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State Aggregation in Insurance Choices

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Optimizing utility in all states of the world at once might be difficult even for a machine. This paper adds to the behavioral literature by testing models in which the agent aggregates the states together, even though he or she is aware of the entire state space. Different ways of framing objective information may cause agents to aggregate states in predictable ways, which also has a predictable effect on their decisions. Our findings from an experiment suggest the participants respond to the above framing manipulations when asked to choose insurance plans. In addition, the subjects demonstrate event-loving – the desire to make more similar choices in aggregated states. This finding should not be confused with risk aversion, because such behavior is triggered by the aggregation-inducing frame rather than the natural desire to lower the uncertainty. Our results explain why agencies such as insurance companies use heuristics and the innate confusing nature of contracts to engage consumers in choices that are profitable only for the supplier. (*JEL* C91, D03, D10, D80)

Keywords: state aggregation, decision under risk, insurance, frame

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1 Introduction

Decision-making is a difficult task that might be affected by a large number of various parameters, including the frame in which the task is presented. Researchers have well established the fact that the context of the choice problem influences consumer decisions. A large experimental literature demonstrates problems such as gains versus losses (Thaler 1980), the isolation effect (Tversky and Kahneman 1979), gamble versus insurance (Hershey, Kunreuther, and Schoemaker 1982), and other phenomena that contradict the invariance of identical alternatives (Schelling 1981, McCaffery 1994, Johnson and Goldstein 2003). Empirical findings suggest that risk attitudes change with the context of the problem (Wolf and Pohlman 1983, Einav et al. 2010, Barseghyan et al. 2011). We add to this literature by showing the participants' decisions can be manipulated by differently formulated Product Disclosure Statements (PDS) without the change in the actual problem context. This paper is the first study that conducts a lab experiment to test how differently framed insurance PDSs affect the final choice of an insurance plan.

The design of our laboratory experiment is based on state aggregation. To illustrate the idea, consider the following example. Suppose there are three states of the world: collision with agent at fault, collision with someone else at fault, and no negative occurrence. Insurance company 1 offers two different products: liability insurance and collision insurance. Liability insurance covers the agent at the state of the car accident when the agent is at fault, whereas collision insurance covers the state when someone else is at fault. Hence, insurance company 1 would offer separate PDSs for different types of losses. An insurance plan in each case would consist of a deductible for a corresponding state. Now consider insurance company 2, which offers car accident insurance. Car accident insurance covers both types of collisions and is offered in a single PDS. An insurance plan of insurance company 2 consists of two deductibles that correspond to two states of collision. A perfectly rational agent who faces the above insurance companies would make identical choices of insurance plans as long as they are identically priced. However, as Burkovskaya (2017) argues, when the agent faces the PDS of insurance company 2, he or she is naturally manipulated to aggregate two states into one event: "car accident." In this case, two different problems now become one and the agent treats the aggregated event as a state of the world instead of two different states. By analogy with risk attitudes, depending on the agent's event attitude, he or she will prefer more similar or more different insurance choices in the aggregated states. This paper tests the possibility of manipulating insurance choices by nudging the agents to state aggregate.

In our experiment, there are also three states of the world, two of which might result in losses. All uncertainty is objective and represented by differently colored balls in the urn. Our subjects were offered the opportunity to buy deductible insurance for each state. We randomly assigned the participants into treatment and control groups. The treatment group received a PDS that included the description of one insurance plan consisting of two deductibles. The control group received a separate PDS for each state with losses, implying the subjects needed to choose two insurance plans consisting of one deductible each. In addition, we used differently colored balls for each group. The control group's urn had blue balls for no loss and red and green balls for different states with losses. The treatment group's urn had blue balls for no loss and red balls that were marked either with "1" or "2" for different states with losses. We used the same ball color for both types of losses together with the single PDS to intensify the similarity of the states to nudge the participants to aggregate them.

We discover that the treatment group chose significantly different insurance options than the control group. On average, relative to the control group, the treatment subjects preferred smaller deductibles in the more expensive state and greater deductibles in the cheaper state. However, we found no difference in the groups' insurance premiums. Consequently, the treatment participants received the same consumption as the control group in the no-loss state. By contrast, the treatment group's consumption choices in the states with losses were more similar and could be confused with the results of greater risk aversion. This desire to make more similar choices in the aggregated states is the result of event-loving. In addition, we discover that 57% of the subjects simplified the decision-making process by picking one of the insurance plans that was offered to them as an example. The type of PDS did not affect this proportion. However, we find that, on average, the effect of state aggregation on the participants who used heuristics was stronger than in the whole sample. Given the evidence of the use of heuristics in insurance, and specifically in health insurance (Ericson and Starc 2012, Heiss et al. 2013, Bhargava et al. 2015), our results highlight the importance of the regulation of insurance and choice environments.

This paper proceeds as follows. Section 2 summarizes the state-aggregation theory and predictions of the SASEU model. Section 3 describes the experimental design. Section 4 discusses the empirical findings. Section 5 concludes. Additional materials are provided in the Appendix.

2 State-Aggregation Theory

There are three states of the world $S = \{s_1, s_2, s_3\}$ that might happen at date 2, and consumers face uncertainty about these states. All uncertainty is objective and $P(s_i)$ denotes probability of state s_i. There is a single consumption good (cash) and the actual consumption happens only on date 2. However, all decisions must be made on date 1.

To follow the experimental environment, the agents are endowed with income I and may purchase an insurance plan to protect themselves from potential losses in states s_1 and s_2. We denote the corresponding losses as L_1 and L_2. State s_3 does not result in any loss. An insurance plan is a triple (p, d_1, d_2), where d_i is the amount of the deductible for state s_i and p is an insurance premium. For simplicity, we assume the premium is a linear function of deductibles, i.e., $p = \alpha - p_1 d_1 - p_2 d_2$, where α

is the price of the full insurance ($d_1 = d_2 = 0$) and p_i is the price of a \$1 deductible decrease in state s_i. Notice that, intuitively, p_i is the price of a corresponding Arrow security: Decreasing the deductible by \$1 in some state is equivalent to increasing consumption by \$1 in the same state. In addition, we set the price $\alpha = p_1 L_1 + p_2 L_2$ to guarantee continuity of the premium in deductibles, because the agent who buys no insurance ($d_1 = L_1, d_2 = L_2$) should pay zero premium. Hence, the premium can be rewritten as $p = (L_1 - d_1)p_1 + (L_2 - d_2)p_2$.

In addition to the standard set-up, the agents face information frame (state aggregation) π – the manner in which the objective information is presented to the participants. The most natural way to think about information frame is as different types of arrangements of a PDS, when choosing an insurance plan.

Our agents are completely described by consumption sets in $\mathbb{R}^3$, income I in $\mathbb{R}$, state aggregation π from $\mathcal{P}$ – the set of all partitions of S, – and utility functions $V : \mathbb{R}^3 \times \mathcal{P} \to \mathbb{R}$. An agent whose income is I, state aggregation is π, and utility function is V chooses an insurance plan $d = (p, d_1, d_2)$ to maximize utility $V(d, \pi)$ subject to the budget constraint $p + s \leq I$, where s is denoted as savings that are equivalent to consumption in state s_3. Consumption in state s_i can be obtained as $c_i = s - d_i$.

Below, we go over the implications on choice behavior from State-Aggregation Subjective Expected Utility (SASEU). Note that we do not make any assumptions on the utility of the agents while testing the model; however, SASEU allows for concise illustration of the decision-making process and is also well suited for intuitive interpretation of the results.

Definition 1. *An agent's behavior is said to follow SASEU for some partition of the state space π and probabilities $P(s|A)$ and $P(A|\pi)$ for any state $s \in A \in \pi$, if a continuous monotone function $u : X \to \mathbb{R}$, and an increasing function $\phi : \mathbb{R} \to \mathbb{R}$*

exist and are such that the value of a consumption bundle $c \in \mathbb{R}^k$ *is evaluated as*

$$V(c,\pi) = \sum_{A\in\pi} P(A)\phi\left(\sum_{s\in A} P(s|A)u(c(s))\right).$$

2.1 Choice without state aggregation

When $\pi = S$, and hence the state aggregation is the entire state space, SASEU simplifies to the regular Subjective Expected Utility (SEU). By definition, the SEU agent's utility from insurance plan $d^S = (p^S, d_1^S, d_2^S)$ is

$$V(d^S, S) = P(s_1)\phi(u(s^S - d_1^S)) + P(s_2)\phi(u(s^S - d_2^S)) + P(s_3)\phi(u(s^S)),$$

where $\phi(u(\cdot))$ and $u(\cdot)$ are assumed to be twice-differentiable and strictly concave. Then the first-order conditions for the optimal choice of an insurance plan are

$$\frac{\phi'(u(s^S))u'(s^S)}{\phi'(u(s^S - d_1^S))u'(s^S - d_1^S)} = \frac{(1-p_1-p_2)P(s_1)}{P(s_3)p_1}$$
$$\frac{\phi'(u(s^S - d_2^S))u'(s^S - d_2^S)}{\phi'(u(s^S - d_1^S))u'(s^S - d_1^S)} = \frac{p_2 P(s_1)}{P(s_2)p_1}.$$

Strict concavity of $\phi(u(\cdot))$ requires $\frac{(1-p_1-p_2)P(s_1)}{P(s_3)p_1} < 1$ for the interior solution and also implies

$$\frac{p_2 P(s_1)}{P(s_2)p_1} < 1 \Leftrightarrow d_1^S > d_2^S.$$

2.2 Choice with state aggregation

Suppose now the agent faces frame $\pi = \{\{s_1, s_2\}, s_3\}$. Denote $A = \{s_1, s_2\}$. The agent's utility in this case would be

$$V(d,\pi) = P(A)\phi\left(P(s_1|A)u(s-d_1) + P(s_2|A)u(s-d_2)\right) + P(s_3)\phi(u(s)).$$

Then the first-order conditions for the optimal choice of an insurance plan are

$$\frac{\phi'(u(s))u'(s)}{\phi'\left(\sum_{i=1,2} P(s_i|A)u(s-d_i)\right)u'(s-d_1)} = \frac{(1-p_1-p_2)P(s_1)}{P(s_3)p_1}$$
$$\frac{u'(s-d_2)}{u'(s-d_1)} = \frac{p_2 P(s_1)}{P(s_2)p_1}.$$

Strict concavity of $\phi(u(\cdot))$ requires $\frac{(1-p_1-p_2)P(s_1)}{P(s_3)p_1} < 1$ for the interior solution, and strict concavity of $u(\cdot)$ implies

$$\frac{p_2 P(s_1)}{P(s_2)p_1} < 1 \Leftrightarrow d_1 > d_2.$$

In addition, Burkovskaya (2017) shows that strictly concave $\phi(\cdot)$ states that

$$s - d_2 > s^S - d_2^S > s^S - d_1^S > s - d_1,$$

strictly convex $\phi(\cdot)$ similarly results in

$$s^S - d_2^S > s - d_2 > s - d_1 > s^S - d_1^S,$$

and linear $\phi(\cdot)$ implies

$$s^S - d_2^S = s - d_2 > s - d_1 = s^S - d_1^S.$$

By analogy with risk aversion for $u(\cdot)$, in this model, it is possible to define event aversion/loving for function $\phi(\cdot)$. If $\phi(\cdot)$ is concave, the agents are event-averse, meaning they care more about smoothing the values of aggregated events rather than consumption in aggregated states. As a result, they achieve a higher value on the aggregated event by purchasing more consumption in a cheaper state and less consumption in a more expensive state than someone who does not aggregate. If $\phi(\cdot)$ is linear, the framing of information does not have any effect on choices, because the agent would be a regular SEU-maximizer. In this case, the phenomenon is called event neutrality. Finally, if $\phi(\cdot)$ is convex, the agents are event-loving. By analogy with risk-loving, the agents prefer taking risks over the values of the events, but pay more attention to how consumption is distributed inside each aggregated event, picking up more similar bundles in aggregated states.

This theory can be tested by a very straightforward lab experiment dividing participants into two groups, with each group being exposed to a different state aggregation. The control group should receive no state-aggregation frame S, whereas the treatment group should get the partition π. If the general theory holds, we expect, on average, different choices by each group. If SASEU holds, state s_1 is more expensive than state s_2, c_i^C and c_i^T denote consumption in state s_i for control and treatment group, correspondingly, and then, depending on the event attitude, we would see one of the following:

1. $c_2^C > c_2^T > c_1^T > c_1^C$ if subjects are event-loving, i.e., $\phi(\cdot)$ is convex;
2. $c_2^T > c_2^C > c_1^C > c_1^T$ if subjects are event-averse, i.e., $\phi(\cdot)$ is concave.

3 Experimental Design

We conducted the lab experiment in the Behavioural Research Laboratory at the University of Sydney. Participants were both undergraduate and postgraduate students at the University of Sydney who were recruited from a pool of volunteers via the Online Recruitment System for Economic Experiments (ORSEE). See the Appendix for more detailed data on the participants. One hundred thirty seven individuals participated in 16 identical sessions, and each participant was only able to take part in one session. Each session included insurance, portfolio choice, and Holt-Laury-style lottery tasks. The entire session lasted for around 75 minutes, with the insurance task given first and taking around 20 minutes to complete. The average payment for each subject for the insurance section was \$5.50 AUD, whereas the average payment for the entire experiment was $18.30 AUD. Participants received a $5 AUD participation payment for completing the experiment.

The entire experiment was programmed and conducted with the experimental software z-tree (Fischbacher 2007) and consisted of two parts. First, participants completed an unpaid practice section in which they received insurance, portfolio-choice and lottery tasks, and obtained feedback after their choices. This portion was followed by a random division of the subjects into treatment and control groups and the paid section afterwards. Feedback was not provided in this section. We present the details of the paid insurance task below and refer the reader to the supplementary materials for the complete instructions.

Upon entering the lab, participants received instructions explaining the structure of the experiment, how they would be paid, and what to do if they had any questions during the session. After the completion of the practice questions, the participants were informed they would be paid for the following task, their payment would be calculated by scaling the parameters down by 50, and no feedback would be provided.

Both treatment and control groups received the same one-shot insurance problem: probabilities of bad states $P(s_1) = P(s_2) = 0.05$, probability of no-loss state $P(s_3) = 0.9$, income $I = 400$, and losses $L_1 = 400$ and $L_2 = 200$ in the bad states. All participants had to choose two deductibles d_1 and d_2 for states s_1 and s_2, correspondingly. Prices of each state $p_1 = 0.4$ and $p_2 = 0.2$ and insurance premium $p = 200 - 0.4d_1 - 0.4d_2$ were not stated directly; however, they could have been easily recovered from the table of example insurance plans or by playing with different choices.

Participants selected their preferred insurance plan by typing numbers $d_1 \in [0, 400]$ for the deductible in state s_1 and $d_2 \in [0, 200]$ for the deductible in state s_2 into the boxes displayed on the computer screen. After the initial choice, we provided the summary of the plan that included the deductibles, premium, and payment in each state. Upon reaching the summary screen, participants could return to the previous screen to choose a different insurance plan or submit their preferred option. The rationale for providing participants with the summary screen described was to have them focus on whether they preferred a given insurance plan to another rather than trying to calculate the payoffs for a given plan. Allowing participants to return and choose a different plan permitted them to try various plans until they were satisfied with their choices. If an individual did not fully understand the insurance problem, he or she could still come to a decision by comparing insurance-plan summaries.

The main feature of this experiment was how PDS was formulated for each group. Note that we used "excess" synonymously with "deductible" in the experiment because we conducted it in Australia, where the usage of "excess" in insurance companies is more common. First, we describe the control group, which received the following information:

An urn contains 100 balls. 90 of them are blue, 5 are red and 5 are green. One ball will be randomly drawn from the urn. You have $400 and if a red ball is drawn, you will lose $400, while if green ball is drawn you will lose $200.

The control group's screen was divided into two parts corresponding to different types of insurance. As a result, the control group had two tables with examples of insurance plans as in Tables 1 and 2. Each table was then followed by relevant explanations of the example plans, which were also displayed on either side of the screen.

Plan	Excess red ball	Premium
No Insurance	400	0
Full Insurance	0	160
50% Coverage	200	80

Table 1: Control group: Red ball insurance-plans examples

To induce state aggregation in the treatment group, we manipulated both the color of the balls and the way the examples were presented. The treatment group received

Plan	Excess green ball	Premium
No Insurance	200	0
Full Insurance	0	40
50% Coverage	100	20

Table 2: Control group: Green ball insurance-plans examples

the information presented below. In addition, Table 3 shows the examples of insurance plans for the treatment group, which were accompanied by written explanations.

An urn contains 100 balls. 90 of them are blue and 10 are red. Red balls represent a negative event in which you will incur some loss. 5 of the red balls are marked '1', while 5 are marked '2'. Different types of red balls represent different types of negative events. One ball will be randomly drawn from the urn. You have $400 and if a red ball marked '1' is drawn, you will lose $400, while if a red ball marked '2' is drawn you will lose $200.

Plan	Excess for red "1" ball	Excess for red "2" ball	Premium
No Insurance	400	200	0
Only red "1" ball insurance	0	200	160
Only red "2" ball insurance	400	0	40
50% Coverage	200	100	100
Full Insurance	0	0	200

Table 3: Treatment group: insurance-plans examples

Note that we changed red and green balls into red "1" and red "2" to cause the treatment group to aggregate the states $\{red_1, red_2\}$ into one event $\{red\}$. In addition, we manipulated the description of PDS by offering one insurance plan that covered all states with losses. As a result, we formulated the examples in the same manner. We expected the subjects from the treatment group to consider the choice of the entire insurance plan as a single problem more often than the control group.

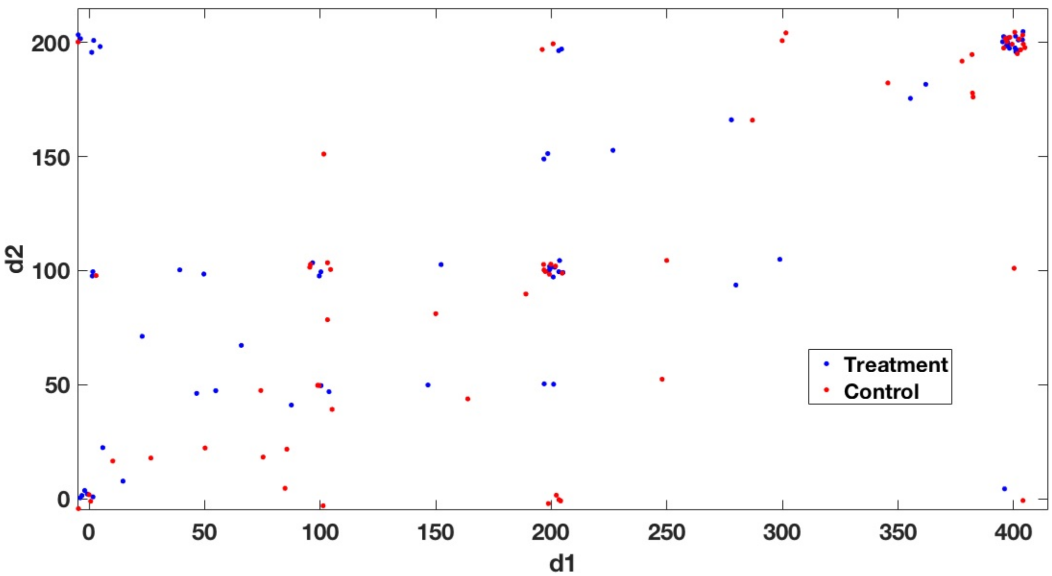

Figure 1: Choices of deductibles: control (red) vs. treatment (blue)

On the other hand, those in the control group had no option to consider each state separately.

4 Empirical Findings

In this section, we discuss the experimental data in relation to the State-Aggregation model.

In the experiment, both control and treatment groups received identical information. The only difference involved the frame. All probabilities were objective: $P(s_1) = P(s_2) = 0.05$ and $P(s_3) = 0.9$. The participants were given the same income, losses, and prices of each state $p_1 = 0.4$ and $p_2 = 0.2$. The premium of an insurance plan (p, d_1, d_2) was defined as $p = 200 - 0.4d_1 - 0.2d_2$. The chosen parameters guaranteed the existence of an interior solution in the case of strictly concave $u(\cdot)$ and $\phi(u(\cdot))$ as $\frac{(1-p_1-p_2)P(s_1)}{P(s_3)p_1} = \frac{1}{18} < 1$. In addition, $\frac{p_2 P(s_1)}{P(s_2)p_1} = 0.5 < 1$; thus, under the strict concavity we should have $d_1 > d_2$.

We have collected data from 137 participants who were randomly assigned by a computer into control (64 participants) and treatment (73 participants) groups. Figure 1 shows the scatter plot of all the choices of insurance plans for treatment (blue) and control (red) groups.[1] Table 4 shows the average choice of deductibles, premium, and consumption in every state for each group.

	deductibles		premium	consumption		
group	d_1	d_2	p	c_1	c_2	c_3
treatment	198.30	123.62	95.96	105.74	180.42	304.04
st.error	(17.53)	(8.05)	(8.10)	(9.61)	(5.92)	(8.10)
control	226.66	110.48	87.24	86.10	202.28	312.76
st. error	(17.56)	(9.68)	(8.53)	(9.23)	(5.53)	(8.53)

Table 4: Average insurance and consumption data for treatment and control groups

Note that the standard t-test for each deductible cannot be used with these data because the choice in this problem is the entire insurance plan, which is a vector of two components (d_1, d_2),[2] and each component is not a separate choice. As a result, we have to use a test that is able to compare the means of vectors. Hence, to test whether the distribution of insurance plans has the same mean in both groups, we construct a Wald statistic.[3] To do so, we randomly subtract the data for the control group from the treatment group individual by individual because the choice of two deductibles constitutes a unique bundle that cannot be split. We next obtain the Wald statistic to test H_0, namely, whether the vector of group differences has zero mean in both components. Under H_0, the Wald statistic should be distributed as $\chi^2(2)$. The value of the Wald statistic we get is 9.91, which corresponds to a p-value of 0.007 for $\chi^2(2)$. Hence, H_0 is rejected, implying the treatment and control groups choose different insurance plans. In addition, we use the standard t-test to check

[1] The scatter plot contains some noise for graphical representation purposes to avoid several identical data points covering each other.

[2] The premium is uniquely defined as a linear combination of deductibles and should be removed from the test.

[3] For more details on the Wald test, see Engle (1983).

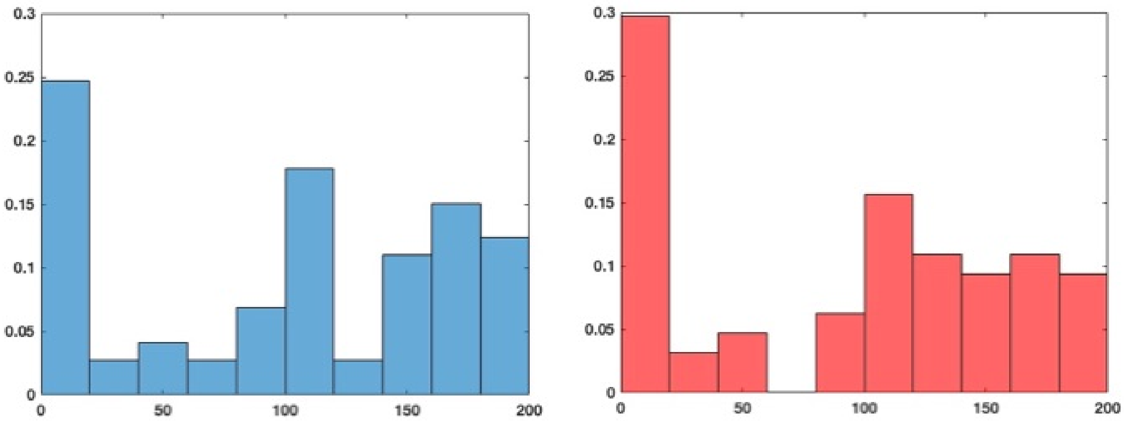

Figure 2: Premium histogram: treatment (blue) vs. control (red)

whether the premium is different between the groups, and we find it is not. We also plot the premium histogram for both groups in Figure 2, which does not demonstrate a significant contrast between groups, but does show a slightly higher probability of a very low premium in the control group. Thus, the results advocate that control and treatment groups buy the same amount of insurance; however, the actual distribution of insurance between the states is different, suggesting the aggregation frame makes the treatment group look more risk-averse on the aggregated event.

The same data can be represented in terms of consumption in each state. On average, the results are consistent with the predictions of the SASEU model with convex $\phi(\cdot)$, implying the participants are event-loving. The subjects in the treatment group tend to choose more similar consumption in aggregated states s_1 and s_2 than the control group. This behavior could be confused with greater risk aversion, because risk-averse agents prefer smoothing consumption over risky states, implying more similar choices with more fear of uncertainty. However, note that our lab experiment randomly assigns individuals, and therefore risk-aversion levels should not be different between the groups.

In addition, when examined in more detail, Tables 5 and 6 show the distribution of the simple plans across the agents that use heuristics for both groups. Approximately 59% (43 participants) of the treatment group and 55% (35 participants) of the control

$d_1 \backslash d_2$	0	100	200	total
0	11.6%	4.7%	11.6%	28%
200	0%	25.6%	4.7%	30%
400	2.3%	0%	39.5%	42%
total	14%	30%	56%	100%

Table 5: Treatment group: heuristics

$d_1 \backslash d_2$	0	100	200	total
0	5.7%	2.9%	0%	8.5%
200	11.4%	22.9%	5.7%	40%
400	2.9%	2.9%	45.7%	51.5%
total	20%	28.7%	51.3%	100%

Table 6: Control group: heuristics

group use heuristics and choose a simple plan such as (0,0), (200,100), and so on, many of which were offered to them as example plans. The variation in the proportion of such participants in each group is not significant. The largest difference between the two heuristic groups comes in the choice of the (0,200) and (200,0) plans. The treatment group shows a stronger preference for full insurance in state s_1 than the control group. In fact, Table 7 shows the difference between heuristic participants in both groups follows the pattern of the entire sample: On average, the treatment group demonstrates event-loving due to more similar consumption in the aggregated states. The Wald test confirms the contrast between the groups for heuristic participants with a p-value of 0.027.

	deductibles		premium	consumption		
group	d_1	d_2	p	c_1	c_2	c_3
treatment	227.90	141.86	80.47	91.63	177.67	319.53
st. error	(25.41)	(11.15)	(11.50)	(14.20)	(9.35)	(11.50)
control	285.71	131.43	59.43	54.86	209.14	340.57
st. error	(22.13)	(13.45)	(10.89)	(11.58)	(7.88)	(10.89)

Table 7: Average insurance and consumption data for the heuristic participants

At the same time, the average consumption and insurance plans of the non-heuristic subjects also follow the general pattern of event-loving, but the difference is neither large nor significant. However, the latter potentially might be due to the small sample size (27 participants in the control group and 30 participants in the treatment group).[4]

5 Conclusion

In this short paper, we study a hypothetical insurance problem, where treatment and control groups are given identical risky situations, but formulated in a different manner. Our findings suggest the PDS that describes two different states with losses in one section instead of two nudged the participants to treat those states as more similar than they are. As the result, on average, the participants chose more similar insurance coverage for the aggregated states – a phenomenon called event-loving. In addition, we discover that around 57% of the subjects used simple heuristics in deciding their insurance plans, and this proportion was not affected by the type of PDS. However, the choices of heuristic agents demonstrated stronger event-loving than in the overall sample, suggesting the various ways of formulating PDS have a stronger effect on people who simplify decision-making. This finding implies an insurance provider might manipulate agents to state aggregate in a specific manner by means of a designed PDS, which policymakers might see as a concern. A potential extension of this study would look at how the choices are influenced by the available examples of plans and whether that information can be used to increase or decrease the effect of state aggregation.

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A Appendix

A.1 Subject Descriptive Statistics

See the descriptive statistics of control and treatment groups in Table 8.

Variable	Treatment	Control
Age	22.12	22.88
Female	51%	48%
Undergraduate	70%	56%
Faculty		
Arts & Social Sciences	16%	25%
Business	21%	16%
Engineering, IT & Science	29%	27%
Dentistry & Medicine	27%	23%

Table 8: Descriptive statistics for all subjects in the main experiment

A.2 Experiment practice question

All of the subjects received the following information: An urn contains 100 balls. 95 of them are blue and 5 are black. One ball will be randomly drawn from the urn. Consider the following Insurance problem:

You have $10 and if a black ball is drawn you will lose $10. You may choose an insurance plan to cover your potential losses. The insurance premium depends on the amount of excess you choose to bear for the black ball being drawn. A higher excess corresponds to a lower premium but a higher excess means that you will receive a smaller reimbursement in the case that a black ball is drawn.

Similarly to the paid task, information including the price of the deductible and the function that generates the premium were not provided to subjects. Examples of possible insurance plans in Table 9 were provided to subjects and each example plan was accompanied by a written explanation.

Plan	Excess	Premium
No Insurance	10	0
50% Coverage	5	2.5
Full Insurance	0	5

Table 9: Practice insurance task examples

Participants were required to choose their preferred excess by typing a number $d \in [0, 10]$ into a box displayed on their computer's screen. After participants made their choice, a summary screen displayed the insurance plan they chose and their payoff in each state. Upon reaching the summary screen, participants could return to the previous screen to choose a different insurance plan or submit the plan they had chosen. After submitting their choice, a feedback screen showed the insurance plan chosen, the ball drawn, and the payoff earned.

A.3 Non-heuristic subjects

	deductibles		premium	consumption		
group	d_1	d_2	p	c_1	c_2	c_3
treatment	155.87	97.47	118.16	125.97	184.37	281.84
st. error	(20.25)	(9.66)	(9.66)	(10.74)	(5.42)	(9.66)
control	159.48	80.41	120.13	120.39	199.47	279.87
st. error	(22.78)	(12.75)	(11.35)	(11.60)	(5.50)	(11.35)

Table 10: Average insurance and consumption data for the non-heuristics subjects