Turning-on Dimensional Prominence in Decision Making: Experiments and a Model*

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Abstract

We experimentally show how slightly modifying a single dimension of one alternative in a manner that makes the dimension more explicit and hence more salient, alters participants' evaluation of the entire choice set. In one study, social preferences over two unequal allocations reverse, depending on whether a third available allocation is equal or unequal. We suggest that when all three options are unequal, the most prominent dimension for choice is efficiency. However, in the presence of an absolutely equal allocation egalitarian considerations are highlighted and this shifts preferences toward equality even when expressed over unequal splits. Such *turning-on* of a dimension in one's mind is shown to play a similar role in two more studies conducted in different environments. Motivated by these findings we propose the Turned-on-Dimensions (ToD) procedure, which draws on ideas raised in models of focusing and salience by Kőszegi and Szeidl (2012) and Bordalo et al. (2013), and modifies them in a manner which allows to accommodate our findings. We further support our suggested psychological procedure by analyzing participants' explanations of their choices.

Keywords: Salience, Dimension, Experiment, Social Preferences, Uncertainty, Investment.
JEL Codes: D03, C91.

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1 Introduction

Imagine elections are to be held in your country next year and there are two candidates in the race, L and R. There are no major ideological differences between them and given that you identify more with the right wing, you plan on voting for candidate R who leans slightly to the right. Later on, a third candidate joins the race. She is inexperienced and her main agenda and focus are on environmental topics and green energy. In your opinion, experience is key for running for office, so you do not seriously consider voting for her. Nonetheless, her agenda turned your focus towards environment-related issues and you now place more weight on them. You realize that candidate L better reflects your views on these topics than R, and on election day, you vote L.

How did the inexperienced, practically irrelevant candidate reverse your preference between L and R? We suggest that she tilted the weights of different dimensions of the choice problem. By explicitly pushing forward the environmental issues, she increased their prominence at the expense of other dimensions, leading to the preference reversal. This example illustrates how a seemingly irrelevant change in the choice set, may lead to major shifts in a dimension's prominence in the decision process. As a result, preference reversals over other available options may emerge, very much like in the *context effects* literature. In this literature, the addition of, say, a dominated or extreme alternative to the choice set, affects the relative subjective ranking of other alternatives in the set (Tversky, 1972; Huber et al., 1982; Simonson, 1989; Tversky and Simonson, 1993).

In this paper we introduce, experimentally and formally, a novel channel for generating context effects. We name it: *turning-on dimensions*, by which we mean making a dimension explicit and obvious to the decision maker. In the voting example this was done by the new candidate who put an emphasis on topics that were not pronounced earlier. In our studies we do so by modifying one alternative in a manner that puts an emphasis on one of its dimensions, for example, by changing the way it is framed or by slightly altering one of its features. We suggest that doing so generates the following psychological procedure: First, it increases that dimension's salience and pushes it to the forefront of the decision process. This, in turn, increases the relative subjective weight of that dimension at the expense of other dimensions. Finally, all alternatives are evaluated with the new dimensional weights. As a result, even unchanged alternatives may seem subjectively better due to their performance on the now more important dimension (as candidate L did on the environmental topics) and lead to preference reversals. We argue that this behavioral preference shift is predictable and carries important welfare implications.

Our suggested channel for context effects shares commonalities with the experimental literature on salience and focusing in decision making (Taylor and Thompson, 1982; Schkade and Kahneman, 1998). As in that literature, we show that once a dimension becomes more salient, it changes individuals' evaluations and perceptions. However, we differ from that literature in the manner in which salience is switched on. In the salience and focusing literature, for example, when attention is drawn to a particular aspect of life prior to the

evaluation of life satisfaction, this aspect tends to receive higher weight in the subsequent evaluation. Our salience shift is more subtle, and is generated through changes applied to the choice set itself: Slightly tweaking an existing alternative's dimension generates discontinuous large effects on decision weights and choices. We move further away from this literature by examining the manner in which a salience shift affects participants' final choices (rather than general perceptions and evaluations).

Salience has recently been introduced into economic models of decision making. Bordalo et al. (2012) discuss salience under risk and later expand to riskless consumer environments (Bordalo et al., 2013) while Kőszegi and Szeidl (2012) develop a model of consumer choice that is formally closest to the procedure we suggest in this work (in fact, we build on their approach when we lay out the model). The main difference between our approach and the above models lies in the feature that underlies salience. In Kőszegi and Szeidl (2012), roughly speaking, a dimension's salience depends on its variance in the choice set. In Bordalo et al. (2012) each alternative may have its own salient dimension depending on the distance of that dimension's value from its mean in the set. In the model we suggest, a dimension's salience is determined by the share of options in which it is turned-on compared to other turned-on dimensions.

We dub our decision process the ToD (Turned-on Dimensions) procedure, and provide experimental evidence supporting it from three different choice contexts: social preferences, choice under uncertainty and investments. To gain deeper insight into the decision making considerations, we not only examine final choices, but also detect evidence of dimensional prominence by thoroughly analyzing participants' explanations. Finally, we formally lay out the ToD model that draws on the existing models of salience mentioned above and discuss how it complements them in light of our experimental findings.

In our first study, participants are asked to rank three monetary allocations that will be paid out to them and to another participant. Using a between subject design, we examine choice in two treatments, named *equal* and *unequal*, that differ only in the first allocation. In the *equal* treatment, participants face the following allocations: *a.* $(100, 100)$, *b.* $(100, 140)$, and *c.* $(100, 160)$, where a pair (x, y) stands for x Israeli Shekels (ILS) for the subject and y ILS for another anonymous subject. In the *unequal* treatment allocation a becomes an unequal $(100, 130)$ split while allocations b and c remain unchanged.

The change we introduce to the choice set should carry no consequences on the relative ranking of b and c if participants hold stable preferences over alternatives. However, we find that a significantly higher proportion of participants rank b over c in the *equal* treatment compared to the *unequal* treatment. Our analysis of participants' explanations provide evidence of higher weighting of the equality dimension in the presence of the all-equal (100,100) allocation. The efficiency dimension, on the other hand, is a far more frequent consideration in the *unequal* treatment. Taken together, the findings show that the presence of the $(100, 100)$ allocation turns-on egalitarian considerations and shifts preferences in the direction of more equal allocations. Notice that replacing $(100, 100)$ with $(100, 130)$ decreases the variance of both the egalitarian and the efficiency criterion in the choice set.

Thus, salience which is determined by variance a-la Kőszegi and Szeidl (2012) and Bordalo et al. (2013) would not generate clear-cut behavioral predictions in this set-up. The ToD procedure, however, is able to predict our findings due to the turning-on of the egalitarian criterion and its consequent discontinuous shift of criteria weights.[1]

Our main insight from this study is that changing an alternative in a way that emphasizes a specific criterion can lead to a shift of weights and result in preference reversals. In our second study, we examine whether weights can be shifted without actually changing the choice set, i.e., by framing alone. We test this hypothesis in the realm of uncertainty. In the first treatment, participants are asked to choose one of the following three alternatives:

- Lottery A: 60 ILS for sure + an additional 35 ILS with a 14% chance.
- Lottery B: 50% chance of winning 40 ILS and 50% chance of winning 95 ILS.
- Bet C: If the Dow- Jones Index drops tomorrow, you win 30 ILS; otherwise, you win 115 ILS.

In the second treatment participants face the exact same alternatives except for the framing of the first lottery:

- Lottery A': 86% chance of winning 60 ILS and 14% chance of winning 95 ILS.

We find that in the first treatment a large share of participants choose Lottery A that mentions the sure gain of 60 (we will also refer to it as the *60-for-sure-option*). By contrast, in the second treatment, framed as Lottery A', its share is significantly lower while the share of Lottery B increases by the same magnitude. Combining this choice pattern with the explanations provided by our participants we suggest that when the first option is framed more like a standard lottery (A'), the "lottery-like features" are more salient in the choice problem and, on their account, Lottery B is often fancied as it has a higher expected value than A' and a larger probability of generating the high 95 prize. However, framed as the 60-for-sure-option, the "sure gain" dimension is much more pronounced and gives Lottery A an edge in the overall assessment. Importantly, the share of participants who choose Bet C (which does not have specified probabilities) is almost unchanged across treatments, suggesting that the effect is indeed due to a shift of weight from the "sure gain" dimension highlighted in the frame of the 60-for-sure-option to the lottery features of A' and B.

In two additional treatments we let participants choose between Lottery A and Bet C or between Lottery A' and Bet C, and find that in these binary choice sets Lottery A' is chosen more frequently than A. In other words, Lottery A' is revealed as a (weakly) better

[1] Throughout the paper we use the words "dimension", "feature" and "criterion" when referring to an aspect of the alternatives in the choice set. When all aspects are clearly spelled out and available to the decision maker and outside analyst, as in Kőszegi and Szeidl (2012) and Bordalo et al. (2013), we refer to them as attributes.

option than the 60-for-sure-option (A) in the absence of B, suggesting that its intrinsic value is at least as high as the intrinsic value of A. Why then, does it receive a lower share of choices when B is present? We suggest this is due to the explicit "turn-on" of the lottery features in the framing of Lottery A' that consequently receive more weight in the evaluation of the entire choice set. On the one hand, it pushes its utility upwards and when the only other option is Bet C, this translates into a higher share of choices. On the other hand, Lottery B, when present, reaps benefits from the larger weight placed on the lottery features at the expense of A'.

We gain two insights from this study. The first is that framing alone may shift criteria weighting. The second is that this effect is strong: not only do we find evidence of different weights but these also affect the choice distributions in a manner that seems to go beyond intrinsic utility considerations. This raises the question: *How* strong is this effect? For example, can one highlight a criterion in a way that will lead people to make choices that violate the basic premise of monotonicity, i.e., that *more is better*?

In our final study we give an affirmative answer to this question in a hypothetical scenario of a real-life choice problem. Our aim is twofold: To show that the effect is meaningful in magnitude and, at the same time, give an example of its policy implications. Participants are asked to imagine that they are about to receive a bonus from their employer and to choose one of three payment options, namely whether the money is to be deposited into: Their checking account, a savings plan that generates 4% annual interest, or a stock that has a probability of 0.5 of going up (and earning 14%) or down (and losing 5%). In the first treatment the checking account pays no interest, while in the second it generates an annual interest of 2%. Standard monotonicity, as well as the focusing and salience models (Kőszegi and Szeidl, 2012; Bordalo et al., 2013), predict that changing the interest rate of the checking account from 0% to 2% would (weakly) increase its choice share.

Contrary to the standard monotonicity assumption, we find that a smaller percentage of participants choose the checking account when it pays a 2% interest rate. This drop in choice share translates into a larger share of participants choosing the savings plan, but does not affect the share of participants who choose the stock. Analyzing participants explanations, we find support for our hypothesized ToD procedure: when the checking carries no interest, liquidity stands out and carries greater weight in the decision process, leading a substantial percentage of participants to choose the checking account. By contrast, when the checking account generates positive interest, the liquidity dimension is shrouded while the "safe gain" dimension is more pronounced, leading to a higher evaluation of the savings plan, which entails a higher safe gain. As the checking account is clearly enhanced when a bank attaches to it a positive interest rate, this apparent violation of monotonicity carries policy implications. It sheds light on an important, yet unknown, channel through which checking accounts' interest rates may affect investment behavior. Specifically, it suggests that by introducing positive interest rates to checking accounts, banks may increase safe investments, such as bonds and CDs, and lead, counterintuitively, to a reduction in checking account balances.

The paper proceeds as follows: In Section 2, we describe the experimental studies in detail followed by the results. Section 3 outlines the ToD model while Section 4 illustrates how it accommodates the experimental findings. In Section 5, we discuss other models and approaches that are only partially in line with our findings, with a special emphasis on the comparison between the models of focusing and salience and the ToD procedure. We also describe related experimental evidence. Section 6 concludes.

2 Experimental Studies

Study 1: Social Preferences in the Presence of an Equal Split

Participants in this study were 393 registered panelists, who regularly participate in online questionnaires, and constitute a representative sample of the Israeli adult population. Their age range was 18 - 65 and roughly 50% were female. A link to the questionnaire, which included only two simple questions (actually one question and a free text explanation for their answer), was sent out and those who completed it, did so in about 3 minutes and received a participation fee of 3 ILS (roughly \$0.9). In addition, it was explained in the instructions that 5% of the participants would be randomly selected to receive additional payoffs according to their answers. Participants were randomly assigned to one of two treatments, named *unequal* ($n = 194$) and *equal* ($n = 199$). Both treatments described a situation in which the participant was chosen, alongside another anonymous participant, to receive payment and was asked to determine the exact payment each of them will receive. It was explicitly mentioned that the identity of the other participant would not be disclosed. The complete questionnaire appears in the Appendix.

Table I shows the different options that were available in each treatment.[2] Options b and c are unequal splits that are identical in both treatments, and option a is different: an equal split in one treatment and an unequal split in the other. In each treatment, participants were asked to rank the options from their most preferred to the least preferred. Notice that standard preferences that do not depend on context predict the relative ranking of b and c to be unaltered across treatments. By contrast, according to our suggested ToD procedure, the presence of the equal split in the *equal* treatment will increase the prominence of the equality criterion and lead a larger proportion of participants to rank option b over c compared to the *unequal* treatment.

In order to incentivize the full ranking, the instructions explained that if the participant is drawn to receive payment, there is a 60% chance that their most preferred option will be implemented and a 40% chance that it will be their second most preferred option. Upon completion of the study, 20 participants were randomly drawn and received payments accordingly. Finally, participants were asked to provide a brief explanation for their ranking.

[2]To control for order effects, each treatment had two opposing orders of the three options. To avoid confusion, we kept an increasing or decreasing order (in the other participant's payoff).

Options	Equal	Unequal
a	(100,100)	(100,130)
b	(100,140)	(100,140)
c	(100,160)	(100,160)

Table I: Monetary payments by treatment in Study 1. A pair (x, y) represents a payment of x ILS to the participant himself, and y ILS to the other participant (at the time of the study 100 ILS were roughly equal to $30).

Study 1: Results

Our main interest is in the relative ranking of options b and c across the two treatments. Ranking b above c reflects a stronger emphasis on equality while the opposite ranking is in line with efficiency considerations. Notice that one does not sacrifice his own payoff by increasing the other (anonymous) person's payoff.[3] We therefore expected most participants in both treatments to rank the outcome with the highest sum of payoffs, $[100, 160]$, on top, which indeed was the case. Nonetheless, we examine the difference in rankings across treatments and its relation to the nature of option a. In the *unequal* treatment only 18% rank b over c. In the *equal* treatment this percentage rises to 32%. This difference of 14% is significant according to Pearson's chi-squared test (p=0.002). In a probit regression reported in Table II we control for the order of the alternatives and find a significant effect of the the *unequal* treatment on ranking b over c and no effect for the order. The treatment effect amounts to a decrease of 14% in the likelihood of ranking b over c when the [100,100] allocation is replaced with [100,130].[4]

Next, we look to gain insight into the underlying psychological procedure leading to these marked differences. In order to do so, we analyze the explanations that were provided by the participants for the ranking they chose. For this purpose, we prepared a list of categories of relevant criteria after reading the explanations ourselves. Then, three research assistants independently classified explanations into these categories (one explanation could fit into a number of categories). After their initial independent classifications, we determined the final classification by majority rule. While classifications were made separately and independently by each RA, unanimous classifications occurred for the vast majority of cases.[5] If, as we expect, the equality criterion (including minimizing inequality) is weighted more heavily in the *equal* treatment, it should be mentioned more often in the explanations compared to the other treatment. Similarly, we expect the efficiency criterion

[3] In fact, efficiency considerations in this set-up go hand in hand with altruistic motives. When we refer to efficiency in the discussion and in the participants' explanation analysis, we include all psychological forces supporting a larger payment to the other participant without hurting one's own payment.

[4] 92% of the rankings were monotone, i.e., from the most efficient allocation to the most equal (70%) or vice versa (22%).

[5] In this study, their classifications were aligned along 91% of possible entries. In the second and third studies, unanimous agreement was reached along 84% and 85% of the entries, respectively.

Table II: Marginal effects on the probability of ranking b over c

Variable	**Marginal Effect**
Unequal treatment	-0.14***
	(0.002)
reverse order	0.01
	(0.831)
cons	-0.928***
	(0.000)
N	393
R^2	0.024

$^{***}p < 0.01$, $^{*}p < 0.1$

to be more prominent in the *unequal* treatment because it is not shrouded by the equality criterion. Figure I summarizes our analysis of participants' explanations and shows that, indeed, equality is mentioned more frequently in the presence of the $[100, 100]$ split while efficiency is more prominent in its absence.[6]

Study 2: The Framing of a Lottery in the Realm of Uncertainty

Participants in this study consisted of 243 undergraduate students from various fields in Tel Aviv University, who are registered in the IDMlab of the Coller School of Management. Their age range was 21-30, and roughly 50% were female. The questionnaire consisted of two straightforward questions and the average completion time was about 5 minutes. As in Study 1, participants were sent a link to the questionnaire and were asked to choose between two or three options, depending on the treatment, and provide a brief explanation of their choice. Participants were randomly assigned to one of four treatments (roughly 60 participants in each), named *certain(2)*, *certain(3)*, *lottery(2)*, and *lottery(3)*, and were instructed that 5% of them would be randomly selected to receive a prize according to their choice. Table III summarizes the options in our main treatments: *certain(3)* and *lottery(3)*. The complete questionnaire appears in the Appendix.

Participants in *certain(3)* and *lottery(3)* face the exact same choice problems with one difference: in the former the first option is framed as a sure gain plus a potential "bonus," whereas in the latter, the first option is framed as a state contingent lottery (probabilities and prizes) as is option B. Therefore lottery-like features are more likely

[6] Text analysis, unlike actual choice distributions, is open for different interpretations and classifications. We therefore view the patterns arising from it as suggestive of the underlying process rather than evidence of it. Given this point of view, in this study and the ones to follow, we follow the "eyeball metric" when referring to the text analysis and do not examine it with any statistical tools.

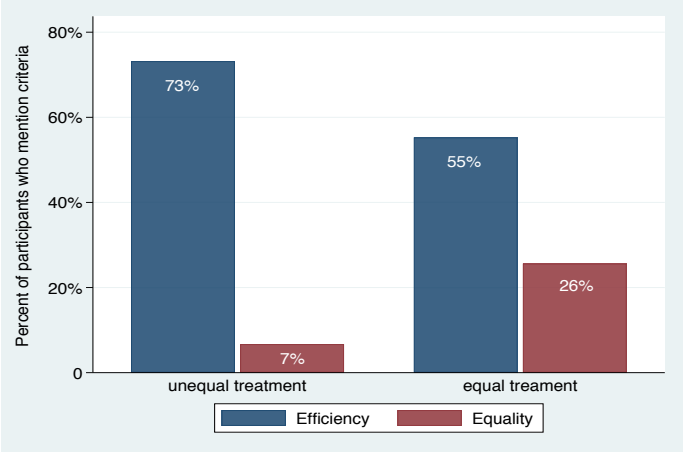


Figure I: Criteria mentioned per treatment in Study 1.

to come to participants' minds in *lottery(3)*, while thoughts about sure gains are more likely to show up in *certain(3)*. According to the ToD procedure, this change of frame is expected to shift weights in the evaluation of the entire set from the sure-gain dimension highlighted in *certain(3)* to the lottery features highlighted in *lottery(3)*. As a result, we expect that option B, which does relatively well along some lottery features - has a higher expected value and a relatively high known probability of delivering the large prize of 95 - will receive a higher share in *lottery(3)* compared to *certain(3)*.

To further investigate ToD in this context, we turn to the *lottery(2)* and *certain(2)* treatments. These are the same as *lottery(3)* and *certain(3)*, respectively, except for the fact that option B (the 50:50 lottery) is absent. Hence the difference in the criteria weighting should be in the same direction as in the main treatments but, in the absence of B, we do not expect the share of the first option to necessarily decrease. The reason is that the lottery features, which have been "turned-on" in option A', are not shared by other alternatives in the set. Thus, no other option, except for A', will gain from the larger weight given to these features, in contrast to our main treatments where option B does exactly that: it gains from the larger weight placed on the lottery features due to the framing of A'. This leads to our completed hypothesis, which states that the first option will lose more share by moving from the certain framing to the lottery framing when option B is present than when it is absent.

Study 2: Results

A probit model is estimated to test if the treatment has an effect on the likelihood of the first lottery (presented as A of A') to be chosen. The probability that the first lottery is chosen is modeled as $\Phi(\tilde{Y})$ where Φ is the CDF of the standard normal distribution and

Options	***Certain(3)***	***Lottery(3)***
$A(A')$	60 for sure + 35 with prob. 0.14	(0.86,60 ; 0.14,95)
B	(0.5,40 ; 0.5,95)	(0.5,40 ; 0.5,95)
C	Dow-J (30,115)	Dow-J (30,115)

Table III: Options by Treatment in Study 2. A lottery with known probabilities is described by $(p, x; 1-p, y)$, i.e., probability p of winning x ILS and probability $1-p$ of winning y. A bet denoted by Dow-J (x, y) is a bet that pays x ILS if the Dow-Jones index goes up the following day and y if it goes down. (We use the term *lottery* to describe contingent claims where probabilities are objective and known to the decision maker, and *bet* for claims with unspecified probabilities).

$\tilde{Y}$ is specified as follows:

$$\tilde{Y}_i \quad = \quad \beta_1 lottery(2)_i + \beta_2 certain(3)_i + \beta_3 lottery(3)_i + \epsilon_i,$$

where $lottery(j)_i,\ j = 2, 3$ is a dummy variable that equals 1 if subject i participated in treatment *lottery(j)*, $certain(3)_i$ is a dummy variable that equals 1 if subject i participated in treatment $certain(3)$ and ϵ is an error term. The benchmark treatment is taken to be *certain(2)* where participants choose between option A, framed as a "sure gain" plus a possible bonus, and the Dow-Jones bet. Coefficient β_1 measures the net effect of framing option A as A', while β_2 measures the effect of adding option B to the choice set without changing the frame, i.e., moving from a doubleton set (without B) to a triplet (including B). Coefficient β_3 is our main coefficient of interest - the interaction coefficient. It measures the effect of changing the frame, and adding B to the set. Formally, our main hypothesis is that $\beta_3 < 0$.

Our full results are summarized in Table IV. Our hypothesis is confirmed by the data as $\beta_3 = -0.35$ (p=0.004). In addition, β_2 is not significantly different from 0, and β_1 is positive, evidence of the fact that adding option B without changing the frame, or changing the frame without adding option B, does not negatively impact the frequency of choosing the first option. It is only the combination of the two that increases the choice frequency of B at the expense of A'. Figure II gives another perspective of the same effect: 60% of the participants choose the first option in *certain(3)* while only 42% do so in *lottery(3)*. This significant reduction (p=0.048, chi-squared test) translates into an increase in the choice share of Lottery B (an increase of 14%, p=0.044) but does not significantly change the percentage of participants who choose to bet on the Dow Jones (p=0.692). This increase in the choice share of B arises despite the fact that A' is more popular than A when compared to C alone (76% choose A' in *lottery(2)* compared to 60% that choose A in *certain(2)*).

Further support is given in Figure III. It segments the data by analyzing participants' explanations in a way that is analogous to our examination of explanations in Study 1. In panel IIIa, we see that participants in the *certain(3)* treatment mention certainty far

Table IV: Marginal effects on the probability of choosing the first option in Study 2

Variable	**Marginal Effect**
lottery(2)	0.177*
	(0.053)
certain(3)	-0.003
	(0.97)
lottery(3)	-0.35***
	(0.004)
cons	0.25
	(0.122)
N	243
R^2	0.046

$^{***}p < 0.01$, $^{*}p < 0.1$

more frequently than participants in the *lottery(3)* treatment (53% compared to 19%), while the prevalence of lottery features in the explanations is reversed (35% compared to 73%). In panel IIIb the same pattern is reported for the treatments *certain(2)* and *lottery(2)*.[7] While the two panels show the same pattern of prominence shift due to framing, they lead the first option to be chosen less only in the presence of option B but not in its absence. Thus, turning-on its lottery features, made the first option perform weakly better compared to an option which is a bet with unknown probabilities. However, when option B was available, the larger prominence of these features due to the lottery framing led participants to choose B at the expense of the first option.

Study 3: The Improvement of a Checking Account in Investment Decisions.

Our last study is hypothetical, and pertains to an important scenario that is quite common in real life. We examine the effect of adding a positive interest rate to the checking account on individuals' investment decisions. Participants were 201 registered panelists who received 5 ILS for completing the questionnaire (the demographic details are similar to Study 1). It took participants on average 4 minutes to complete 2 questions, each followed by a free text explanation of their answers. Each participant was asked to imagine she/he is an employee in a firm and is about to receive a new year's bonus of 10,000 ILS. Then

[7] Certainty was a relatively straightforward category to specify for classifications to be made by the RAs, as efficiency and equality were in the previous study. Lottery features, on the other hand, is a category which incorporates various attributes of lotteries. We specified this category to contain explanations referring to expected values, variance and considerations of known probabilities (as opposed to unknown probabilities) to obtain a particular prize.

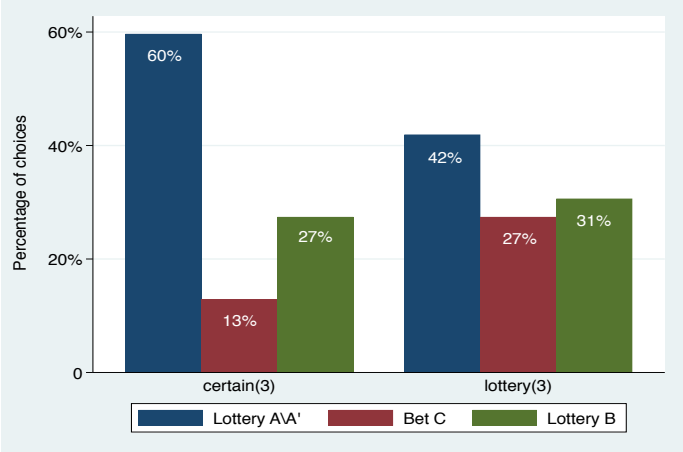
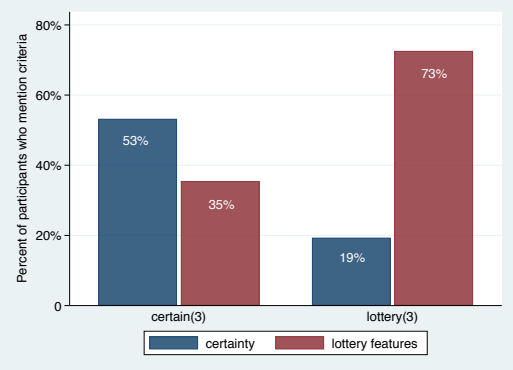
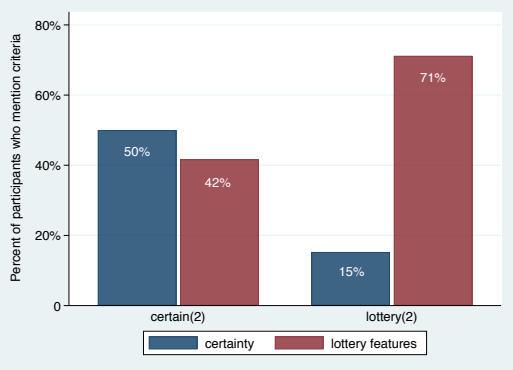


Figure II: Choice percentages of each option in *certain(3)* and *lottery(3)* in Study 2.



(a) Treatments *certain(3)* and *lottery(3)*



(b) Treatments *certain(2)* and *lottery(2)*

Figure III: Criteria mentioned per treatment in Study 2.

they were asked to choose one of the following options to which the employer will transfer the money:

- Their checking account.
- A savings plan that generates 4% yearly interest.
- A stock that has a 50:50 chance of going up (and earn 14%) or down (and lose 5%).

Participants were randomly assigned to one of two treatments. In the *2-checking* treatment ($n = 103$), the checking account paid a 2% yearly interest rate. In the *0-checking* treatment ($n = 98$), the checking account earned no interest. All three options were explained in detail, including withdrawal options and renewal terms, and in the most realistic fashion. The savings plan allowed weekly withdrawal options while the stock could be sold anytime. It was also stated that early withdrawal from the savings plan or the stock required a phone call or a visit to the bank (the full questionnaire is available in the Appendix). Following their choice and the explanation they provided for it, in the next question, participants were asked to imagine the same scenario, except that this time around they could choose the proportion of the bonus that they wanted to allocate to each option (so that they summed up to 100%). We also ran the same study (with minor wording changes) with an enhanced checking account that had only a "tiny" yearly interest of 0.1%. That is, in this "tiny interest study" one treatment had a 0% checking account, a savings plan and a stock (the exact same options as in the *0-checking* treatment reported above) whereas the other treatment had a 0.1% checking account alongside the same savings plan and the same stock. The results are very similar to those reported below and are therefore omitted.

Study 3: Results

Standard consumer theory would predict a weakly higher share of participants choosing the checking account when it earns positive interest due to preference monotonicity. However, counterintuitively, the checking account is actually chosen less often when presented with an interest rate. As shown in Figure IV, 23% of the participants chose the checking account with zero interest while only 11% did so when it generated a 2% interest (p=0.016, chi-squared test). This significant reduction translates into an increase in the share of participants who chose the savings plan (an increase of 15%, p=0.044), but does not change the percentage of participants who chose the stock (p=0.835). Interestingly, even the two models of salience mentioned earlier (Kőszegi and Szeidl, 2012; Bordalo et al., 2013) are unable to explain this choice pattern. Notice that increasing the interest rate of the checking account from 0% to 2% reduces the variance of the safe interest rate in the choice set. According to Kőszegi and Szeidl (2012), this dimension now becomes less salient and receives smaller decision weights. As a result, their model predicts the savings plan to

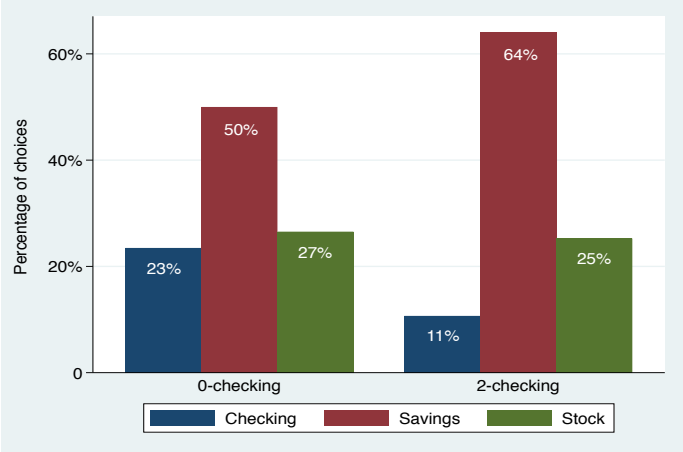


Figure IV: Choice percentages of each investment per treatment in Study 3.

be chosen less frequently while the other, more liquid options, should gain popularity at its expense (especially the checking account which has been enhanced).[8]

The results of the second question, where participants were asked to state the proportion of the bonus for each option, give further support to this pattern. Comparing the distribution (and averages) of allocations of each of the options across treatments, we find lower proportions allocated to the checking account in the enhanced checking treatment compared to the no-interest checking. This can be viewed in Figure V which shows the cumulative distribution of allocations to the checking account across treatments. The Figure shows that the CDF of allocations to the checking account in the *0-checking* treatment first order stochastically dominates the CDF of the allocations to the checking account in the *2-checking*. The two distributions are statistically different from each other (p=0.016 according to a two sample t-test). The effect of higher proportions of the bonus allocated to the savings plan in the enhanced checking treatment are also documented (p=0.045), as well as no effect on allocations to the stock across the two treatment (p=0.95) (Figures VI and VII, respectively).

Finally, as in the previous studies, we look into participants' explanations of their choices in the first question to give a more complete picture of the decision-making process. In Figure VIII we see that participants refer to liquidity more often in the *0-checking* treatment while safe gains are alluded to more frequently in the *2-checking* treatment. Once again, the emerging pattern is well explained by the ToD procedure. When the

[8] According to Bordalo et al. (2013), increasing the interest rate would reduce the distance of the savings plan's interest rate from the average safe interest rate and hence this dimension would become less salient in the evaluation of the savings plan. It should therefore be chosen (weakly) less. At the same time, the lower interest rate of the checking account would be more pronounced when it is 0 hence it should be chosen less in the *0-checking* treatment (once again "pushing" choices in a direction which contradicts our findings).

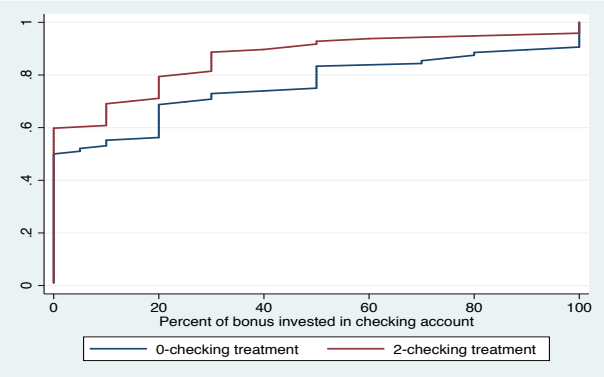


Figure V: CDF of allocation to the checking account per treatment in Study 3.

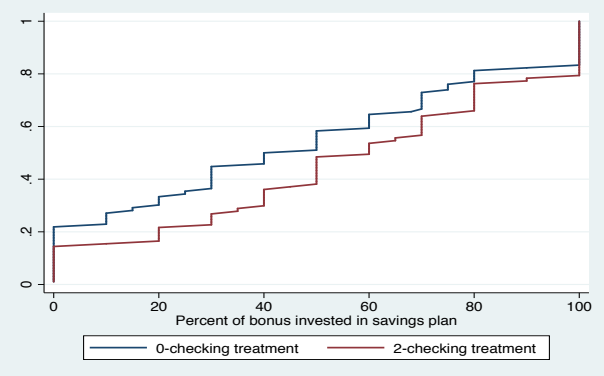


Figure VI: CDF of allocation to the savings plan per treatment in Study 3.

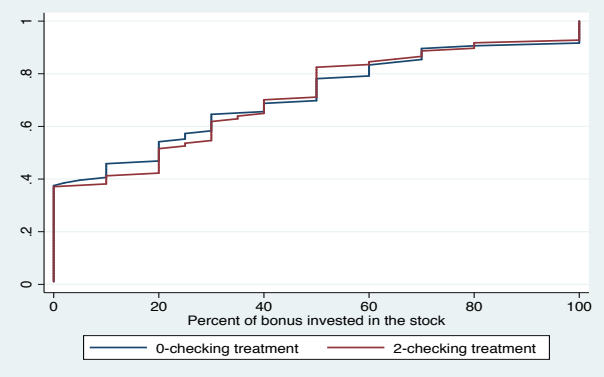


Figure VII: CDF of allocation to the stock per treatment in Study 3.

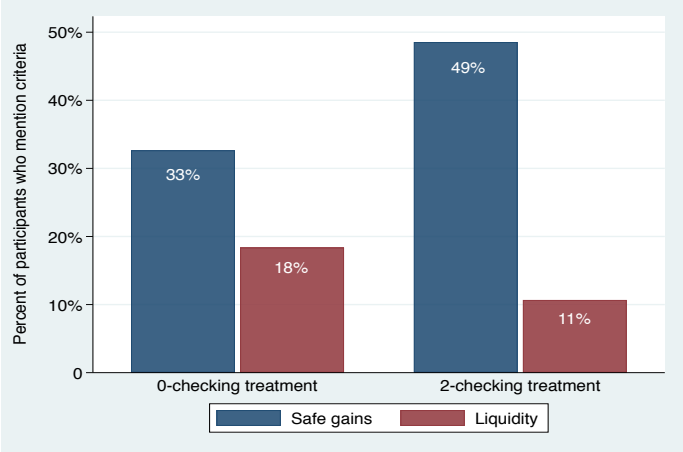


Figure VIII: Criteria mentioned per treatment in Study 3.

checking account pays no interest, its liquidity is prominent and leads it to be chosen by some participants. When it carries a positive interest rate, its nature as a riskless investment becomes more prominent and carries more weight at the expense of liquidity. With this weight shift, not much is left for the checking account to show for. After all, along the safe gain dimension it is completely dominated by the savings plan and is therefore chosen less frequently (of course, those who still value the liquidity dimension, due to, say, debt or an urgent need for money, may very well choose it even in this case).

3 The ToD Model

We now propose a formal model of the decision-making procedure we suggested for our observed behavioral patterns. As in Kőszegi and Szeidl (2012) (henceforth KS), our agent chooses from a finite set $\mathcal{C} \subseteq \mathbb{R}^K$ of K-dimensional objects and maximizes the following context-dependent weighted utility function:

$$\tilde{U}(c, \mathcal{C}) = \sum_{k=1}^{K} g_k(\mathcal{C}) \cdot u_k(c_k).$$

where $u_k(c_k)$ are the "classical utilities" as in KS assigned to the different dimensions and $g_k(\mathcal{C})$ are the menu-dependent-weights of each dimension. The difference between our ToD model and the one proposed by KS comes from the structure imposed on the weighting functions g_k, which measure the weight given to dimension k in the decision process. KS impose the following structure:

Assumption 1 in KS. The weights g_k are given by $g_k = g(\Delta_k(\mathcal{C}))$, where $\Delta_k(\mathcal{C}) = \max_{c' \in \mathcal{C}} u_k(c'_k) - \min_{c' \in \mathcal{C}} u_k(c'_k)$ and the function g is strictly increasing in Δ.

This assumption implies that the weights of the different dimensions correspond to their variance in the choice set. Using the words of KS,"the decision maker focuses more on attributes in which her options generate a greater range of consumption utility." From now on, we will refer to these weights as g_k^{KS}. We would like to suggest a different restriction on the g_k weights, one which is motivated by our studies. In order to do so, we need the following definition.

Definition 1. We say that dimension k is *turned-on in alternative* c if the agent perceives dimension k as pertaining to c.

As an illustration, in the context of Study 1, a larger percentage of participants had the egalitarian criterion turned-on in the $(100, 100)$ allocation compared to the $(100, 130)$ allocation. For every alternative c we define the K-vector of Turned-on Dimensions c^{ToD} by

$$c_i^{ToD} = \begin{cases} 1, & \text{if } i \text{ is turned-on in } c \\ 0, & \text{otherwise} \end{cases} \tag{1}$$

for every $i \in \{1, ..., K\}$. Following is our assumption on the weights.

Assumption 1 - ToD Weights. The weights g_k^{ToD} are given by

$$g_k^{ToD} = g[(\sum_{c \in \mathcal{C}} c_k^{ToD}) / (\sum_{j=1}^{K} \sum_{c \in \mathcal{C}} c_j^{ToD})],$$

and the function $g : \mathbb{R} \to \mathbb{R}$ is strictly increasing.

For a given dimension, the ToD weights are calculated by dividing the number of alternatives where that dimension is turned-on by the total number of instances of turned-on dimensions in the choice set (i.e., if some dimension is turned-on in two alternatives it will be counted twice in the denominator). In our elections example, the dimension of environmental issues was turned off in the set, i.e., received zero weight before the appearance of the new candidate who turned it on and led to its positive weight. In Study 3, the safe-gain dimension received a larger weight when the checking account's interest rate was raised from 0% to 2%. We do not impose any additional structure on g although it is natural to concentrate on cases where $g'' < 0$ and $g(0) = 0$. The first restriction implies that turning-on a dimension in one more alternative has diminishing effects on the weight of that dimension as the number of alternatives in which that dimension is turned-on grows. The second simply states that when a dimension is turned-off in the entire set, it does not

receive any weight in the decision process.

Remarks.

- According to our definition of a *turned-on dimension,* an alternative has a dimension turned-on only if it has a positive (or negative) level in that dimension, e.g. 0% interest rate on the checking account ensures it has the safe-gain dimension turned-off. However, the converse is not true: an alternative may have a dimension turned-off despite having a positive (or negative) level in that dimension. For example, if a participant was asked to rate the degree of equality presented by the allocation $(100, 130)$, it is reasonable to expect the answer not to be 0. Nonetheless, the presence of such an allocation does not raise the equality criterion in the direct sense that $(100, 100)$ does. Thus, we believe that for some participants in the *unequal* treatment, that dimension was turned-off and they focused only on efficiency.

- The overall weights sum up to 1. Thus, an increase in the weight of a specific dimension reduces the weight given to others. This feature of the model highlights the intuition that turning-on a dimension increases that dimension's prominence while it masks the other dimensions at the same time.

- Our model generalizes the standard linear utility model and it reduces to it by imposing $g = 1$. KS refer to this benchmark case as *consumption utility.*

- As in KS, our weights apply to the evaluation of all alternatives in the set. In this sense both models differ from the one proposed by Bordalo et al. (2013) where salient features, and hence their weights, may differ for different alternatives.

- We do not give a formula for measuring whether a dimension is "turned-on" for a given alternative. In fact, it is determined endogenously by the decision maker's perception. In our experimental studies, we tweaked one alternative in a manner that makes it quite obvious to an outside observer, which dimensions are turned-on and which are not by our manipulation.

- Dimensions, unlike attributes, are not necessarily explicitly stated for every alternative. When referring to the model, they are taken to be exogenous, as is assumed in the case of attributes in most attribute-based-models, KS's included.

- As is common in the development of theoretical models, our approach is not meant to replace the insights of the existing salience models, both of which capture important features of human behavior.[9] In fact, we believe one has to take into account their insights as well as ours. For example, one can imagine a more general model which

[9]For recent experimental support of the model of KS and the model of salience theory under risk of Bordalo et al. (2012) see Dertwinkel-Kalt et al. (2017) and Dertwinkel-Kalt and Köster (2018), respectively.

takes our approach towards "turned-on" vs. "turned-off" dimensions but acts as suggested by KS when all dimensions are "turned-on" (where ToD is silent with respect to small changes in the dimension levels). Combining the models in this manner allows for continuous effects of dimension levels based on the variance of each dimension as in KS without compromising the discontinuities around the "turn-on" point of these dimensions which will be accounted for by the ToD procedure.

4 Explaining our Experimental Findings with the ToD Model

We illustrate the model using the investment decision from Study 3 but a similar exercise may be carried out to explain the other studies as well. Our goal in this section is to show that the ToD model *is able* to accommodate our findings rather than find the range of parameter values for which it would do so. As mentioned later in the section, looking back at our findings we believe that the parameter values used below reflect the reasoning expressed in the explanations of at least some of our participants.

ToD weights are simplified by taking g to be the identity function. We consider the following triplet of dimensions: (safe gain, liquidity, highest possible returns).[10] Dimensions are numbered 1, 2, 3 respectively. We assume three *levels* (0,L,H) of these dimensions for each alternative where 0 reflects a 0 level of that dimension, L is Low and H is High: *checking*-0%=(0,H,0), *checking*-2%=(L,H,0), savings=(H,0,0), stock=(0,L,H).

We further assume that the decision maker is relatively risk averse and does not need the money right now so that $u_1(H)$ is relatively high. Thus, for dimensions $k \in \{2,3\}$, we have $u_k(0) = 0$, $u_k(\text{L}) = 1, u_k(\text{H}) = 2$, while for dimension 1, $u_1(0) = 0$, $u_1(\text{L}) = 1, u_1(\text{H}) = 5$. In addition, each investment option has the following dimensions turned-on: $checking - 0\%^{ToD} = (0,1,0)$, $checking - 2\%^{ToD} = (1,1,0)$, $savings^{ToD} = (1,1,0)$, $stock^{ToD} = (0,1,1)$.

Let us now calculate the dimensional weights in each treatment according to our assumption on the ToD weights. In the *0-checking* treatment:

$$g_1^{ToD} = {}^{(0+1+0)}/_{(0+1+0+1+1+0+1+1)} = {}^{1}/_{5}.$$

Similarly, we obtain:

$$g_2^{ToD} = {}^{3}/_{5},\ g_3^{ToD} = {}^{1}/_{5}.$$

In the *2-checking* treatment, the weights are different due to the extra turned-on dimension of the checking account. The weights are:

$$g_1^{ToD} = {}^{2}/_{6},\ g_2^{ToD} = {}^{3}/_{6},\ g_3^{ToD} = {}^{1}/_{6}.$$

[10] For simplicity, and without loss of generality, we exclude other dimensions relevant for this decision, such as "risk," "chances of losing," etc.

We now have all the necessary ingredients for the overall evaluation of every alternative in both treatments. In the *0-checking* treatment:

$$\tilde{U}(\textit{checking} - 0\%, \mathcal{C}) = 1/5 \cdot u_1(0) + 3/5 \cdot u_2(\text{High}) + 1/5 \cdot u_3(0) = 1/5 \cdot 0 + 3/5 \cdot 2 + 1/5 \cdot 0 = 6/5.$$

Similarly,

$$\tilde{U}(\textit{savings}, \mathcal{C}) = 1/5 \cdot 5 + 3/5 \cdot 0 + 1/5 \cdot 0 = 1,$$

and

$$\tilde{U}(\textit{stock}, \mathcal{C}) = 1/5 \cdot 0 + 3/5 \cdot 1 + 1/5 \cdot 2 = 1.$$

Thus, an agent described by our utility function and abiding to the ToD procedure will choose the checking account in the *0-checking* treatment. Turning to the *2-checking* treatment, we obtain:

$$\tilde{U}(\textit{checking} - 2\%, \mathcal{C}) = 2/6 \cdot 1 + 3/6 \cdot 2 + 1/6 \cdot 0 = 8/6,\ \tilde{U}(\textit{savings}, \mathcal{C}) = 10/6,\ \tilde{U}(\textit{stock}, \mathcal{C}) = 5/6$$

and we observe a choice reversal that is an apparent violation of monotonicity. Looking at the numbers, it is evident that the checking account is not worse per se due to its additional interest rate. In fact, its overall utility goes up from $6/5$ to $8/6$. However, the shift of weights leads to a sharper increase in the overall utility of the savings plan. These forces pull the relative attractiveness of the two options in opposite directions. With some utility parameters, there would be no reversal. We explicitly chose to describe an individual who cares about safe gains, with parameters to match, so that the weight shift and its positive effect on the savings plan outweigh the direct enhancement of the checking account's utility. Reflecting on Study 3 and the participants' frequent mention of the safe gain dimension in the enhanced *2-checking* treatment, we argue that this describes the actual weight shift of prominent dimensions of at least some participants.

5 Discussion and Related Literature

5.1 Our Model and Related Theories

In this section we briefly discuss our model, alongside other approaches, in light of the behavioral patterns that arise in our studies. The closest models are those of Kőszegi and Szeidl (2012) (KS) and Bordalo et al. (2013). Both have a similar motivation as they deal with how salience, focusing, and weighting of different dimensions affect choice. We draw on the idea, which is common to both models, that some criteria stand out more than others and receive larger weights in the assessment of goods. In Bordalo et al. (2013), the

decision maker examines the dimensions of each alternative, assigning a larger weight to the dimension that is farthest away from the mean level of that dimension in the choice set. Thus, every alternative has its own salient dimension that may differ across alternatives. In KS, salience is determined by the variation of each dimension in the choice set and it applies uniformly to the assessment of the members of the set. In our model, salience is also determined by the choice set and applies to the entire set as in KS and hence, for purpose of the current discussion we focus on the comparison between their model and ours.[11]

The main difference between our model and KS lies in how weights of different dimensions are determined. In KS, a dimension with a larger range will become more prominent and receive larger weights. In the ToD model, a dimension's prominence is determined by the number of alternatives that explicitly express that dimension. In this sense, our model is more discontinuous than KS. For example, decreasing the level of some dimension of one alternative is likely to affect its prominence according to KS but not according to ToD. By contrast, a tiny dip in the level of some dimension from $\epsilon > 0$ to 0 is likely to generate a larger effect on relative prominence in our model than in theirs.

This difference generates different predictions of choice behavior. For example, in Study 3, the "safe gain" dimension's range decreased when we increased the interest rate of the checking account from 0% to 2%. Thus, according to KS (and according to Bordalo et al., 2013) the weight placed on this dimension should decrease and, as a result, the savings plan should become less attractive, in contradiction to our findings. The ToD model, on the other hand, will place a larger weight on this dimension since it is now "turned-on" in the checking account, whereas it was "shut" in that alternative in the *0-checking* treatment.

As another example, consider the social preferences of Study 1. Here the two natural dimensions are equality and efficiency. Turning from the *unequal* treatment to the *equal* one, the range of both dimensions increases: there is a larger gap in terms of equality and efficiency between [100,100] and [100,160] than between [100,130] and [100,160]. Thus, it is difficult to derive a sharp prediction based on KS as to which dimension becomes more prominent. This will depend on the specifics of the weighting function. By contrast, the ToD model predicts a larger weight placed on egalitarian considerations when [100,100] is present due to its explicit reflection of equality. As a consequence, preferences are expected to shift and express a stronger positive attitude toward egalitarianism.

A closely related approach, which is interesting to examine in light of our findings, is that of relative thinking. Bushong et al. (2017) derive a model that formally resembles KS but assumes that the decision maker places less weight (rather than more weight as in KS) on dimensions with larger variance of consumption utility.[12] Using the authors' example, the model predicts that the difference between losing 12$ and losing 13$ dollars

[11] The general discussion in this section would be very similar if we chose to compare our approach to the model of Bordalo et al. (2013) with only small nuances reflecting the different weighting functions.

[12] Other approaches to relative thinking have been suggested by Azar (2007) and Cunningham (2013). For experimental evidence of relative thinking see, for example, Azar (2011).

will loom larger when the range of possible losses is 13$ compared to when the loss range is 25$. While relative thinking, as focusing and salience, is an important phenomenon of human behavior, it is unable to accommodate our findings. As in the case of focusing, we believe that the reason lies in the discontinuous nature of our findings, which is reflected by the ToD procedure, but is not incorporated by the relative thinking model. For example, consider Study 3. As we mentioned earlier, a similar distribution of choices arises when the checking account carries a 2% interest rate or 0.1%. We suggest that as long as the interest rate is strictly greater than 0 the "safe gain" dimension is *turned-on* in the checking account, generating the same dimensional weights across the two experimental versions. By contrast, according to the relative thinking theory of Bushong et al. (2017) increasing the interest rate from 0.1% to 2% decreases the utility variance along the safe gain dimension. Thus their model predicts that the savings plan, which has the highest safe gain in the set, should be chosen (weakly) more often when the interest rate is higher.

In their paper, Bushong et al. (2017) sketch a model which incorporates insights from the focusing model of KS together with their relative thinking approach: Focusing plays a role when choices feature more than two dimensions while relative thinking takes over when there are only two dimensions to consider. In one of our earlier remarks we crudely suggested that one could come up with a model which combines our insights alongside those of KS at the stage in which weights are determined. As these approaches seem to complement each other, it would be interesting to consider a model that is general enough to incorporate all of them together. For example, following the sketch of Bushong et al. (2017), one may consider a model in which facing multiple dimensions, variance and turned-on dimensions considerations lead the agent to concentrate on two dimensions for which he applies relative thinking to reach his final choice.

Our findings may be explained, at least to some extent, not only through the lens of dimensional weighting. Categories may be one alternative approach. Models taking this approach describe a decision maker who first forms categories endogenously, and then either chooses the best alternative from the most preferred category (Manzini and Mariotti, 2012) or picks the best option in each category (Furtado et al., 2017).[13] To illustrate, we follow Manzini and Mariotti (2012) and consider the investment example in Study 3. It is plausible that in the *0-checking* treatment, an agent will divide the set into three categories: liquid options, safe options and risky options. Those who care about liquidity may end up choosing the checking account. However, it is also perfectly reasonable that in the *2-checking* treatment the same agent will perceive only two categories: safe options and risky ones. If he is risk averse, he will choose the best option from the first category, which is the savings plan. Categorization, however, does not seem to apply to the findings from the social preferences study since it does not predict the reversal of ranking between the two unequal splits, which naturally belong to the same category across treatments.

Another channel through which our findings may be addressed is choice by iterative

[13] For a different approach involving categories and reference points see Barbos (2010).

search, suggested by Masatlioglu and Nakajima (2013). In their model, the agent starts off with some default option or reference point in the set. This option generates a consideration set from which the agent picks the best alternative which replaces his previous reference. The new reference generates another consideration set and the process goes on until the reference point is the best option in the consideration set, at which point it is chosen. The model is a good fit for online search, which often leads to a list of options that need to be skimmed through sequentially. Applying it to our findings, one would naturally treat the first option we introduce as the default. Suppose that when it is the 0% checking account (Study 3), the consideration set includes all perfectly liquid options. In this case, only the checking account is considered and hence it is chosen. However, when the first option is the 2% checking account it consists of all safe options and the agent may end up choosing the savings plan. Once again, as with categories, this approach does not fare well with our findings in Study 1, where preferences are actually reversed, a phenomenon that is hard to reconcile through the channel of consideration sets or categories.

Other models based on reference points, such as loss aversion (Kahneman and Tversky, 1991), may also shed light on our findings but are somewhat harder to apply as they require identifying the reference point from which losses and gains are contemplated. Unlike the iterative search model by Masatlioglu and Nakajima (2013) where the first alternative is a natural and somewhat technical starting point, as in online search, in models based on loss aversion, identifying the reference point is a much more subtle task (Barberis, 2013). Yet, even if we consider the first option as the reference point or the expectation of the participant as he logs in to answer the questionnaire as in Kőszegi and Rabin (2006), our findings are hard to reconcile with the loss aversion approach. Consider for example the investment study in which the checking account is enhanced to include a 2% interest rate and suppose that in the spirit of Kőszegi and Rabin (2006) the reference point's safe gain dimension is taken as the average of the safe interest rates of the checking account and savings plan (2% in the *0-checking* treatment and 3% in the *2-checking* treatment). Under these assumptions, choosing the 0% checking account would generate larger losses compared to choosing the 2% checking account. At the same time, choosing the savings plan would generate larger gains on that dimension in the *0-checking* treatment compared to choosing it in the *2-checking* treatment. As nothing else changes across treatments, no other gain or loss considerations change either. Thus, the model would predict weakly more choices of the savings plan at the expense of the checking account in the *0-checking* treatment, in contrast with our findings.

It is also worth mentioning the viewpoint suggested by reason-based choice (Shafir et al., 1993). According to this approach, the agent looks for reasons and arguments that will enable him to better explain his choices. It is plausible that our manipulation of the choice set affects such reasons and hence alters choice. For example, in the presence of the [100,100] allocation it is easy to explain why [100,140] is better than [100,160], whereas when it is replaced with [100,130] one may find it easier to explain the reverse. In fact, to some extent, our ToD model delivers this intuition as well if one considers the most

prominent criterion, i.e., the one with the highest weight, as the "reason for choice." This interpretation is in line with the findings reported by Slovic (1975). In his study subjects were asked to choose between two alternatives which they previously equated in value. Most of them chose according to the alternatives' performance on the dimension that was considered as more important.

To sum up, other theoretical models are able to partially explain our findings but none is able to predict all of them at the same time. We suggest the ToD procedure that draws on the literature on salience and focusing, while adding the role of "turned-on" dimensions to relative weighting and accounts for the discontinuous nature of our findings. This novel aspect of the model generates predictions that are in line with the findings of all three studies. In addition, the analysis of participants' explanation provides further support for this procedure.

5.2 Experiments

We would now like to relate our findings to experiments reported in the psychology and economics literature. For example, the investment study relates to findings regarding violations of monotonicity. These have been documented in intertemporal choice (Scholten and Read, 2014; Cheng-Ming et al., 2017) as well as in the domain of uncertainty (Gneezy et al., 2006; Bateman et al., 2007). These studies focus on the intrinsic valuation of goods and argue that sometimes an objective improvement (such as a small payment in the future) may actually reduce the attractiveness of an alternative. Our work, on the other hand, is not focused on intrinsic values of alternatives. We argue that the apparent violation of monotonicity found in Study 3 is due to the shift of dimensional weights and its effect on the other options in the choice set, rather than the checking account being deemed worse when it generates a positive interest rate. In fact, it is hard to argue that receiving a 2% annual interest from one's checking account is worse than not receiving any interest.

Our studies also share commonalities with experimental work on comparisons along different attributes.[14] Slovic and MacPhillamy (1974) show that in binary choices attributes that are common to both alternatives are weighted more heavily than those that are unique. Building on this early work, Kivetz and Simonson (2000) show that this tendency may lead subjects to choose alternatives that have higher values of the common attributes. In a similar vein, Palmeira (2010) suggests that subjects find it easier to compare two positive values of a given attribute than a positive value and a zero value of that same attribute. He claims that compared to zero, any number is infinitely larger, and so it becomes meaningless to make a comparison between them. He provides evidence of apparent violations of monotonicity in binary choices by manipulating attribute values from 0 to small positive levels, findings that are similar in spirit to those we report in Study 3. In another experiment involving lotteries, Birnbaum (2005) finds that different frames of the same lottery

[14] Notice that we use the term attributes here as these studies indeed deal with explicit spelled out aspects of the alternatives.

may lead subjects to choose in a manner which violates first order stochastic dominance. Dertwinkel-Kalt and Köster (2015) develop a model in the realm of uncertainty, which is is based on the salience model of Bordalo et al. (2013), and incorporates framing effects to account for these findings. The main focus of this development is on how different frames generate different attribute-by-attribute comparisons that may result in anomalies as the ones reported by Birnbaum (2005).

These studies emphasize the role of comparability, whether along common attributes or along attributes that share positive values. Our work relates to these experimental studies and, to some extent, provides a formal explanation of the driving force underlying them: a higher weight on a given dimension in the ToD model, translates into more prominence given to this dimension in the assessment of options. This may be viewed as "more comparisons" along that dimension, as suggested by the above studies. At the same time, our findings and the suggested ToD procedure are more general and direct the spotlight onto dimensional weights. These weights carry consequences in general settings far and beyond binary comparisons, which are not discussed in the above studies.

5.3 Policy Implications

The manner in which choices change according to emphasized dimensions may be utilized to affect consumers' considerations in predictable ways. The manipulation implied by our findings does not act directly on choice, as it does in default options or the order of alternatives in a menu, but rather on drawing individuals' attention to different criteria. Policywise, if one would like consumers to consider all relevant criteria before reaching a decision, all important dimensions pertaining to the available alternatives should be duly presented. For example, consider a potential investor who approaches a financial consultant at the bank to learn about different investment opportunities. According to our approach, there should be a checklist of criteria that are regulated and that are presented for each option (say, past 5-year returns, past 5-year volatility, withdrawal terms and annual fees). Such a checklist would ensure strictly positive weights given by the decision maker to each of the relevant criteria. What are the relevant criteria that should be made precise? That is a policy question on its own right which is outside the scope of our discussion and should be determined on a context to context basis. Whatever the chosen criteria, our approach to such regulation does not aim to push to a particular choice but rather to ensure that all important dimensions (as viewed by the regulator) are weighted by the decision maker prior to making his choice.

6 Conclusion

We provide evidence from three studies for the effect of turning-on dimensions on individuals' decision process and choice. In three different contexts we show that turning-on a dimension shifts participants' prominent criteria when contemplating alternatives and, as

a result, choices are affected in a predictable manner. We show that this effect may be achieved through framing alone and is in some cases strong enough to cause violations of the basic premise of monotonicity in money. Based on ideas raised by Kőszegi and Szeidl (2012) and Bordalo et al. (2013), we suggest a model that accounts for the discontinuous nature in which turned-on dimensions shift decision weights in our studies. Incorporating the role of turned-on dimensions into existing models of focusing, salience and relative thinking may enable us to derive sharper predictions of choice. As a policy implication we consider the possibility of increasing safe investments through an increase in the interest rate of one's checking account. Finally, we propose that regulating explicit mentioning of dimensions of choice problems has the potential to lead individuals to more informed decisions, in the sense of taking all criteria into account prior to making a decision.

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7 Appendix A

Below are the English translations for the instructions of all studies (the instructions were originally written in Hebrew as the experiment was run in Israel). The wording of the parallel treatment is reported in square brackets.

7.1 Appendix A.1. Study 1: Instructions of the equal [unequal] treatment

Decision Making Questionnaire - General Instructions

1. Thank you for agreeing to participate in a brief decision-making experiment. The experiment includes two questions and is expected to take a few minutes to complete.

2. The questions are phrased in masculine form but are addressed to women and men alike.

3. The questionnaire deals with your preferences and therefore there are no right or wrong answers.

4. **In this questionnaire there is a possibility of winning a significant amount of money. At the end of the experiment (in about two days) 5% of those who complete the entire questionnaire will be randomly drawn to receive prizes according to their choices. Please note that this payment is on top of the participation fee which you will receive for filling out the questionnaire.**[15] **At the moment it is impossible to know which of the participants will be drawn for payment and therefore it is recommended to answer according to your true preferences. Those who will be drawn to receive the additional payment will be notified of their prize via email.**

5. The experiment is completely anonymous.

[15] Participants received a flat rate of 3 ILS for completing the questionnaire but the exact compensation was not iterated in the instructions as it was communicated through their user account in the panel company.

Question 1

Assume that you have been selected for payment. Chosen alongside you is another participant that you do now know (which will also complete the questionnaire). You are asked to determine the payment for both of you. There are three options:

a. 100 ILS for you and 100 ILS for the other participant. [100 ILS for you and 130 ILS for the other participant.]

b. 100 ILS for you and 140 ILS for the other participant.

c. 100 ILS for you and 160 NIS for the other participant.

Please rank the options according to your preferences: **1 - the option you prefer the most, 2 - the option that is ranked 2nd according to your preferences, 3 - the option that you prefer the least.**

You and the other participant will not know anything about each others identity.

Note: For payment purposes, the option you rank highest will be selected with a 60% chance and the option you rank second will be chosen with a 40% chance. Therefore, it is recommended that you rank all three options according to your true preferences.

a. 100 ILS for you and 100 ILS for the other participant. [100 ILS for you and 130 ILS for the other participant.] ☐

b. 100 ILS for you and 140 ILS for the other participant. ☐

c. 100 ILS for you and 160 NIS for the other participant. ☐

Question 2

Please briefly explain your choice: ☐

7.2 Appendix A.2. Study 2: Instrctions of the *certain(3)* [*lottery(3)*] treatment

Below are the instructions for treatments *certain(3)* and *lottery(3)*. The instructions for treatment *certain(2)* and *lottery(2)* are identical except for the fact that option (b) is excluded.

Decision Making Questionnaire - General Instructions

1. Thank you for agreeing to participate in a short experiment that includes two questions and is expected to take a few minutes.
2. The questions are phrased in masculine form but are addressed to women and men alike.
3. The experiment is anonymous. You are only requested to specify your gender, your major, and age range. In addition, we ask you to type your email address which will be used only to update you if you won a prize.
4. The questionnaire deals with your preferences and therefore there are no right or wrong answers.
5. If you have any questions or comments, please send an email to Ayala Arad from Tel Aviv University (aradayal@post.tau.ac.il).
6. As you will shortly see, the experiment describes a choice between several options that entitle you to significant amounts of money. As soon as the experiment ends (it will end in a couple of days), 5% of those who fill out the entire questionnaire will be randomly drawn **to receive the money amount according to their choice.** We will send an email to the winners and explain where they can receive their payment. Payment can also be received through Bit and Pepper Pay payment applications.
7. At the moment it is impossible to know which of the participants will be drawn for payment and therefore it is recommended to address the question as if you will really receive your chosen option.

Email (to be used only to notify you if you won a prize): ☐

Gender:

- male
- Femal

Age:

- 18-25
- 26-35
- 36-45
- 46+

Major: [ ]

Question 1

You are facing the following three options. Which one would you like to choose?

a. Receive 60 ILS with certainty. On top of this amount, you will receive an additional 35 ILS if you win in a lottery that will be performed by the computer (a 14% chance). [Participate in the following computer lottery: A 14% chance to receive 95 ILS and an 86% chance to receive 60 ILS.]

b. Participate in the following computer lottery: A 50% chance to receive 95 ILS and a 50% chance to receive 40 ILS.

c. Participate in the following gamble on the stock market: If the Dow Jones Industrial Average Index at the end of the next trading day is higher than at the beginning of that day you will receive 115 ILS. If it drops, you will receive 30 ILS (the probability that the index will increase / decrease is not known).
Note: The Dow Jones Industrial Average Index is a stock market index that shows how 30 large publicly owned companies based in the United States have recently traded.

Question 2

Please briefly explain your choice: [ ]

7.3 Appendix A.3. Study 3: Instructions of the *2-checking* [*0-checking*] treatment

Decision Making Questionnaire - General Instructions

1. Thank you for agreeing to participate in a brief decision making experiment. The experiment includes just a few questions and is expected to take a few minutes to complete.

2. The questions are phrased in masculine form but are addressed to women and men alike.

3. The questionnaire deals with your preferences and therefore there are no right or wrong answers.

4. The questions describe hypothetical situations in which you are asked to choose between several options. For the success of the experiment we ask that you answer the questions sincerely.[16]

5. The experiment is completely anonymous.

Question 1

Imagine that you are an employee in a firm. At the beginning of the new year your employer informs you that you, as well as the other employees, are about to receive a bonus of 10,000 ILS. This bonus will be deposited for you by your employer in one of three options. Which one would you choose?

a. In your checking account which generates a 2% yearly interest rate with certainty. [which does not generate any interest.]
   * Some checking accounts in Israel have interest and some do not. Please assume for this questionnaire that your account has a 2% interest [no interest] even if this is not the case in reality.

b. In a savings plan which generates a 4% yearly interest rate with certainty.
   * The account has weekly exit stations, in which you can withdraw the money by making a request online or by phone.

c. In stocks that can gain or lose with a 50-50 chance. If it goes up, it earns 14% a year, if it goes down it loses 5% a year.
   * The stocks can be sold any time by making a request online or by phone.

[16] Participants received a flat rate of 5 ILS for completing the questionnaire but that was not iterated in the instructions as it was communicated through their user account in the panel company.

Note: If the amount (or part of it) is withdrawn before an entire year has passed, you will receive the proportional share of the expected annual profits. At the end of each year, the remaining balance on your chosen track will remain on the same track under the same conditions unless you specify otherwise.

Question 2

Please briefly explain your choice: ☐

Question 3

Now imagine that the situation is the same as described in Question 1, only that now the employer asks you to choose the percentage of the amount of 10,000 ILS that you would like to deposit in each option. Note that the sum of the percentages must equal 100. What is the percentage you would like to allocate to each option?

a. In your checking account which generates a 2% yearly interest rate with certainty. [which does not generate any interest.] ☐

b. In a savings plan which generates a 4% yearly interest rate with certainty. ☐

c. In stocks that can gain or lose with a 50-50 chance. If it goes up, it earns 14% a year, if it goes down it loses 5% a year. ☐

Please briefly explain your choice: ☐