SD = 62.72$) than in the control condition ($n = 69$, $M = 325.80$, $SD = 59.12$), $t(202) = 2.77$, $p = .006$, $g = 0.45$, and in the savings condition (n = 69, $M = 320.58$, $SD = 50.06$), $t(202) = 3.30$, $p = .001$, $g = 0.58$. The indifference point did not differ between the latter two conditions, $t(202) = 0.53$, $p = .595$, $g = 0.10$.

These findings indicate that financial scarcity increased temporal discounting of gains. Moreover, given that the control and savings condition did not differ, this finding cannot be explained by the wealth effect (see Lettau & Ludvigson, 2004).

Experiment 2: Financial Scarcity and Temporal Discounting of Gains and Losses

In our second experiment, we examined whether the finding that financial scarcity increases discounting of gains would replicate and whether a similar effect could be obtained for losses. Experiment 2 thus served as a replication and extension of Experiment 1 and tested two specific hypotheses: Financial scarcity increases discount rates for gains (Hypothesis 1) and financial scarcity increases discount rates for losses (Hypothesis 2).

Experiment 2 also connects to previous research on the differences between temporal discounting of gains and losses. Previous research has shown that, independent of people's financial situation, gains are discounted stronger than losses (Estle et al., 2006; Hardisty & Weber, 2009; Thaler, 1981). In line with these findings, our third hypothesis was that, overall, temporal discounting is stronger in the domain of gains than the domain of losses. That is, we expected that gains are discounted more so than losses, both in a situation of financial scarcity and in a situation of financial abundance.

Moreover, we expected that the difference between the temporal discounting of gains and losses is dependent upon experienced financial scarcity. That is, participants who already are in financial arrears might be disproportionally likely to try to avoid losing money in the present. Therefore, we

[9] In our preregistration, we stated that we would calculate the discount rate from the indifference point using a linear transformation. However, to increase ease of interpretation, we chose to report the findings using the original values of the indifference point. This deviation from the preregistration has no influence on the results of the statistical analyses.

predicted that the expected difference in temporal discounting between gains and losses is smaller for participants who experience financial scarcity. Thus, our fourth hypothesis was that, compared to participants who experience financial abundance, those who experience financial scarcity in the Household Task show a smaller difference in discounting of gains and losses. In other words, we expected that the motivation to avoid immediate losses for participants who experience scarcity moderates (i.e., attenuates) the overall effect of gains being discounted more than losses.

We preregistered all our hypotheses, method, and analysis plan on the OSF (https://doi.org/10.17605/OSF.IO/2R5KC).

Method

Participants and Design

We recruited 220 British participants via the online platform *Prolific Academic*, whereof 219 completed the study (M_{age} = 34.63 years, SD_{age} = 12.70; 137 females, 80 males, 2 participants indicated "other" as their gender). In line with our preregistered exclusion criteria, we excluded two participants because they switched back and forth between immediate and delayed outcomes in the temporal discounting task multiple times, making it impossible to calculate a single indifference point. In addition, we excluded two participants who switched between immediate and delayed outcomes in such a way that indicated it a preference for more losses. We interpreted that these two participants did not understand the task or did not complete it seriously. These exclusions led to a final sample of 215 participants. For our main-effect hypotheses, the minimum effect size to consider the observed effect as relevant is $\eta^2 = .04$.

The experiment had a two-factorial between-participants design, with Financial Resources (debts, savings) and Domain (gains, losses) as factors. Participants' indifference point in the temporal discounting task was the dependent measure. Note that we omitted the control condition from Experiment 1 in our experimental design for efficiency reasons and because it did not yield different results from the savings condition.

Procedure

The procedure was the same as in Experiment 1, except that the outcome of the tax assessment at the end of the Household Task differed between the gains and losses conditions. In the gains condition, the tax assessment stated that participants would receive a tax return of £250 (cf. Experiment 1). In the losses condition, the tax assessment stated that participants would need to pay £250 of additional taxes. Then, participants made the respective 10 binary hypothetical decisions between receiving (vs. paying) £250 right now and a varying amount in a year. The average completion time of the study was 23 minutes. Participant payment was similar as in Experiment 1.

Results and Discussion

A 2 (Financial Resources: debts, savings) x 2 (Domain: gains, losses) between-participants ANOVA with indifference point as dependent variable showed a main effect of Financial Resources, $F(1, 211) = 20.70$, $p < .001$, $\eta^2 = .09$. A planned contrast analysis showed that the indifference point for gains was higher in the debts condition ($n = 53$, $M = 341.89$, $SD = 56.33$) than in the savings condition ($n = 56$, $M = 320.00$, $SD = 43.48$), $F(1, 211) = 5.83$, $p = .017$, $g = 0.44$. This finding confirmed Hypothesis 1 and replicated the results from Experiment 1, namely that financial scarcity increased discounting of gains. A second planned contrast analysis showed that for losses, the indifference point was higher in the debts condition ($n = 52$, $M = 294.23$, $SD = 51.08$) than in the savings condition ($n = 54$, $M = 257.41$, $SD = 36.25$), $F(1, 211) = 16.07$, $p < .001$, $g = 0.83$. This finding confirmed Hypothesis 2 and indicated that financial scarcity also increased discounting of losses. Results of the ANOVA also yielded a main effect of Domain, $F(1, 211) = 73.00$, $p < .001$, $\eta^2 = .26$. Planned contrast analyses showed that the indifference point was higher for gains than for losses, both in the debts conditions ($p < .001$, $g = 0.89$) and in the savings conditions ($p < .001$, $g = 1.56$). These findings confirmed Hypothesis 3 and indicated that, both in a situation of financial scarcity and in a situation of financial abundance, gains were discounted more than losses. Finally, results showed no interaction between Financial Resources and Domain, $F(1, 211) = 1.34$, $p = .248$, $\eta^2 = .01$. This finding did not support Hypothesis 4. Thus, our results did not indicate that, as compared to financial abundance, financial scarcity leads to more discounting in the domain of losses than in the domain of gains.

In sum, Experiment 2 replicated the effect that financial scarcity increased discounting in the domain of gains. In addition, Experiment 2 also showed a similar effect in the domain of losses. Moreover, in line with previous research we found that, independent of the financial situation, gains were discounted stronger than losses (Estle et al., 2006; Hardisty & Weber, 2009; Thaler, 1981). However, we did not find support for the hypothesis that this effect was less pronounced for people experiencing financial scarcity.

Together, Experiments 1 and 2 showed that when people have debts compared to savings (i.e., scarce financial resources), they tend to make decisions that focus more on short-term instead of long-term consequences. These findings were reliable and replicate and extend previous research. Notably, while participants in the debts conditions of our experiments were always able to pay their expenses, it is still possible that they felt they simply could not afford to be patient (i.e., experienced liquidity constraints). Then, they would also make decisions that are optimal in the short-term but the underlying psychological mechanism might be a different one than increased temporal discounting. Therefore, we conducted a set of three experiments in which we manipulated the experience of financial scarcity (i.e., a scarcity mindset) while keeping the available financial resources positive and constant between conditions.

Experiment 3: Scarcity Mindset and Late Income Shock

In Experiment 3, we tested whether financial scarcity also increases temporal discounting when controlling for available financial resources. Here, we made minimal changes to the Household Task compared to Experiments 1 and 2. That is, we kept the savings condition from previous experiments the same and added a positive income shock to the debts condition, such that participants in this condition would end the task with the same final balance as participants in the savings condition. We hypothesized that participants who accumulate debts and receive a positive income shock at the end of the Household Task would have higher discounting than participants who accumulated savings throughout the task. This was based on the prediction that the experience of having debts throughout the task would induce a scarcity mindset, which might still affect discounting after debts had been equalized. We preregistered our hypothesis, method, and analysis plan on the OSF (https://doi.org/10.17605/OSF.IO/AN7H5).

Method

Participants and Design

We recruited 200 British participants via the online platform *Prolific Academic* (M_{age} = 33.42 years, SD_{age} = 10.93; 148 females, 47 males, three participants indicated "other" as their gender, and two preferred not to indicate their gender). In line with our preregistered exclusion criteria, we excluded five participants because they switched multiple times back and forth between immediate and delayed outcomes in the temporal discounting task, making it impossible to calculate a single indifference point. This led to a final sample of 195 participants. For our hypothesis, the minimum effect size to consider the observed effect as relevant is g = 0.36.

The experiment had a one-factorial between-participants design, with Financial Resources (savings, losses-and-shock) as single factor. As in previous experiments, participants' indifference point in the temporal discounting task was the dependent measure.

Procedure

The procedure was similar to our previous experiments, with the following changes: At the start of the Household Task, all participants were instructed that, during the task, they might experience a change in their income once or not at all. Then, after round five of the Household Task, participants were informed that a new collective bargaining agreement had been reached. For participants in the savings condition, the outcome stated that there were no changes to their salary. Thus, the savings condition was basically the same as in Experiment 1 and 2. For participants in the losses-and-shock condition, the outcome of the collective bargaining agreement stated that they would receive a one-time payment of +£2,160. At the time of the collective bargaining agreement, they had accumulated average debts of approximately -£875. The size of this positive income shock was such that participants in both conditions ended the Household Task with a similar amount of savings (approx. +£1,110). Then, participants completed the discounting measure with gain framing (i.e., receiving £250 today or a larger amount in the future). In an experiment conducted for a different project, we used the same

experimental manipulation together with the debts condition from Experiments 1 and 2. Results of the manipulation check (similar) showed that this manipulation successfully induced an experience of financial scarcity, similar in strength to the manipulation from Experiment 1 and 2 (see online supplement on the OSF).

The average completion time of the study was 22 minutes. Participant payment was the same as in previous experiments.

Results and Discussion

Contrary to our hypothesis, a two-sided *t*-test indicated that the indifference point was not significantly higher in the losses-and-shock condition (n = 98, M = 333.67, SD = 52.21) than in the savings condition (n = 97, M = 324.74, SD = 51.21), $t(193) = 1.21$, $p = .228$, $g = 0.17$. Thus, as compared to accumulating savings, accumulating losses and receiving a positive income shock did not significantly increase temporal discounting. This result did not support our hypothesis that the experience of financial scarcity throughout the task also increases discounting when controlling for available financial resources. The finding of this experiment therefore failed to provide evidence for a mindset effect of financial scarcity.

We see two potential reasons for this. First, it is possible that financial scarcity only increases discounting when financial resources are lacking (as in Experiment 1 and 2) but not when financial scarcity is manipulated merely as a mindset. This would suggest that financial scarcity only increases discounting in so far that it is a rational response to the present concern of lacking financial resources. Following this, as soon as financial problems are resolved, discount rates would revert to baseline level. Second, it is possible that the (manipulated) experience of financial scarcity induced a scarcity mindset that could have increased discounting as hypothesized, but which was subsequently overruled by the positive income shock. While in the losses-and-shock condition the losses per round were considerable, the income shock was so high that participants ended the task with a large amount savings (more than £1,000). In addition, the timing of the shock was such that it occurred shortly before the discounting task. Together, the size and timing of the shock might have induced a feeling of relief and thereby overruled the psychological impact of the debts in the previous rounds. This would be in line with findings from field experiments showing that debt relief reduces discounting (Ong et al., 2019). Moreover, the debts might have even served as a reference point for participants, such that they evaluated the same financial situation even more positively than participants in the savings condition while making the discounting decisions (Tversky & Kahnemann, 1991). Therefore, we conducted an additional experiment in which we adjusted the timing and size of the income shock while keeping available resources constant between conditions.

Experiment 4: Scarcity Mindset and Early Income Shock

In Experiment 4, we administered the income shock in an earlier round and also changed the amount of savings and losses for both conditions, such that participants ended the task with a smaller

amount of savings on their final balance. We hypothesized that participants who accumulate debts and receive a positive income shock in an earlier round of the Household Task would have a higher discount rate than participants who accumulated savings throughout the task. This was based on the prediction that after receiving the income shock, participants in the losses-and-shock condition would lose money each round and plunge through their savings, inducing a scarcity mindset. We preregistered our hypothesis, method, and analysis plan on the OSF (https://doi.org/10.17605/OSF.IO/W2TNM).

Method

Participants and Design

We recruited 300 British participants via the online platform *Prolific Academic* (M_{age} = 41.76 years, SD_{age} = 14.25; 177 females, 120 males, three participants indicated "other" as their gender). In line with our preregistered exclusion criteria (see above), we excluded one participant. This led to a final sample of 299 participants. For our hypothesis, the minimum effect size to consider the observed effect as relevant is g = 0.29. The experiment followed the same design as Experiment 3.

Procedure

The procedure was similar to the previous study, except that in the savings condition, participants earned approximately +£20 per round. In the losses-and-shock condition, participants accumulated losses of approximately -£230 per round. The income shock was framed similarly as in Experiment 3 but administered after the first round. In the losses-and-shock condition, participants received a positive income shock (windfall) of +£1,500. Consequently, both conditions finished the task with a final balance of approximately +£120. While in the savings condition, gains were accumulated slowly but steadily, participants in the losses-and-shock condition experienced heavy losses to their balance every round, reducing the savings they had received from the income shock.

The average completion time of the study was 24 minutes. Participant payment was the same as in previous experiments.

Results and Discussion

Contrary to our hypothesis, a two-sided t-test indicated that the indifference point in the losses-and-shock condition (n = 153, M = 337.65, SD = 55.58) was not significantly higher than in the savings condition (n = 146, M = 332.33, SD = 53.83), $t(298) = 0.84$, $p = .402$, g = 0.10. Thus, as compared to accumulating savings, accumulating losses and receiving a positive income shock did not significantly increase temporal discounting.

As for Experiment 3, this result did not support our hypothesis that the experience of financial scarcity increases discounting when controlling for available financial resources. In contrast to Experiment 3, this null finding cannot be explained by the timing and size of the income shock or the psychological effect of a negative reference point. Therefore, a remaining explanation for this null finding is that only a lack of available resources leads to a rational response such that present financial

concerns are met with increased discounting. When controlling for available resources, the experience of financial scarcity itself might not increase discounting.

However, it is also possible that the framing of the experiment might have given participants a sense of closure, such that a potential effect of a scarcity mindset was overruled. When making the discounting decision, participants were explicitly informed that the last round of the Household Task had passed. This might have given participants a sense of closure, as they finished the task while avoiding to get into debts. As a result, they might have closed a mental account with small savings for the Household Task and then moved on to the discounting decisions (see also Thaler, 1985).

To further investigate the roles of lacking resources and cognitive closure for the discounting effect, we conducted an additional experiment. If lacking financial resources at present increases discounting while a mere scarcity mindset does not, one could expect that anticipating a lack of financial resources in the future would also increase discounting, even if current available resources are controlled for.

Experiment 5: Scarcity Mindset and Endowment

In Experiment 5, all values for income and expenses stayed the same as in Experiment 4. However, instead of receiving an income shock, participants in the endowment-and-losses condition (see below) now started the Household Task with an endowment of +£1,500. In addition, to avoid giving participants a psychological sense of closure and avoid end-of-task effects, we changed the instructions such that participants were not explicitly informed that the task had ended at the time they made the discounting decision. Last, we extended the scale of the discounting measure to give participants a broader range to indicate their indifference point.[10] We hypothesized that participants who received a positive endowment and then accumulated losses throughout the Household Task would have a higher discount rate than participants who accumulated savings throughout the task. We preregistered our hypothesis, method, and analysis plan on the OSF (https://doi.org/10.17605/OSF.IO/MJUQC).

Method

Participants and Design

We recruited 302 British participants via the online platform *Prolific Academic* (M_{age} = 38.66 years, SD_{age} = 14.54; 219 females, 79 males, 3 participants indicated "other" as their gender, and one preferred not to indicate their gender)[11]. In line with our preregistered exclusion criteria (see above), we excluded ten participants. This led to a final sample of 292 participants. For our hypothesis, the minimum effect size to consider the observed effect as relevant is g = 0.29. The experiment followed the

[10] Data exploration from the results of Experiments 3 and 4 indicated that 27 and 59 participants, respectively, scored the highest indifference point that the scale could assess. This may have restricted the variance on the dependent measure (see online supplement on the OSF).

[11] We aimed to recruit 300 participants, but two participants did not finalize their submission on prolific after finishing their participation. This led to an automatic refill of two additional participants.

same design as Experiment 4. Participants were randomly allocated to either the endowment-and-losses condition or the savings condition.

Procedure

We adapted the debts-and-shock condition from Experiment 4 to an endowment-and-losses condition. That is, instead of receiving an income shock of +£1,500 during the task, participants in the endowment-and-losses condition started the task with an endowment of +£1,500. The savings condition remained the same as in the previous experiment. In addition, we adapted the instructions of the task such that participants were not told the exact number of rounds of the Household Task. Thus, when they completed the discounting measure, they were not informed explicitly that the last round of the Household Task had passed already. Last, we added five binary hypothetical decisions to the discounting task to allow participants to indicate a wider range of time preferences (participants could now also indicate their preference between earning £250 today and £510, £490, £470, £450, and £430 in a year).

The average completion time of the study was 24 minutes. Participant payment was the same as in previous experiments.

Results and Discussion

In line with our hypothesis, a two-sided *t*-test indicated that the indifference point in the endowment-and-losses condition (n = 148, M = 384.32, SD = 95.32) was significantly higher than in the savings condition (n = 144, M = 355.14, SD = 87.62), $t(290) = 2.72$, $p = .007$, $g = 0.32$. Thus, even though participants in the endowment-and-losses condition had the same balance as participants in the savings condition when making the discounting decision, they showed stronger temporal discounting. This finding suggests that participants in Experiments 1 and 2 did not show higher discounting simply because they felt liquidity constraint. Next, contrary to Experiments 3 and 4, participants in the endowment-and-losses condition made their discounting decision without knowing that the Household Task had ended. Instead, they could reasonably expect that the pattern of repeated losses per round would continue and that they might therefore get into debts in the next round. Participants could thus anticipate a negative balance in the future. This suggests that participants might have adjusted their temporal preferences based on expected financial problems in the future.

General Discussion

Here, we showed that financial scarcity increases temporal discounting. In the pilot, we found that the Household Task can be used to induce financial scarcity in an experimental setting. In Experiment 1, we found support for our hypothesis that financial scarcity increases discounting in the domain of gains. In Experiment 2, we replicated this finding and extended it to discounting of losses. Together, the two experiments showed that when people lack needed financial resources (i.e., they have household debts), they focus more on short-term consequences of their decisions. The magnitude of these effects was substantial: From participants' indifference points, we calculated the highest interest

rate participants would be willing to pay to borrow money from the future[12]. Regarding gains, participants with resource scarcity (i.e., who had household debts) devalued hypothetical future outcomes with a yearly interest rate between 37% and 41%, whereas participants with sufficient financial resources did so with a yearly interest rate of 28% (Experiment 1 and 2). Regarding losses, participants with resource scarcity devalued hypothetical future outcomes with a yearly interest rate of 18%, whereas participants with sufficient financial resources did so with a yearly interest rate of 3% (Experiment 2). We had also hypothesized that financial scarcity would increase the discounting of losses more strongly relative to the discounting of gains (Experiment 2). However, the findings did not support this hypothesis. Experiments 3 and 4 failed to provide evidence for a similar effect when participants experienced financial scarcity while the available resources were constant between conditions. Thus, when experiencing scarcity but having sufficient resources available, there was no evidence for increased discounting. In Experiment 5, we found that even when resources were positive and constant between conditions, differences in the predicted financial future might have led to differences in discounting. That is, discounting might have increased because participants were expecting future debts compared to future savings. Taken together, the pattern of results from our five experiments suggests that when experiencing scarcity, discounting increases as a response to a current or anticipated future shortcoming of available financial resources, but there was no effect of scarcity per se. That is, we did not find evidence that discounting increased when a scarcity mindset was induced in isolation.

This pattern of results is informative for financial scarcity theory, which initially has put a strong emphasis on sub-optimal effects of financial scarcity on decision-making and cognition (e.g., Mani et al., 2013; Vohs, 2013; see also, Dang et al., 2015). However, in our experiments, we only found evidence for increased discounting when it might have been optimal in terms of rational choice but not when it would have been sub-optimal in these terms. When experiencing scarcity, participants only showed increased discounting when there was a current shortcoming in financial resources. In this instance, it is possible that a focus on the present can lead to better outcomes in the future, because potential benefits of a long-term focus might not materialize (Mischel, 1974; Tomlin et al., 2015). Thus, our findings are in line with contentions that financial scarcity might lead to an adaptive response in an unfavorable environment (Frankenhuis & Nettle, 2019) and that it might align behavior with predictions of a rational choice model (Shah et al., 2015, 2018).

Our findings also corroborate and extend previous correlational and field research on financial hardship and temporal discounting (e.g., Bos et al., 2016; Carvalho et al., 2016; Falk et al., 2018). Our experimental findings add to the literature by providing additional causal evidence for an effect of

[12] While the outcome of the Household Task was incentivized, these results were obtained using a hypothetical discounting task. Yet, previous studies showed that discounting functions similarly for real and hypothetical rewards and that hypothetical discounting tasks are ecologically valid (Johnson & Bickel, 2002; Lagorio & Madden, 2005; Locey et al., 2011).

financial scarcity on temporal discounting. Of the few previously conducted experiments in the literature, one found that financial scarcity only increased temporal discounting when participants experienced a negative 'income shock' (i.e., lost a large amount of money unexpectedly) and not when they were relatively poor throughout the whole experiment (i.e., had less money than others; Haushofer & Fehr, 2019). In Experiment 1 and 2, we also found an effect of financial scarcity on discounting when participants became gradually indebted, while Experiment 5 provided evidence for such an effect when participants gradually lost their savings and could expect future debts. Thus, for a discounting effect to appear, we think it is necessary that the need of having sufficient resources is seriously threatened. This might be the case when experiencing a negative income shock as previous research has shown (Haushofer & Fehr, 2019), or when losing money while having to pay one's expenses, as our current research indicates, but not when simply having less than others (i.e., relative scarcity). Relatedly, our findings add to the literature by showing that financial scarcity increases discounting in the context of problematic household finances. Previous experiments found this effect with different methods, namely when participants could borrow turns from future rounds of an experimental task (Shah et al., 2012, 2018) and in the context of economic exploitation by others (Haushofer et al., 2018).

Avenues for Future Research

With the Household Task, we were able to induce financial scarcity in an experimental setting, which was associated with the experience of stress and feelings of financial worry and lack of control. Thus, the paradigm allows researchers to simulate a problematic financial situation in a fully controlled environment, which participants experience as immersive and threatening. This is a valuable addition to the field of financial scarcity, given that a recent empirical audit and review found that there was only little evidentiary value within the published experimental studies in the field of financial scarcity (O'Donnell et al., 2021). The authors conducted 20 replications of studies that used experimental manipulations of financial scarcity, of which only four yielded significant results. They conclude that "although many replications failed to find evidence for the psychological consequences of primed scarcity, real-life scarcity likely has many antecedents and consequences" (O'Donnell et al., 2021, p. 3). The authors thus point towards the currently available experimental methods as most likely explanation for the surprisingly large number of failed replications. We agree that for researchers in the field of financial scarcity, it is a non-trivial challenge to translate the threatening experience of lacking needed financial resources from real-life into the laboratory (for a discussion on this, see also Hilbert et al., 2022b). Interestingly, O'Donnell and colleagues (2021) point out that the most promising approach to study effects of financial scarcity in experiments was to "prime participants with some type of financial constraint and then requiring them to engage in a financial or consumer decision task under these constraints" (p. 3).[13] The Household Task can be used to do just this. We think that it is therefore a

[13] We note that this conclusion is also in line with the pattern of results from our experiments, as our manipulation only affected discounting when varying (anticipated) financial constraints. Moreover, we found additional support for this conclusion in an earlier experiment that showed no effect of financial scarcity on temporal discounting

valuable additional experimental paradigm for the field of financial scarcity research––a field that is still in the process of assembling a reliable toolkit to test its theory in the laboratory.

In the current research, we used a constrained version of the Household Task, meaning that participants had limited options of making financial decisions. For example, they were not able to work extra shifts to generate more income and could not decide to cut expenses or delay their payment. We chose such a constrained version of the paradigm to establish it as a strong and consistent manipulation of financial scarcity. An important advantage of the Household Task, however, lies in the flexibility of its design. The paradigm could easily be adapted for future studies to investigate a wide range of behavioral, cognitive, or emotional effects of financial scarcity. For example, building on longitudinal findings showing that financial scarcity and financial avoidance increase alongside each other (Hilbert et al., 2022b), one could investigate the underlying causal mechanism of this temporal association by giving participants the opportunity to avoid or delay the payments of their expenses within the Household Task. In addition, one could use various kinds of tasks as work shifts (i.e., effort tasks, cognitive tasks) and test whether the performance during these tasks is affected by financial scarcity. The experimental manipulation could also be adapted to test the effects of various economic stressors. For example, building on existing field studies showing that financial hardship reduces the effectiveness of job search (Gerards & Welters, 2022), one could manipulate job security or employment status and investigate this effect under laboratory control. In addition, one could manipulate the volatility of the expenses and study effects of economic uncertainty on household decision-making.

Last, future research could further investigate potential underlying mechanisms explaining the effect of financial scarcity on temporal discounting. Besides financial scarcity theory, financial problems might lead to a decreased connectedness with the future self (Hershfield & Bartels, 2018; Hershfield et al, 2011) or a constricted scope of reference (Frederickson, 2004), which might mediate the effect of financial scarcity on temporal discounting. A better understanding of the psychological mechanism underlying the effect of financial scarcity on temporal discounting might further inform researchers and policy makers for potential leverage points of policy interventions.

Conclusion

When having trouble to make ends meet, people experience financial scarcity. Here, we investigated whether this experience of financial scarcity increases temporal discounting. To do so, we developed an experimental paradigm that allows to study causal effects of financial scarcity in the context of problematic household finances. We found that when having household debts, temporal discounting increases, both for the discounting of gains and losses. We did not find evidence for increased discounting when inducing a scarcity mindset while keeping available resources positive (i.e.,

when participants made the discounting decisions after the "financial constraint was lifted". That is, participants first did the Household Task and then completed a discounting measure that was unrelated (this was also explicit in the instructions; see online materials on the OSF for working paper, open materials, open data and preregistration).

without debt) and constant between conditions. However, when experiencing scarcity and expecting to become indebted, discounting increased as well. Taken together, these findings suggest that the effect of financial scarcity on temporal discounting is based on a (rational) response to pressing financial concerns. When these concerns are resolved, the experience of scarcity does not seem to increase discounting.

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