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A first test of focusing theory

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Working Paper Series

A First Test of Focusing Theory

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A First Test of Focusing Theory*

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Abstract

Focusing theory hypothesizes a *bias toward concentration* according to which consumers prefer goods with one outstanding feature over those with several smaller sized upsides. In contrast to models of present-biased behavior, focusing theory prescribes also future-biased behavior if an option's future reward is particularly outstanding. Our laboratory experiment yields substantial support for the bias toward concentration and finds both present-biased and future-biased choices as predicted by focusing theory.

JEL Classification: D03, D11, D90

Keywords: Attention, Focusing, Rational choice.

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1 Introduction

In order to form a preference ordering between alternatives, their different dimensions have to be evaluated and traded-off. Kőszegi and Szeidl (2013) provide a model of attentional focusing according to which agents evaluate options *locally*, that is, based on their eye-catching dimensions. This assumption is supported by psychological evidence suggesting that a decision maker's attention is limited and thus attracted by outstanding choice features (Taylor and Thompson, 1982; Kahneman, 2011).

We test focusing theory (Kőszegi and Szeidl, 2013) in the context of inter-temporal decision making. Intertemporal decisions represent a major class of decision situations to be analyzed in economics and give rise to clearly defined choice dimensions—namely points in time where the available alternatives yield payoffs. According to Kőszegi and Szeidl (2013), a decision maker focuses on payments at such points in time where the payment differences between her available options are large, but rather neglects payments at points in time where these differences are small. Therefore, focusing predicts a *bias toward concentration* such that a decision maker chooses options with rather concentrated large advantages relative to alternatives with many small dispersed advantages. The more balanced a choice is, that is, the more similar the dispersion of the alternatives' advantages over the choice dimensions is, the more rational decisions are hypothesized to be made. In contrast, unbalanced decision situations (where the distribution of the advantages over the choice dimensions differs significantly among the alternatives) induce focusing effects and decision errors. As Kőszegi and Szeidl (2013) point out, many “lifestyles choices” such as exercise, harmful consumption, and consumption-savings fall into this category of unbalanced decision situations.

Thereby, focusing results in a new theory of intertemporal decision making which opposes the prevalent quasi-hyperbolic discounting model (Laibson, 1997) under certain circumstances. While the latter predicts present-biased choices in general, focusing predicts biased choices only in decision situations where the advantages' distribution is unbalanced among the alternatives. But in a sharp contrast to other discounting models, focusing theory prescribes future-biased choices if future rewards are sufficiently concentrated while alternative sooner rewards are dispersed.

Whether financial decisions are prone to focusing effects has important implications for the *framing* of actual financial contracts. Consider for instance an annuity agreement according to which a certain percentage of the wage is saved each month. Typically, at the retiring age the agent can either choose between a lump-sum payment and a monthly annuity. According to focusing, the framing of the expected savings may impact on the expected savings. While a rational agent may be indifferent between the annuity and the lump sum, the large lump sum is more appealing for the focused thinker. Therefore, a focused thinker may be willing to agree to a higher savings rate if the expected payout of an annuity contract is framed as a one-time payment. Thus, the frame may serve as an important nudge to induce higher savings rates. In order to assess the impact of this nudge, however, it is important to know whether focusing effects indeed impact on choices.

In this experimental study we test for a strong form of focusing effects, that is, whether focusing theory can explain violations of revealed preferences. We test for the focusing effect in two setups: in a present- and a future-bias frame. While our experiment involves intertemporal decisions, we remain agnostic about how subjects discount payouts at different points in time. As we employ a revealed preference approach, our elicitation of the focusing bias does not require any assumptions on the functional form of the subject's discounting function. We find that a substantial share of around half of our subjects violate revealed preferences as predicted by focusing theory.

Thereby, to the best of our knowledge, our study is the first to document the focusing bias in a controlled environment, leading to new insights in particular with respect intertemporal decision making. Focusing implies that agents do not have a present bias *per se*, but choices could be also future-biased. It is the asymmetry of decision situations which induces subjects to make suboptimal decisions.

2 The model

An agent chooses a monetary bundle $c = (c_0, \dots, c_{N-1})$ from a finite set $C \subset \mathbb{R}^N$ where c_0 gives c 's present payout and c_k denotes c 's payout k periods ahead. Suppose that for all $0 \leq k \leq N-1$ there is a strictly monotonically increasing utility function $u_k(\cdot) : \mathbb{R} \rightarrow \mathbb{R}$ which gives the utility

of a monetary Euro-payout k periods ahead.¹ Suppose that this utility is non-convex, $u_k(\cdot)'' \leq 0$,² and set $u_k(0) = 0$ for all k .

Rational choice. A rational agent maximizes her *consumption utility* $U(\cdot) : \mathbb{R}^N \rightarrow \mathbb{R}$ which is additively separable over points in time and given by

$$U(c) := \sum_{k=0}^{N-1} u_k(c_k).$$

Focusing. In contrast to rational choice, focusing theory (Kőszegi and Szeidl, 2013) hypothesizes that the valuation of an item $c \in C$ depends on the choice set C it is chosen from. We call an agent choosing in line with focusing theory a *focused thinker*. Instead of consumption utility, a focused thinker maximizes her *focus-weighted utility*

$$U(c|C) := \sum_{k=1}^N w_k u_k(c_k). \quad (1)$$

Factor w_k denotes the distorted decision weight a focused thinker assigns to dimension k and is defined by the following two assumptions.

A₁. $w_k := w(\Delta_k(C))$, where $\Delta_k(C) = \max_{c \in C} u_k(c_k) - \min_{c \in C} u_k(c_k)$ denotes the range of feasible utility along dimension k

A₂. $w(\cdot)$ is strictly increasing on $(0, \infty)$

The first assumption states that decision weights are range dependent. According to the second assumption, a focused thinker overweights a dimension in which her available options offer a particularly wide range of utilities. Essentially, focusing theory predicts a bias toward concentration according to which a local thinker overvalues concentrated compared to dispersed outcomes.

A decision situation with two options, each of which yields one payoff at one point in time, is balanced as both options' payouts are concentrated at one point in time. In such balanced

¹This utility function may include any form of discounting such as exponential or quasi-hyperbolic discounting.

²Non-convexity of monetary utility has been shown in many studies, such as Bernoulli (1954); Coombs and Komorita (1958); Wakker et al. (2007).

choice situations focusing effects do not distort choices: a focused thinker chooses the option which yields the higher consumption utility. Therefore, balanced choice situations allow to elicit a focused thinker’s true preference ranking.

Thus, we use balanced decision situations in order to elicit ordinal preferences between different payouts at different points in time. Taking a revealed preference approach, we construct an inferior option which a focused thinker is inclined to choose due to its concentrated benefit while the superior option has dispersed benefits.

3 Design

Our experimental approach is to—in a first phase—elicit time preferences in an environment where local thinking is aligned with rational choice while—in a second phase—we use these elicited time preferences to construct decision environments in which subjects according to the theory should exhibit a bias. In fact, in the first phase we use balanced choices for which focusing theory prescribes rational behavior, while in the second phase we use unbalanced decision situations for which attentional focusing predicts distorted choices.

First phase	Elicitation of switching points in multiple price lists
Second phase	Focusing decision
Control questions	Cognitive Reflection Test
	Memory
	Demographics

Table 1: Experimental schedule

3.1 The experiment

For half of the subjects we tested for present-biased choices as predicted by focusing (*Present Frame*), and for half of the subjects we tested for future-biased choices as predicted by focusing

(*Future Frame*). All payments are made via bank transfers.

First Stage. In the *Present Frame*, we elicited the largest amount of $x \in \{5.00; 5.50; \dots; 8.00\}$ Euro to be transferred today which is dominated by 8 Euro in one month. In the *Future Frame*, we elicited the largest amount of $x \in \{5.00; 5.50; \dots; 8.00\}$ Euro to be transferred in one month which is dominated by 8 Euro in two months.

Second Stage. We elicited for all subjects the smallest amount of $y \in \{5.00; 5.50; \dots; 10.00\}$ Euro in two months which is dominated by 5 Euro today.

Third Stage: Focusing question. We tested for the focusing bias in the present framing by asking subjects in the *present frame* if they preferred

(A.) Today $x + 5$ Euro or (B.) In one month 8 Euro and in two months $y + 0.50$ Euro.

and in the *future frame* if they preferred

(A.) Today 5 Euro and $x + 0.50$ Euro in one month or (B.) In two months $8 + y$ Euro.

Whoever opts for (A.) in the present frame violates her preferences revealed in the prior tasks as predicted by focusing. Whoever chooses the concentrated payout (B.) in two months in the future frame decides in line with local thinking, but forgoes surplus. We hypothesize that in both groups a significant share of subjects reveal the focusing bias, that is, we test the following Hypothesis.

Hypothesis. *A significant share of subjects in both groups opt for the inferior option which gives a concentrated reward.*

3.2 Controls and filler tasks

To enhance subjects' concentration on the decision making tasks, we included two filler tasks. After the first multiple price list task, subjects in each treatment had to count all "1"s in a binary code of 1,000 digits within six minutes. The closer the subject's result to the true value, the higher her resulting payment. The next filler task, in which eight trivia questions had to be answered, was set prior to the task that tests for the focusing bias.

In addition, we included two controls which we tested for after all the other tasks had been accomplished (the ordering of tasks is given in Table 1). In order to control for mental capabilities, we included the cognitive reflection test (CRT; see Frederick, 2005) which is highly correlated with the IQ as Toplak et al. (2011) and Frederick (2005) report. Furthermore, we tested for subjects' memory by repeating the second price list choice task in which subjects chose between 5 Euro today and an overall future sum of between 5 and 10 Euro. Here, subjects should match their decisions made during the first iteration of this task.

3.3 Incentivization

To avoid differences in the payment mechanism between the options, all sums were paid via bank transfers. All points in time mentioned throughout our experiment do not indicate the date on which the respective sum is received, but the date on which it is transferred to their bank account. To enhance our trustworthiness, we adopted the procedure by Andreoni and Sprenger (2012) and provided all subjects with the contact information (phone and email) of one of the authors (Riener) and encouraged them to contact him immediately if any payments were delayed. As Andreoni and Sprenger state, this invitation to inconvenience a professor was intended to boost confidence that future payments would arrive as promised.

One task is selected by the computer at random for payout. Each of the multiple price list tasks and the counting, trivia, memory and CRT tasks are chosen with an equal probability. Only this chosen task, the *payment task*, is paid. The multiple price list tasks are incentivized via the standard procedure that one line is randomly selected and the chosen option is paid at the indicated point in time. For the other tasks, correct answers are paid.

3.4 Implementation

The experiment was implemented at the DICE laboratory at the University of Düsseldorf in June 2014 and December 2015. In total, 89 student subjects—recruited via ORSEE (Greiner, 2004)—participated in the experiment. The experiment was programmed in z-Tree (Fischbacher, 2007). An average session lasted 45 minutes and the average payout was 9 Euros, with a minimum of 3 and a maximum of 16.50 Euros.

4 Results

First, we categorized subjects according to their answers in these three tasks as follows. A subject is “inconsistent” if she revealed more than one switching point in at least one of the multiple price list tasks. If a subject always opted for the earlier payout in at least one of the multiple price list tasks, then our procedure does not allow to construct the inferior option we need, such that we categorize her as “not classifiable” as—if present— we cannot identify the focusing bias for this subject. We find that three of the subjects behaved inconsistently and nine were not classifiable.

Frame	Present (n=43)	Future (n=46)	Total (n=89)
No focusing bias	44.2%	41.3%	42.7%
Focusing bias	46.5%	41.3%	43.8%
Not classifiable	7.0%	13.0%	10.1%
Inconsistent	2.3%	4.2%	3.4%

Note: This table shows subjects demonstrating the focusing bias in the present and in the future frame. There is no significant difference between the present and the future frame judging by a χ^2 -test, p-value=0.73, excluding subjects who are either inconsistent or not classifiable.

Table 2: Classification of choices in percentages

We find substantial evidence of the descriptive power of focusing theory for actual decisions (Table 2) as around 44 percent of the subjects reveal the focusing bias (test of probabilities, p-value <0.001). This confirms our Hypothesis.³

Since decisions in line with focusing violate one’s own revealed preferences, local thinkers commit real decision errors. We run robustness checks using linear regression models with the binary *Focusing bias* as the dependent variable to control for cognitive ability via the CRT and for gender. We included three binary variables CRT-1, CRT-2, and CRT-3 indicating whether the

³According to task “Memory”, subjects can on average correctly remember 10.76 out of their 11 decisions, which indicates that subjects’ choices were deliberate and which therefore is a strong support for our revealed preference approach.

	(1)	(2)	(3)	(4)
	Focusing bias	Focusing bias	Focusing bias	Focusing bias
Future frame	-0.0391 (0.115)		-0.0310 (0.115)	0.0368 (0.175)
Female		0.0915 (0.115)	0.0931 (0.116)	0.159 (0.172)
Future × Female				-0.128 (0.240)
CRT-1		0.0158 (0.152)	0.0166 (0.154)	-0.00203 (0.160)
CRT-2		-0.108 (0.150)	-0.111 (0.150)	-0.125 (0.154)
CRT-3		-0.293* (0.174)	-0.289 (0.176)	-0.316* (0.176)
Constant	0.526*** (0.0821)	0.524*** (0.108)	0.539*** (0.122)	0.517*** (0.130)
Observations	77	77	77	77

Note: This table reports the linear probability model with having the focusing bias is the dependent variable. The sample includes only subjects who are classifiable and showed a consistent behavior. Robust standard errors are reported in parenthesis. * $p < .10$, ** $p < .05$, *** $p < .01$

Table 3: Linear probability model: Focusing vs. rational choice

subject answered one, two or three CRT-questions correctly. Column (1) of Table 3 corroborates our previous observation that there is no significant difference between the present and the future frame. In column (2) we report a weakly significant negative relationship between the results of the cognitive reflection test and the focusing bias. Scoring the highest score of three is related to a 30 percentage point decrease in the susceptibility to the focusing bias. The size of the coefficients remains when controlling for the future frame (Column (3)) and the interaction of the future frame with gender (Column (4)). This is in line with the findings by Oechssler et al. (2009) who find a relationship between cognitive biases and cognitive skills.

5 Conclusion

We find substantial support for focusing theory (Kőszegi and Szeidl, 2013) in intertemporal choices. A large share of subjects violate their revealed preferences in a manner which is consistent with focusing. We find weak evidence that this bias reduces with cognitive ability as measured by the cognitive reflection test.

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A Instructions

Here, we provide the instructions of the basic treatment and a representative screenshot.

Information regarding the experiment

Important: You need your bank account details! Otherwise you cannot participate in this experiment, unfortunately!

Welcome to this experimental study. Please note that you are not allowed to talk to other participants during the whole experiment. Please do not make use of additional informational devices like the internet or your cell phone during the duration of the experiment.

You have to do **7 different tasks** during the experiment. You have **an incentive to answer all questions honestly** since every single decision could affect your payment at the end of the experiment!

After finishing all tasks, at the end of the experiment one task will be chosen **randomly**; this task will be your **payment task**. Your answers in this task exclusively determine your payment. Answers given in tasks other than the payment task do not affect your payment at all. All tasks obtain the same probability of being chosen as the payment task. Since you are not able to influence which task will be chosen, you have got an incentive to answer all questions as well and honestly as possible.

How you will be rewarded for each task, will be declared within the task description on the screen. None of your decisions is negotiable afterwards, all of your decisions are **binding**.

In any case you receive a show-up fee of **1 euro today and 1 euro in exactly one month** by bank transfer. Therefore, we need your bank account details. The payment task will be rewarded by bank transfer as well. Independent of the possible additional payments due to the payment task, you receive the show-up fee of two times 1 euro (today and in one month) definitely via two separate bank transfers.

Depending on the task chosen to be paid and how you decide within this task the amounts which will be transferred to your bank account at these two dates can increase.

We **guarantee** to handle your personal bank account details confidentially and **transfer the amount when due**. Please immediately contact Jun. Prof. Dr. Gerhard Riener (0211-81-10252 or riener@dice.hhu.de) if problems regarding the bank transfers arise.

Please note the **time display in the upper right-hand corner of the screen** during the experiment. Please answer all questions **within the given time**. If not all questions are answered, it could be that you will not earn anything in the particular task: for some tasks once the time is over you will automatically be moved onto the next task. You cannot get to the screen with the next task until all participants have accomplished the last one and clicked the OK-button.

If you have a question, you can appeal to the experimenter at any time. Raise your hand and we will come to your desk and answer your question personally.

After the end of the experiment, please remain seated at your desk till you are called.

Good Luck!

Figure 1: Translated instructions for the experiment

Task 1

Please decide what you prefer. Please make a decision in EACH line. This means that you are asked to make 11 decisions in this task. If this task is your payment task, then one of your following 11 decisions is randomly selected. According to your decision, we will transfer then either

9 Euro today

or

the respective sum in one month punctually on your bank account.

Today	In one month
5,00 Euro €	5,00 Euro
5,00 Euro €	5,50 Euro
5,00 Euro €	6,00 Euro
5,00 Euro €	6,50 Euro
5,00 Euro €	7,00 Euro
5,00 Euro €	7,50 Euro
5,00 Euro €	8,00 Euro
5,00 Euro €	8,50 Euro
5,00 Euro €	9,00 Euro
5,00 Euro €	9,50 Euro
5,00 Euro €	10,00 Euro

OK

Figure 2: A translated screen-shot including the instructions for task 1.