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Abstract

In this study we analyze framing effects caused by two versions of the choice (multiple price) list procedure used to elicitate individual risk preferences. In the probability equivalence (PE) version, subjects face pairwise choices between lotteries within a choice list. In the certainty equivalence (CE) version, subjects are asked to state a minimum selling price to give up the lottery they cope to. We implement a within-subjects experiment allowing for preference imprecision and preference for compound lotteries, by means of repetition of identical risk tasks. Introducing different variations in the number of lottery options offered with and without decreasing their range, we find that changes in the framework disturb subject's risk preferences only in the CE version.

Keywords: risk aversion, framing effects, risk task repetition, preference imprecision, preference for compound lotteries, choice list procedure

JEL classification: C93, D03, D81

FRAMING AND REPETITION EFFECTS ON RISKY CHOICES: A BEHAVIORAL APPROACH

Noemí Herranz-Zarzoso[a] and Gerardo Sabater-Grande[b]

Abstract

Framing effects play an importance role in individual decision making under risk. This investigation revisits framing effects caused by two versions of the multiple price list procedure used to elicit risk preferences via a new experiment that allows imprecision and controls the proper functioning of the random lottery incentive mechanism: Binary Lotteries (BL) and Certainty Equivalent (CE). In the former, subjects face pairwise choices between lotteries within a choice list. In the latter, subjects are asked to state a minimum selling price to give up the lottery they cope to. Particularly, we test whether variations in the number of options offered with and without decreasing the range affect subjects' choices. We find that changes in framework disturb subjects' risk preferences only in the CE version.

Keywords: risk aversion, framing effects, risk task repetition, choice list procedure.

JEL classification: C91, D03, D81

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1. Introduction

Risk attitude is known to be a key determinant of various economic and financial choices. Behavioural studies that aim to evaluate the role of risk attitude in contexts of this type require tools for measuring risk aversion at both the individual and aggregate levels. The most frequent procedure to elicit individual risk attitudes is referred as the ***choice (multiple price) list procedure***. The choice list method presents a table of binary choices designed so that as a respondent works through the table, he/she can be expected to switch at some point from “one side” to the other. Two alternative versions of this procedure are the Binary Lotteries (BL) and the certainty equivalence (CE) methods. In the PE method, subjects face pairwise choices between lotteries within a choice list. A famous example of this method was proposed by Holt and Laury (2002, HL hereafter), in which subjects cope to a list of 10 decisions between binary lotteries with constant payoffs and increasing probabilities. The CE method is based on a Becker-DeGroot-Marschak (BDM) auction in which subjects are asked to state a minimum selling price to give up the lottery they have been endowed with. In order to determine the subject’s payoff in a choice list, the Random Lottery Incentive (RLI) payment mechanism is used to pick randomly one decision of the list. If the isolation hypothesis is maintained, each pairwise choice a subject makes in the list can be interpreted as if he/she had faced only a single binary choice.

This paper investigates whether subjects’ choices are influenced by framing effects originated by the choice list procedure. Framing effect is a cognitive bias by which subjects make different choices depending on the description of a formally identical decision problem. This effect can be referred to multiple issues affecting the presentation of the risk task implemented. The best-known framing effects are related to variations in the order, the number and range of the options presented in the risk choice task. In risky choice framing, the seminal problem was presented by Tversky and Kahneman (1981) highlighting the importance of changes in individual preferences because of inconsequential changes in the formulation of choice problems. In a subsequent paper, Tversky and Kahneman (1986) argued that framing effects violate the normative condition of description invariance, which stipulates that the same problem should be evaluated in like manner regardless its description. An example of models assuming this principle is the Expected Utility Theory model where choice options are evaluated strictly as a function of probability and payoff, with no specification of probability-payoff framing.

Results on framing effects are a mixed bag depending on the method used to elicit subjects’ risk aversion and the type of framing effect analysed (ordering effects, changes in the number of options presented with or without affect their range, simultaneous versus sequential presentation of lotteries, etc.). Hey and Orme (1994) found that when the same 100 pair of ternary lotteries were repeated two times on separate days[1] (with a possibility to declare indifference) in different order, subjects chose identical options for each pair in around 75% of all cases. Increasing the number of repetitions[2] with respect to his previous paper, Hey (2001) found that some individuals maintained a constant variability. Using the HL method, Andersen *et al.* (2006)[3] found that choices were affected by ordering effects[4] and the lottery range. Specifically, they found out that the deletion of the worst pairs (with the lowest expected value) of lotteries increased risk aversion. Additionally, the authors showed that enforcing only one switching point, strict monotonicity and transitivity, had no systematic effect. Lévy-Garboua *et al.* (2012) presented experimental evidence of how framing[5] affected decisions in the context of the HL procedure. They found that presenting lotteries simultaneously induced significantly less inconsistency than showing lotteries in sequential appearance. Additionally, both repetition of identical choices and high payoffs reduced inconsistency too. Bosch-Domènech and Silvestre (2013) found what they called "an embedding bias". This bias implies that when some specific pairs of alternative lotteries are removed, risk aversion becomes less frequent and the ranking of individuals by risk aversion is not preserved. However, the aforementioned bias was not found when they analysed the CE elicitation method. Contrary to these results, Freeman *et al*. (2016) found that embedding a pairwise choice in a choice list increased the fraction of subjects choosing the riskier lottery when the safer alternative was certain, but it did not significantly affect choices when the safer alternative is risky. Erev *et al.* (2008) and Blavatskyy and Koehler (2009) analysed the robustness of CE mechanism to elicit risk preferences obtaining that elicited payoffs were systematically affected by the range of certain payoffs to which the lottery was compared. Beauchamp *et al.* (2012) studied how risk aversion parameters were affected by the manipulation of the intermediate pairs of options without affecting the range of the selling prices. They found that when the endpoints of the multiple price list were fixed and intermediate outcomes were decreased, participants' choices became significantly more risk averse. Finally, Loomes and Pobregna (2014) used three elicitation methods[6] finding a

[1] However, their design included confounding wealth effects from paying all experiments after subjects had performed the final one.
[2] The same set of ternary lotteries was presented to subjects in five sessions separated by at least two days and authors did not give participants the opportunity to indicate indifference.
[3] In this paper, a budget constraint precluded paying all subjects, so each subject is given only a 10% chance to actually receive the payment associated with his decision.
[4] These order effects are consistent with findings reported in Harrison *et al.* (2005).
[5] In this experiment lottery choices were presented either simultaneously or sequentially and probabilities of winning are ranked either in increasing, decreasing, or in random order.
[6] The choice list procedure, the ranking procedure (presenting a set of options and asks the respondent to identify which option they ranks top) and the allocation procedure (providing the respondent with a budget and allowing him to distribute it between different state-contingent claims).

considerable variability within -and even more, between- the results they produced. This finding suggested that not only different elicitation instruments but also framing-specific issues could interact with imprecise underlying preferences[7].

However, framing effects in the literature rely on two crucial assumptions: (1) to suppose that subjects are precise, choosing always the same answer to exactly the same question; and (2) the fulfilment of the isolation hypothesis, which implies that subjects evaluate each risk task in a RLI mechanism independently of the other tasks.

Imprecision occurs when subjects do not have a clear choice between some options and they choose between a set of contiguous options. Lévy-Garboua *et al.* (2012) pointed out that "even in decision experiments where subjects make repeated independent and identically distributed decisions among pairs of lotteries without any alteration" (p. 129) an estimable quantity of subjects reported different options over repetition. Supporting this evidence, experiments by Ballinger and Wilcox (1997) and Loomes and Sugden (1998) sustained that repetition drove subjects toward increasingly safer choices. Besides, Butler and Loomes (2011) suggested that the violations of the Expected Utility Theory could be explained by imprecision. Later, Loomes and Pogrebna (2014) found that most subjects showed variability when they answered to some questions with the aim of eliciting their risk attitude. In addition, they pointed out that the imprecision that subjects exhibited in their preferences could produce that preferences depended on the effects of the procedure. More recently, Cubitt *et al.* (2015) elicited certainty equivalents and then, using lists they associated intervals in which subjects were imprecise. They obtained that there existed imprecision which was persistent across various lotteries. Their purpose was to reach clear statements about three questions that were coherence, stability and value added to economics. The first question was whether imprecision intervals vary comprehensibly with the structure of the objects over which preferences are considered. The second one was stability, i.e. they assumed that individuals' imprecision could be affected by experience. The third issue they wanted to address was the potential value added to economics. Their main finding was that the measure they constructed in order to test imprecision varied across lotteries in an "intelligible and systematic way" (p. 5) but in contrast, it did not have a systematic change with repetition or experience. We allow subjects' imprecision including the repetition of identical risk choices in order to differentiate framing effects and preference imprecision.

[7] In this online experiment only 1/8 of the subjects randomly selected were invited to the laboratory to play out their decisions for real money.

The second crucial assumption is related to the fact that the RLI mechanism provides incentives for truthful revelation of preferences. This standard payment protocol in individual risky choice experiments involves a subject making K > 1 binary choices over objective lotteries, and then selecting one choice at random for payment. If this assumption is sustained, there should not be differences between risk preferences revealed under RLI and in the case where a subject makes only one choice, and then he/she is being paid with certainty for the single choice (1-in-1 payment procedure). Although the RLI payment system has been widely accepted by experimentalists, there are some studies pointing out that that this mechanism could not work properly in some cases. Holt (1986) presented a theoretical objection arguing that, if the reduction of compound lotteries (ROCL) axiom holds, a failure of the expected utility compound independence axiom (CIA) would suffice to reject the RLI mechanism compatibility.

Starmer and Sugden (1991) were the first ones who tested behaviourally whether the subjects' behaviour in random-lottery experiments was consistent with the ROCL assumption. Showing that the reduction principle did not hold, they discarded Holt's conjecture. Comparing choices of subjects in 1-in-1 with RLI payment procedures in experiments, Beattie and Loomes (1997) and Cubitt *et al*. (1998) supported the conclusion that the RLI payoff mechanism elicited true preferences. Contrary to this result and directly testing the CIA, Harrison and Swarthout (2014) showed that risk preference estimates obtained under RLI mechanism differed from those obtained in a 1-in-1 design. Complementary to this paper, Cox *et al*. (2014) found that risk preferences could be manipulated by integrating a second, asymmetrically dominated choice problem in a RLI mechanism behaviour. In the same vein, Harrison *et al.* (2014) highlighted the apparent problem of inferring preferences using the RLI and treating these results "as if" they were the same as those from a 1-in-1 scenario. This concern was shared by Cox *et al.* (2015) showing large differences across mechanisms in subjects' revealed risk preferences. Lastly, Brown and Healy (2016) found out that RLI was not incentive compatible when all decisions were displayed in a standard list format but it was restored when the rows of the list were randomized and shown on separate screens.

Our study argues that it cannot be concluded that changes in decisions are necessarily due to changes in framing if subjects make different decisions in identical sequentially repeated risk tasks. In this vein, we depart from the literature because we analyse framing effects taking into account contamination effects due to preference imprecision or preference for compound lotteries.

Isolating these effects, we find that the BL elicitation method is robust to manipulations in the number and/or the range of options offered in the list. Nevertheless, the CE method is not that robust because changes in the task structure modify subjects' choices.

2. Experimental Design

In order to study framing effects in the multiple price procedure we test for shifts in risk preferences due to: (1) a (a)symmetric increase of the number of pairs offered keeping constant the range (CR) of options, and (2) a (a)symmetric decrease of the number of pairs diminishing the range (DR) of options offered.

CR and DR changes are analysed using both elicitation methods. Treatment 1 (T1) and treatment 2 (T2) correspond to the PE elicitation method for CR and DR changes respectively. Treatments 3 (T3) and treatment 4 (T4) are related to the CE method for CR and DR variations respectively. Following Gonzalez and Wu (1999), we ask the subject to choose which row he/she wants to switch at to fill out the remaining choices for the subject[8].

A total of 141 subjects (34 in T1, 36 in T2 and T3, and 35 in T4) were recruited among undergraduate students from different economics or business-related courses from the University Jaume I (UJI), using standard recruitment procedures with an open call for subjects through the LEE (Laboratorio de Economía Experimental) website. Before the beginning of each session, subjects were given written instructions, which were also read aloud by the organizers. Any remaining questions were privately answered.

At the end of each session, subjects responded to a questionnaire, asking them to report the main reason why, if this was the case, they have varied choices across different trials. After that, they were privately paid in cash. All sessions were computerized and carried out in a specialized computer laboratory, using software based on the Z-Tree toolbox by Fischbacher (2007).

In the case of pairwise choices between lotteries, we present BL_9 as our baseline risk task in table 1. The name obeys to the fact that in this task subjects face a list of nine pairs of binary lotteries, which we numerate with odd numbers from one to seventeen, each pair involving a "safe" lottery (S) and a "risky" lottery (R). These labels are provided since if we compare lottery R with S, R

[8] These authors found that enforcing strict monotonicity and transitivity had no systematic effect on responses. However, Lévy-Garboua *et al.* (2012) showed that a non-negligible part of players exhibited inconsistent behavior when monotonicity was not imposed. Andersson *et al.* (2016) reported evidence that lower cognitive ability was significantly correlated with subjects having multiple switching points

offers the best payoff and the worst (null) payoff. The last three columns in Table 1 (not shown to the experimental subjects) indicate the expected euro values of the safe lottery in the pair (denoted EV_s) and that of the risky lottery (denoted EV_R), as well as the difference between the two. For the first eight rows, the risky option offers the higher expected value (EV) while for the last row, the safe option offers the higher EV, with the difference between EVs decreasing as we go down the list. Thus, the risk-neutral individual would select the R lottery in all pairs with the exception of the last one. Subjects' payoffs are selected in order to offer: (1) a sufficient reward to subjects in an experiment with multiple risk task repetitions and random lottery incentive (RLI) as payment mechanism, and (2) a wide number of pairs of lotteries where EV_R exceeds EV_s.

	Safe lottery (S)				Risky lottery (R)				EV_S	EV_R	EV_S- EV_R
	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff			
1	10%	17.5€	90%	26.70€	10%	0.0€	90%	100.0€	25.78€	90.0€	- 64.22€
3	20%	17.5€	80%	26.70€	20%	0.0€	80%	100.0€	24.86€	80.0€	- 55.14€
5	30%	17.5€	70%	26.70€	30%	0.0€	70%	100.0€	23.94€	70.0€	- 46.06€
7	40%	17.5€	60%	26.70€	40%	0.0€	60%	100.0€	23.02€	60.0€	- 36.98€
9	50%	17.5€	50%	26.70€	50%	0.0€	50%	100.0€	22.10€	50.0€	- 27.90€
11	60%	17.5€	40%	26.70€	60%	0.0€	40%	100.0€	21.18€	40.0€	- 18.82€
13	70%	17.5€	30%	26.70€	70%	0.0€	30%	100.0€	20.26€	30.0€	- 9.74€
15	80%	17.5€	20%	26.70€	80%	0.0€	20%	100.0€	19.34€	20.0€	- 0.66€
17	90%	17.5€	10%	26.70€	90%	0.0€	10%	100.0€	18.42€	10.0€	8.42€

Table 1. Pairs of lotteries offered in BL_9.

Using BL_9 as comparison, we construct four additional risk tasks: BL_{17}, BL_{13}, BL_5 and BL_7 (displayed in Appendix A). BL_{17} (BL_{13}) task symmetrically (asymmetrically) increases the number of pairs of lotteries keeping constant the range of options with respect to BL_9. Similarly, task BL_7 (BL_5) decreases the range of options offered to subjects with respect to BL_9 by symmetrically (asymmetrically) diminishing the number of pairs featured.

Subjects are asked to make repeated i.i.d. decisions among lists of pairs of options without any alteration. Specifically, in treatment 1 (2), each subject faces tasks BL_9, BL_{17} (BL_5) and BL_{13} (BL_7) in random order, six times each one of them. Repetition of tasks allows us: (1) to test for preference imprecision without explicitly ask subjects if they are sure about their risk preferences[9]. This is so since subjects choosing adjacent switching points in i.i.d. risk tasks could be classified as imprecise; (2) to control for inconsistency detecting subjects choosing not adjacent switching points. Thus, subjects who do not fulfil the isolation hypothesis that is, a failure in the functioning of the RLI mechanism. Papers like Bosch-Domènech and Silvestre (2013) allowing more than one switching point (without repetition of i.i.d. risk tasks) identify inconsistent subjects as individuals who switch to S after having already chosen R in a pair, in order to disregard them. However, preference imprecision cannot be detected with this method and subjects who are not sure about their preferences can be identified as inconsistent[10].

In both treatments, we inform subjects that three draws would be implemented to determine their payment. A first draw is carried out to choose which one of their 18 tasks will be selected; a second draw is used to randomly choose one from all pairs of lotteries contained in the selected task; a third draw given the odds of the lottery preferred by the subject in the pair, will be applied to determine individual payoffs. This design rules out possible wealth effects due to subjects' (expected) earnings from previous periods.

As regard the CE elicitation method, we use two lotteries: a safe lottery (S) and a risky one (R). In table 2 (table 3), we present CE^{S}_{11} (CE^{R}_{16}) as our baseline task. In these tasks, subjects must choose between the lottery (S or R) they have been endowed with and increasing certainty payoffs. The last columns of these tables (not shown to the experimental subjects) indicate the difference between the expected euro value of the lottery in the pair (denoted $EV_{S/R}$) and the CE. A risk-neutral individual would select the safe lottery in all pairs of the table 2 excepting the two last ones. However, a risk-neutral subject would choose the R lottery only in the three first pairs of table 3.

Pair		S			CE	EV_S-CE
1	81%	10.0€	19%	0.00€	0.00€	8.10€
3	81%	10.0€	19%	0.00€	1.00€	7.10€
5	81%	10.0€	19%	0.00€	2.00€	6.10€
7	81%	10.0€	19%	0.00€	3.00€	5.10€

[9] We feel that ask directly to participants about how sure they are about their risk preferences as Cubit *et al*. (2015) could generate a biased sample because of the concept of certainty (defined as that state of mind in which we firmly adhere to a truth) can be interpreted in very different ways by each subject.

[10] For example, a subject choosing SSRSRRR in a list of seven pairwise choices is identified as inconsistent whereas in our case a subject choosing SSRRRRR, SSSRRRR, SSSSRRR, SSRRRRR, SSSRRRR, SSSSRRR is classified as imprecise.

9	81%	10.0€	19%	0.00€	4.00€	4.10€
11	81%	10.0€	19%	0.00€	5.00€	3.10€
13	81%	10.0€	19%	0.00€	6.00€	2.10€
15	81%	10.0€	19%	0.00€	7.00€	1.10€
17	81%	10.0€	19%	0.00€	8.00€	0.10€
19	81%	10.0€	19%	0.00€	9.00€	-0.90€
21	81%	10.0€	19%	0.00€	10.00€	-1.90€

Table 2. Pairs of options offered in CE^{S}_{11}

Pair	R				CE	EV_R-CE
1	19%	45.0€	81%	0.00€	0.00€	8.55€
3	19%	45.0€	81%	0.00€	3.00€	5.55€
5	19%	45.0€	81%	0.00€	6.00€	2.55€
7	19%	45.0€	81%	0.00€	9.00€	-0.55€
9	19%	45.0€	81%	0.00€	12.00€	-3.55€
11	19%	45.0€	81%	0.00€	15.00€	-6.55€
13	19%	45.0€	81%	0.00€	18.00€	-9.55€
15	19%	45.0€	81%	0.00€	21.00€	-12.55€
17	19%	45.0€	81%	0.00€	24.00€	-15.55€
19	19%	45.0€	81%	0.00€	27.00€	-18.55€
21	19%	45.0€	81%	0.00€	30.00€	-21.55€
23	19%	45.0€	81%	0.00€	33.00€	-24.55€
25	19%	45.0€	81%	0.00€	36.00€	-27.55€
27	19%	45.0€	81%	0.00€	39.00€	-30.55€
29	19%	45.0€	81%	0.00€	42.00€	-33.55€
31	19%	45.0€	81%	0.00€	45.00€	-36.55€

Table 3. Pairs of options offered in CE^{R}_{16}

Using CE^{S}_{11} as comparison, we create four additional risk tasks: CE^{S}_{21}, CE^{S}_{16}, CE^{S}_{5} and CE^{S}_{8} (displayed in Appendix A). Task CE^{S}_{21} (CE^{S}_{16}) symmetrically (asymmetrically) increases the number of certainty payoffs without increasing their range with respect to CE^S_{11}. Additionally, task CE^S_5 (CE^S_8) decreases the range of options offered to subjects with respect to CE^S_{11} by symmetrically (asymmetrically) diminishing the number of certainty payoffs featured.

In like manner, we use CE^R_{16} as benchmark to compare with four additional risk tasks: CE^R_{31}, CE^R_{23}, CE^R_{10} and CE^R_9. Task CE^R_{31} (CE^R_{16}) symmetrically (asymmetrically) increases the number of sure payoffs without increasing their range with respect to CE^R_{21}. Additionally, task CE^R_{10} (CE^R_9) decreases the range of options offered to subjects with respect to CE^R_{21} by symmetrically (asymmetrically) diminishing the number of certainty payoffs featured, as one can observe in table 14 (table 15).

In treatment 3 (treatment 4), all subjects complete in random order tasks CE^S_{11}, CE^S_{21} (CE^S_5), CE^S_{16} (CE^S_8), CE^S_{16}, CE^R_{31} (CE^R_{10}) and CE^R_{23} (CE^R_9). All tasks are repeated six times in both treatments. In this case, subjects are informed that until three draws could be necessary to calculate their payment, avoiding aforementioned wealth effects. A first draw is used to choose which one of their 36 tasks will be selected; a second draw is put through to choose one from all pairs of options contained in the selected task; in case that the chosen option is the lottery, a third draw will be implemented to obtain subjects payoffs.

To sum up the experimental design, a summary of the treatments is presented in table 4.

Treatment	Subjects	Tasks	Type of framing effect
T1	34	BL_9, BL_{17}, BL_{13}	Constant range (CR)
T2	36	BL_9, BL_5, BL_7	Decreased range (DR)
T3	36	CE^S_{11}, CE^S_{21}, CE^S_{16} CE^R_{16}, CE^R_{31}, CE^R_{23}	Constant range (CR)
T4	35	CE^S_{11}, CE^S_5, CE^S_8 CE^R_{16}, CE^R_{10}, CE^R_9	Decreased range (DR)

Table 4: Summary treatments

3. Data analysis

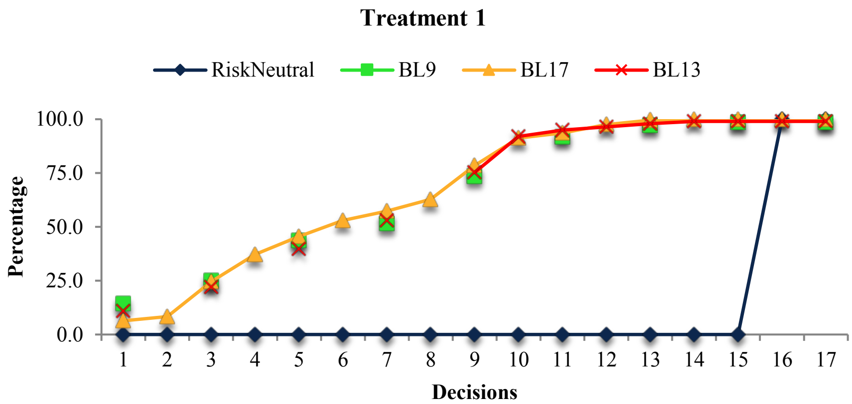
3.1. Statistical tests

In order to analyse framing effects, we use a Wilcoxon Rank-Sum test, which is a nonparametric test alternative to the two-sample t-test. Specifically, this test is used to compare the percentage of safe choices (in the PE method) or the certainty choices (in the CE method) taking place under two different frameworks for the same sample of subjects. We apply a Bonferroni correction[11] to take into account the problem of false positives in multiple pair comparisons.

By repetition of the same risk task six times, we are able to analyse in a within-subject framework the variability of subjects' choices within each i.i.d. task. This allows us to classify subjects depending on their variability within i.i.d. tasks. We name *"constant"* (C) subjects to individuals who always choose the same option in i.i.d. tasks. Alternatively, we classify subjects who do not choose the same option in i.i.d. tasks in two types: *"imprecise"* (I) subjects, those who choose adjacent options; and "*inconsistent*" subjects, those whose choices are not adjacent. Based on answers to a questionnaire (where they have to report the main reason why, if this were the case, they varied their choices across risk tasks), the subjects who were classified as imprecise mainly informed that they do not have a clear choice between some adjacent pairs. Those classified as inconsistent subjects violate the isolation hypothesis, and the RLI mechanism does not provide incentives for truthful revelation of their preferences. Consequently, we will consider his/her deletion from our sample later.

3.1.1. Binary Lotteries method

In figures 1 and 2, we present the average rate of safe choices per pair of options in each BL task included in T1 and T2. In both treatments, the benchmark lottery is BL_9. In T1 we symmetrically (asymmetrically) increase the number of pairs offered keeping constant the range of options by means of BL_{17} (BL_{13}). In T2, we symmetrically (asymmetrically) decrease the number of pairs diminishing the range of options offered by means of BL_5 (BL_7).



[11] The Bonferroni correction consists in multiplying the p-value by the number of pair comparisons, resulting in a rather demanding threshold for rejection.

Figure 1. Average rate of safe choices per pair in the BL task in T1.

In T1, where the range is constant, the differences among the average rate of safe choices in the risk tasks is, in general, unnoticeable. Specifically, when we expand symmetrically the number of pairs (from BL_9 to BL_{17}) we do not find significant differences between the percentages of safe lotteries chosen by subjects in the same pair.[12] An identical result is obtained when the number of options increases asymmetrically (from BL_9 to BL_{13} or from BL_{13} to BL_{17}). Therefore, we can conclude that:

Result 1: *An increase (symmetric or asymmetric) in the number of pairs offered in the PE method, keeping constant the range encompassing the options, does not produce framing effects.*

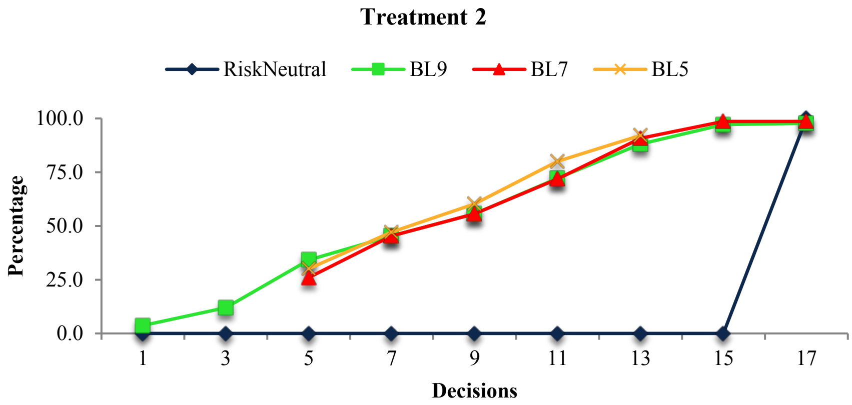


Figure 2. Average rate of safe choices per pair in the BL task in T2.

In T2, we present a symmetric or an asymmetric decrease in the number of pairs offered decreasing the range of options. Specifically, in task BL_7 (BL_5) the range of options offered decreases respect to the baseline task diminishing symmetrically (asymmetrically) the number of pairs. Comparing BL_9 and BL_7, no significant differences[13] between the percentage of safe lotteries chosen by subjects in the common pairs are found. The same results are found when we compare BL_9 with BL_5. In consequence, we can state that:

Result 2: *A decrease (symmetric or asymmetric) in the number of pairs offered in the PE method, reducing the range encompassing the options, does not generate framing effects.*

The previous analysis is based on the entire sample, including constant and imprecise subjects (C&I hereafter) and those inconsistent. We repeat the above analysis considering C&I subjects and

[12] All Bonferroni-corrected Wilcoxon test p-values corresponding to each pair are above 0.05.
[13] All Bonferroni-corrected Wilcoxon test p-values corresponding to each pair are above 0.05.

disregarding inconsistent individuals because they do not fulfil the isolation hypothesis.

Figures 3 and 4 reformulate the empirical evidence of figures 1 and 2 presenting the average rate of safe choices per pair of options only for constant and imprecise subjects.

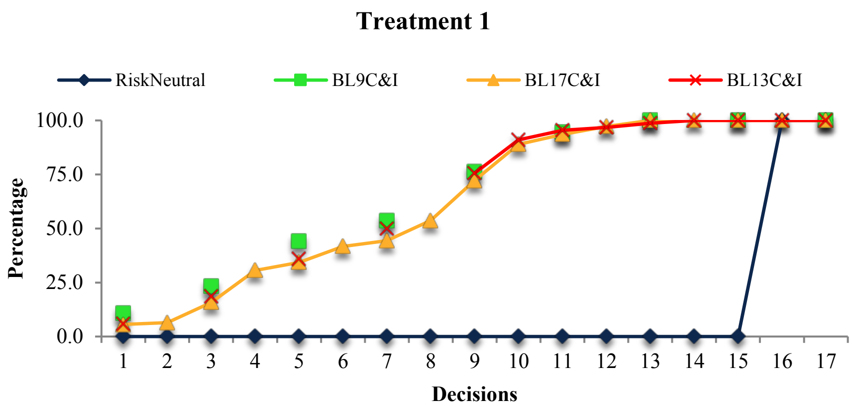


Figure 3. Average rate of safe choices per pair in the BL task for constant and imprecise subjects in T1.

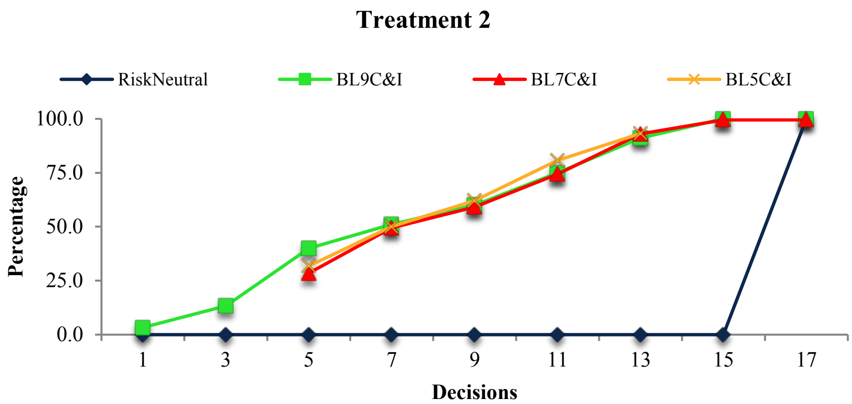


Figure 4. Average rate of safe choices per pair in the BL task for constant and imprecise subjects in T2.

In all aforementioned comparisons, we obtain identical results to the full sample case ones, i.e. no framing effects are found.

Result 3: *In both cases, considering or disregarding subjects preferring compound lotteries, no framing effects are found in the BL method*[14].

[14] The same conclusion in reached when only the first decision in each pair is used instead of the mean of the six repetitions.

These results contrast with some authors who have analysed the same method searching for framing effects. Andersen *et al*. (2006) found that choices were affected by order and lottery range when they deleted the two worst pairs. More recently Bosch-Domènech and Silvestre (2013) found out that when some pairs were removed the subjects' choices change, what they called embedding bias.

3.1.2. Certainty equivalence method

Framing effects in the CE method are analysed by means of T3 and T4. In T3, we symmetrically/asymmetrically increase the number of certainty payoffs keeping constant their range respect to the baseline tasks (CE^{S}_{11} or CE^{R}_{16}). In T4, we decrease the range of options offered to subjects respect to the baseline tasks symmetrically/asymmetrically diminishing the number of certainty payoffs.

Figure 5 and 6 display the average percentage of certain choices in both the safe and the risky lottery respectively per pair in the CE task presented in T3.

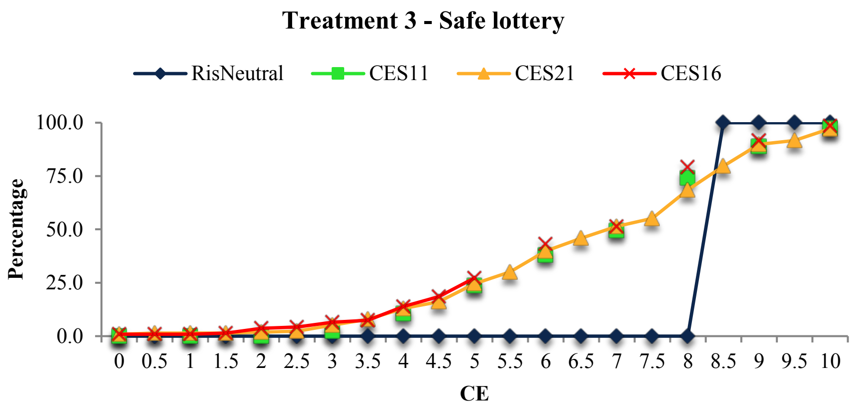


Figure 5. Average percentage of certain choices per pair preferred to the safe lottery in T3.

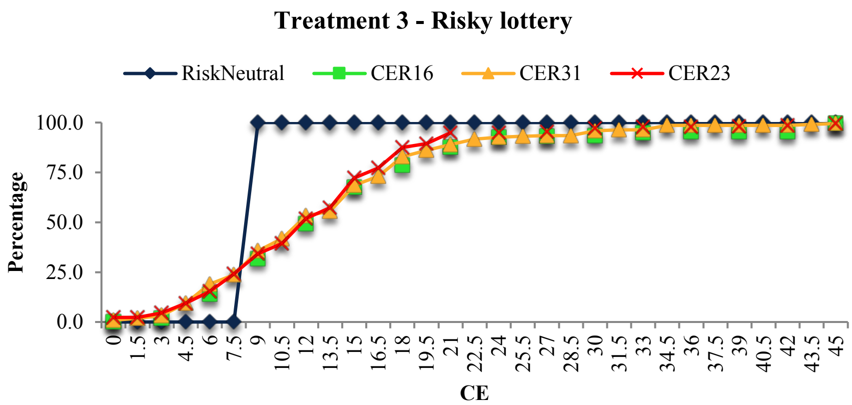


Figure 6. Average percentage of certain choices per pair preferred to the risky lottery in T3.

In general, when we symmetrically (from CE^{S}_{11} to CE^{S}_{21} and from CE^{R}_{16} to CE^{R}_{31}) or asymmetrically (from CE^{S}_{11} to CE^{S}_{16} or from CE^{S}_{16} to CE^{S}_{21} and from CE^{R}_{16} to CE^{R}_{23} or from CE^{R}_{23} to CE^{R}_{31}) increase the number of certainty payoffs, without changing the range of options, we do not find significant differences between the percentage of certainty equivalents chosen by subjects in the same pair. An exception is found when we compare CE^{R}_{16} and CE^{R}_{23} for a selling price of 18€[15].

Result 4: *An asymmetric expansion of the number of pairs offered keeping constant the range covering the options does produce framing effects.*

Figures 7 and 8, we present the average percentage of certain choices in both the safe and the risky lotteries respectively per pair in the CE task presented in T4, in which the range of options the subject copes to has been reduced.

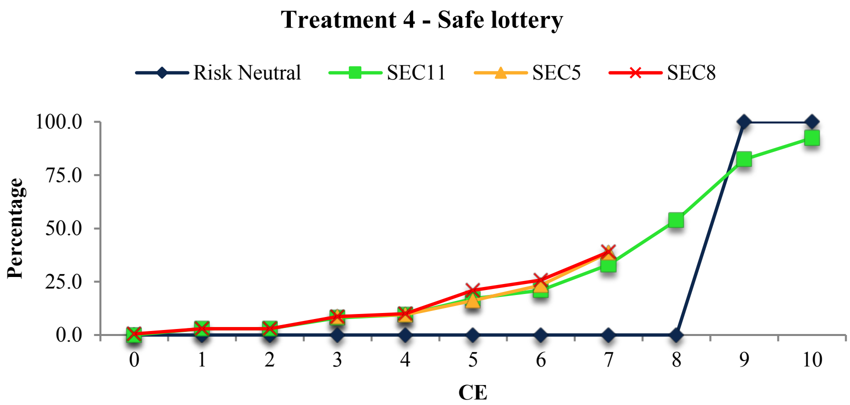


Figure 7. Average percentage of certain choices per pair preferred to the safe lottery in T4.

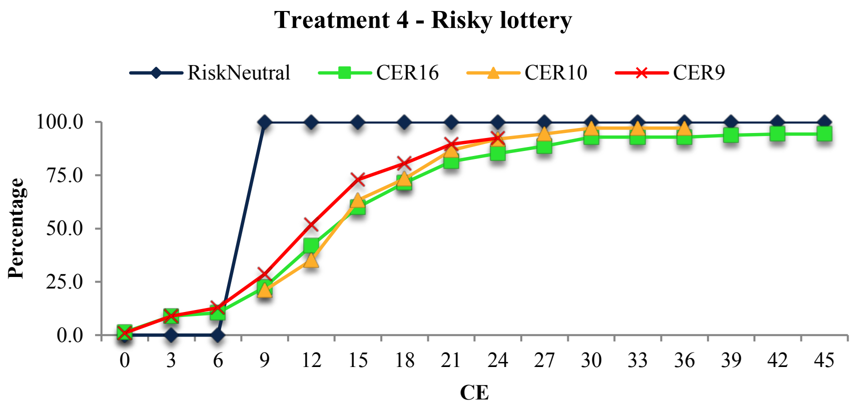


Figure 8. Average percentage of certain choices per pair preferred to the safe lottery in T4.

[15] There is a framing effect after computing the Bonferroni-corrected Wilcoxon at a 10% level of significance.

It is important to note that in the safe (risky) lottery, we symmetrically reduce the number of certainty payoffs between CE^S_{11} and CE^S_5 (CE^R_{16} and CE^R_{10}), whereas the number of certainty payoffs is asymmetrically decreased between CE^S_{11} and CE^S_8 (CE^R_{16} and CE^R_9), and between CE^S_5 and CE^S_8 (CE^R_{10} and CE^R_9).

We find significant differences between the percentage of certain choices selected only for the risky lottery in the following cases: (a) comparing CE^R_{16} and CE^R_{10} for selling prices 24€, 27€, 30€, 33€ and 36€[16]; (b) comparing CE^R_{10} and CE^R_9 for selling prices of 12€ and 18€[17]; and (c) in the comparison between CE^R_{16} and CE^R_9 for selling prices of 9€, 12€, 15€ and 18€[18].

Result 5: *A reduction (symmetric or asymmetric) in the number of certainty payoffs diminishing the range encompassing the options offered produces framing effects for a large number of selling prices.*

Like in the BL method, we remove from our sample the inconsistent subjects, thus only constant and imprecise subjects are considered.

In figures 9 and 10, we present the average percentage of certain choices per pair preferred to the safe and the risky lottery respectively, for constant and imprecise subjects in T3.

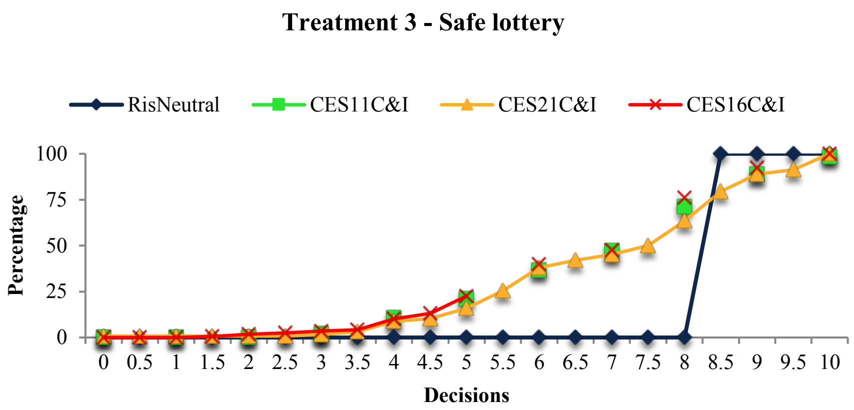


Figure 9. Average percentage of certain choices per pair preferred to the safe lottery in T3.

[16] Bonferroni-corrected Wilcoxon test p-values are 0.07, 0.06, 0.07, 0.07 and 0.07 respectively after multiplying the original p-values by 15.
[17] Bonferroni-corrected Wilcoxon test p-values are 0.012 and 0.090 after multiplying the original p-values by 6.
[18] Bonferroni-corrected Wilcoxon test p-values are 0.063, 0.012, 0.090 and 0.072 after multiplying the original p-values by 9.

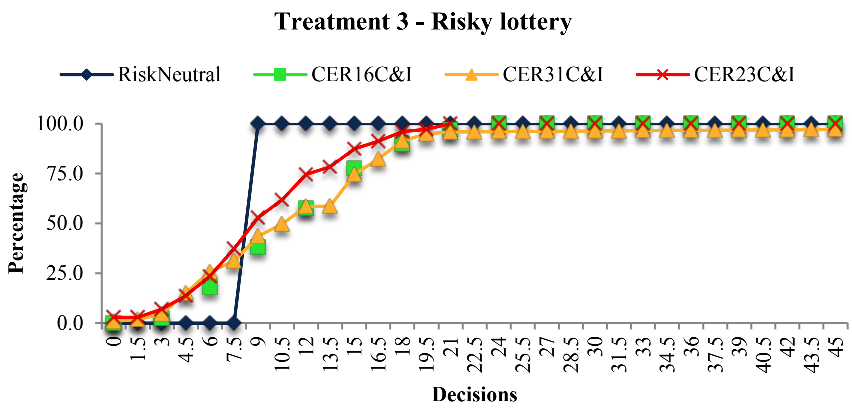


Figure 10. Average percentage of certain choices per pair preferred to the risky lottery in T3.

A (a)symmetric increase in the number of certainty payoffs without changing the range of options and removing inconsistent subjects does not produce framing effects.[19]

Result 6: *An increase (symmetric or asymmetric) in the number of certainty payoffs keeping constant the range covering the options offered and removing inconsistent subjects does not produce framing effects.*

In figures 11 and 12, we present the average percentage of certain choices per pair preferred to the safe and the risky lottery respectively, for constant and imprecise subjects in T4.

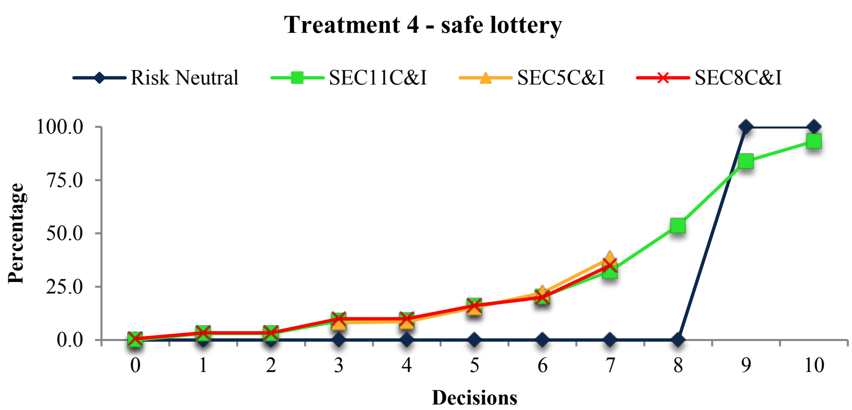


Figure 11. Average percentage of certain choices per pair preferred to the safe lottery in T4.

[19] All Bonferroni-corrected Wilcoxon test p-values are above 0.05.

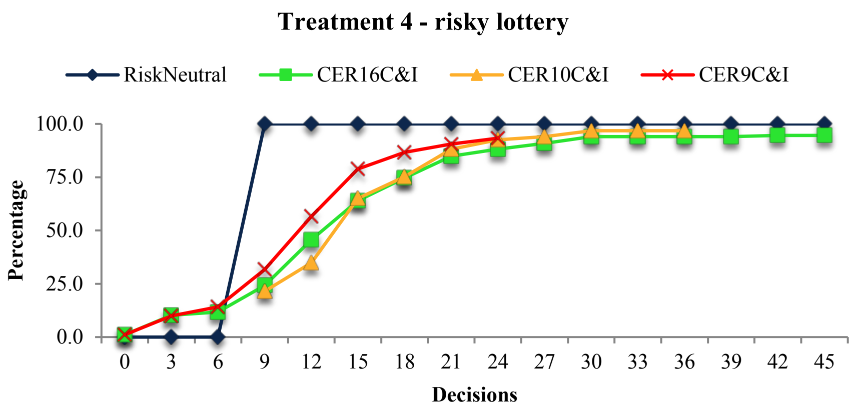


Figure 12. Average percentage of certain choices per pair preferred to the risky lottery in T4.

Unlike the full sample case, when we exclude inconsistent subjects and reduce symmetrically the number of certainty payoffs decreasing the range of options offered, no significant differences[20] are found in the average rate of adoption of the certainty equivalent. However, the removal of these subjects cannot completely eliminate all framing effects generated by reducing asymmetrically the number of sure payoffs offered decreasing the range: we find that the previous differences obtained in the comparison of CE^R_{16} and CE^R_9 disappear, but the ones between CE^R_{10} and CE^R_9 still remain[21].

Result 7: *Removing inconsistent subjects, a symmetric decrease in the number of certainty payoffs offered reducing the range of options does not generate framing effects. Nevertheless, disregarding these subjects reduces, but not completely deletes framing effects if the number of selling prices is reduced asymmetrically, diminishing the range of options*[22].

These results nuance those of Blavatsky and Koehler (2009) inferring that the range of feasible minimum selling prices systematically affects elicited prices, and those of Bosch-Domènech and Silvestre (2013) concluding that the CE method is robust.

3.2. Regression analysis

3.2.1. Binary Lotteries (BL)

In this subsection, we estimate different models to shed light on the determinants of framing effects

[20] All Bonferroni-corrected Wilcoxon test p-values are above 0.05.
[21] Bonferroni-corrected Wilcoxon test p-values corresponding to 9€, 12€, 15€ and 18€ are 0.066, 0.018, 0.054 and 0.042 respectively after multiplying the original p-values by 6.
[22] The same conclusion in reached when only the first decision in each pair is used instead of the mean of the six repetitions.

and to corroborate our previous results.

Table 5 includes as explanatory variables the tasks (lotteries) subjects face in random order in each treatment and period. In other words, all the tasks that modify our baseline lottery (BL9). The modifications are based on changes in the number of options offered with and without decreasing the range. Additionally, we have two different models for each treatment: one includes the entire sample and the other includes only consistent and imprecise subjects.

BL choices	T1	T1 (C&I)	T2	T2 (C&I)
BL13	0.0560	0.0215		
	(0.0789)	(0.104)		
BL17	-0.0473	-0.0270		
	(0.0794)	(0.104)		
BL5			-0.163	0.175
			(0.114)	(0.140)
BL7			0.0851	0.263
			(0.114)	(0.140)
Period	-0.0222	-0.000924	0.00823	0.0117
	(0.0189)	(0.0248)	(0.0274)	(0.0333)
Constant	-0.846***	-0.762***	-1.015**	-1.426**
	(0.206)	(0.292)	(0.469)	(0.603)
N	31	17	36	26

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. BL models for the entire sample and for constant and imprecise subjects only.

These models corroborate our *Results 1, 2* and *3*. Any modifications in the number of pairs offered with and without changing the range encompassing the options do not produce framing effects in binary lotteries. These results hold not only for consistent and imprecise subjects, but also for the entire sample. Thus, this version of the multiple price list procedure is robust to framing effects.

3.2.2. Certainty Equivalent (CE)

The aim of this subsection is the same that in the previous one, but now for the certainty equivalence version.

Table 6 includes as explanatory variables the different certainty equivalent modifications faced by subjects in random order in each different treatment (for safe and risky lotteries) and the period. In other words, all the modifications made to our baseline lotteries (CE^{S}_{11} and CE^{R}_{16}) in the number of options offered with and without decreasing the range. Furthermore, we have two different models for each treatment: one includes the entire sample and the other includes only consistent and imprecise subjects.

CE decision	T3 Safe	T3 Safe C&I	T3 Risky	T3 Risky C&I	T4 Safe	T4 Safe C&I	T4 Risky	T4 Risky C&I
CE^{S16}	-0.123*	-0.0559						
	(0.0644)	(0.0927)						
CE^{S}_{21}	-0.0258	0.0790						
	(0.0651)	(0.0937)						
CE^{R}_{23}			-0.134**	0.0143				
			(0.0554)	(0.111)				
CE^{R}_{31}			-0.110**	0.00703				
			(0.0551)	(0.109)				
CE^{S}_{5}					-0.180	-0.366		
					(0.172)	(0.230)		
CE^{S}_{8}					-0.378**	-0.665***		
					(0.168)	(0.222)		
CE^{R}_{10}							-0.740***	-0.815***
							(0.0897)	(0.123)
CE^{R}_{9}							-0.246***	-0.266**
							(0.0752)	(0.106)
Period	-0.00800	0.00571	-9.81e-05	-4.78e-05	0.0974**	0.0764	0.00378	0.000547
	(0.0156)	(0.0223)	(0.0132)	(0.0262)	(0.0401)	(0.0521)	(0.0195)	(0.0274)
Constant	0.706***	0.856***	-0.835***	-1.386***	3.429***	4.177***	0.620***	0.646*
	(0.144)	(0.203)	(0.127)	(0.191)	(0.638)	(0.687)	(0.236)	(0.351)
N	36	18	36	11	34	26	32	16

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. CE models for the entire sample and for constant and imprecise subjects only.

From the previous models our *Result 4, 5* and *7* are corroborated with this additional analysis. The only difference found is respect to our *Result 6*. The deletion of inconsistent subjects from the sample does not eliminate all the framing effects in the regression analysis. This fact is because in the statistical tests, the Bonferroni correction was used and it is quite restrictive. Nevertheless, in general terms, the same conclusion is found: this version of the multiple price list procedure is not robust to framing effects. Modifications in the structure (number of options and range) of the CE used produce modifications in the risk attitude of subjects.

4. Conclusions

In this study, the robustness of two different choice list methods has been analysed: the BL method, where subjects face pairwise choices between lotteries within a choice list, and the CE method, where subjects were asked to state a minimum selling price to give up the lottery they have been endowed with. In order to analyse framing effects we have implemented a within subjects experiment, allowing for preference imprecision and controlling for the proper work of the Random Lottery Incentive Mechanism, by means of the repetition of i.i.d. risk elicitation tasks. The framing effects analysed include shifts in risk preferences due to a (a)symmetric increase in the number of pairs offered keeping constant the range of options, and a (a)symmetric in the number of pairs diminishing the range of options offered.

By means of a six times repetition of each identical risk task, we classify subjects depending on their variability within i.i.d. tasks in three categories: constant subjects, those who always choose the same option; imprecise subjects, those who choose adjacent options; and inconsistent subjects, those whose choices are not adjacent. The latter subjects violate the isolation hypothesis, driving a bad functioning of the RLI mechanism used to reward them in the experiment. For this reason, they are disregarded of the sample in part of our analysis in order to analyse if their presence in the sample is the fact that may drive framing effects.

In the BL elicitation method, we do not find framing effects, either considering inconsistent subjects or disregarding them from our sample. However, the CE method does not seem as robust as the BL method, especially if inconsistent subjects are not removed from the sample. Particularly, if only constant and imprecise subjects are considered, all framing effects found in the full sample analysis disappear with the exception of the selling prices when the range is diminished.

Summing up, some changes in risk preferences attributed to framing effects in the literature can really correspond to a malfunctioning of the RLI mechanism used to reward subjects in most experiments.

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Appendix

Binary Lotteries (BL) method

Lottery Pair	Safe lottery (S)				Risky lottery (R)				EV_S	EV_R	EV_S- EV_R
	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff			
1	10%	17.5€	90%	26.70€	10%	0.0€	90%	100.0€	25.78€	90.0€	- 64.22€
2	15%	17.5€	85%	26.70€	15%	0.0€	85%	100.0€	25.32€	85.0€	- 59.68€
3	20%	17.5€	80%	26.70€	20%	0.0€	80%	100.0€	24.86€	80.0€	- 55.14€
4	25%	17.5€	75%	26.70€	25%	0.0€	75%	100.0€	24.40€	75.0€	- 50.60€
5	30%	17.5€	70%	26.70€	30%	0.0€	70%	100.0€	23.94€	70.0€	- 46.06€
6	35%	17.5€	65%	26.70€	35%	0.0€	65%	100.0€	23.48€	65.0€	- 41.52€
7	40%	17.5€	60%	26.70€	40%	0.0€	60%	100.0€	23.02€	60.0€	- 36.98€
8	45%	17.5€	55%	26.70€	45%	0.0€	55%	100.0€	23.56€	55.0€	- 31.44€
9	50%	17.5€	50%	26.70€	50%	0.0€	50%	100.0€	22.10€	50.0€	- 27.90€
10	55%	17.5€	45%	26.70€	55%	0.0€	45%	100.0€	21.64€	45.0€	- 23.36€
11	60%	17.5€	40%	26.70€	60%	0.0€	40%	100.0€	21.18€	40.0€	- 18.82€
12	65%	17.5€	35%	26.70€	65%	0.0€	35%	100.0€	20.72€	35.0€	- 14.28€
13	70%	17.5€	30%	26.70€	70%	0.0€	30%	100.0€	20.26€	30.0€	- 9.74€
14	75%	17.5€	25%	26.70€	75%	0.0€	25%	100.0€	19.70€	25.0€	- 5.30€
15	80%	17.5€	20%	26.70€	80%	0.0€	20%	100.0€	19.34€	20.0€	- 0.66€
16	85%	17.5€	15%	26.70€	85%	0.0€	15%	100.0€	18.88€	15.0€	3.88€
17	90%	17.5€	10%	26.70€	90%	0.0€	10%	100.0€	18.42€	10.0€	8.42€

Table 5. Pairs of lotteries offered in BL_{17}

Lottery Pair	Safe lottery (S)				Risky lottery (R)				EV_S	EV_R	EV_S- EV_R
	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff			
1	10%	17.5€	90%	26.70€	10%	0.0€	90%	100.0€	25.78€	90.0€	- 64.22€
3	20%	17.5€	80%	26.70€	20%	0.0€	80%	100.0€	24.86€	80.0€	- 55.14€
5	30%	17.5€	70%	26.70€	30%	0.0€	70%	100.0€	23.94€	70.0€	- 46.06€
7	40%	17.5€	60%	26.70€	40%	0.0€	60%	100.0€	23.02€	60.0€	- 36.98€
9	50%	17.5€	50%	26.70€	50%	0.0€	50%	100.0€	22.10€	50.0€	- 27.90€
10	55%	17.5€	45%	26.70€	55%	0.0€	45%	100.0€	21.64€	45.0€	- 23.36€
11	60%	17.5€	40%	26.70€	60%	0.0€	40%	100.0€	21.18€	40.0€	- 18.82€
12	65%	17.5€	35%	26.70€	65%	0.0€	35%	100.0€	20.72€	35.0€	- 14.28€
13	70%	17.5€	30%	26.70€	70%	0.0€	30%	100.0€	20.26€	30.0€	- 9.74€
14	75%	17.5€	25%	26.70€	75%	0.0€	25%	100.0€	19.70€	25.0€	- 5.30€
15	80%	17.5€	20%	26.70€	80%	0.0€	20%	100.0€	19.34€	20.0€	- 0.66€
16	85%	17.5€	15%	26.70€	85%	0.0€	15%	100.0€	18.88€	15.0€	3.88€
17	90%	17.5€	10%	26.70€	90%	0.0€	10%	100.0€	18.42€	10.0€	8.42€

Table 6. Pairs of lotteries offered in BL_{13}

Lottery Pair	Safe lottery (S)				Risky lottery (R)				EV_S	EV_R	EV_S- EV_R
	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff			
5	30%	17.5€	70%	26.70€	30%	0.0€	70%	100.0€	23.94€	70.0€	- 46.06€
7	40%	17.5€	60%	26.70€	40%	0.0€	60%	100.0€	23.02€	60.0€	- 36.98€
9	50%	17.5€	50%	26.70€	50%	0.0€	50%	100.0€	22.10€	50.0€	- 27.90€
11	60%	17.5€	40%	26.70€	60%	0.0€	40%	100.0€	21.18€	40.0€	- 18.82€
13	70%	17.5€	30%	26.70€	70%	0.0€	30%	100.0€	20.26€	30.0€	- 9.74€

Table 7. Pairs of lotteries offered in BL_5

Lottery Pair	Safe lottery (S)				Risky lottery (R)				EV_S	EV_R	EV_S- EV_R
	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff	Prob.	Payoff			
5	30%	17.5€	70%	26.70€	30%	0.0€	70%	100.0€	23.94€	70.0€	- 46.06€
7	40%	17.5€	60%	26.70€	40%	0.0€	60%	100.0€	23.02€	60.0€	- 36.98€
9	50%	17.5€	50%	26.70€	50%	0.0€	50%	100.0€	22.10€	50.0€	- 27.90€
11	60%	17.5€	40%	26.70€	60%	0.0€	40%	100.0€	21.18€	40.0€	- 18.82€
13	70%	17.5€	30%	26.70€	70%	0.0€	30%	100.0€	20.26€	30.0€	- 9.74€
15	80%	17.5€	20%	26.70€	80%	0.0€	20%	100.0€	19.34€	20.0€	- 0.66€
17	90%	17.5€	10%	26.70€	90%	0.0€	10%	100.0€	18.42€	10.0€	8.42€

Table 8. Pairs of lotteries offered in BL_7

Certainty equivalent (CE) method

Safe lotteries:

Pair	S				CE	EV_S-CE
1	81%	10.0€	19%	0.00€	0.00€	8.10€
2	81%	10.0€	19%	0.00€	0.50€	7.60€
3	81%	10.0€	19%	0.00€	1.00€	7.10€
4	81%	10.0€	19%	0.00€	0.50€	6.60€
5	81%	10.0€	19%	0.00€	2.00€	6.10€
6	81%	10.0€	19%	0.00€	2.50€	5.60€
7	81%	10.0€	19%	0.00€	3.00€	5.10€
8	81%	10.0€	19%	0.00€	3.50€	4.60€
9	81%	10.0€	19%	0.00€	4.00€	4.10€
10	81%	10.0€	19%	0.00€	4.50€	3.60€
11	81%	10.0€	19%	0.00€	5.00€	3.10€
12	81%	10.0€	19%	0.00€	5.50€	2.60€
13	81%	10.0€	19%	0.00€	6.00€	2.10€

14	81%	10.0€	19%	0.00€	6.50€	1.60€
15	81%	10.0€	19%	0.00€	7.00€	1.10€
16	81%	10.0€	19%	0.00€	7.50€	0.60€
17	81%	10.0€	19%	0.00€	8.00€	0.10€
18	81%	10.0€	19%	0.00€	8.50€	-0.40€
19	81%	10.0€	19%	0.00€	9.00€	-0.90€
20	81%	10.0€	19%	0.00€	9.50€	-1.40€
21	81%	10.0€	19%	0.00€	10.00€	-1.90€

Table 9. Pairs of options offered in CE^S_{21}

Pair	S				CE	EV_S-CE
1	81%	10.0€	19%	0.00€	0.00€	8.10€
2	81%	10.0€	19%	0.00€	0.50€	7.60€
3	81%	10.0€	19%	0.00€	1.00€	7.10€
4	81%	10.0€	19%	0.00€	0.50€	6.60€
5	81%	10.0€	19%	0.00€	2.00€	6.10€
6	81%	10.0€	19%	0.00€	2.50€	5.60€
7	81%	10.0€	19%	0.00€	3.00€	5.10€
8	81%	10.0€	19%	0.00€	3.50€	4.60€
9	81%	10.0€	19%	0.00€	4.00€	4.10€
10	81%	10.0€	19%	0.00€	4.50€	3.60€
11	81%	10.0€	19%	0.00€	5.00€	3.10€
13	81%	10.0€	19%	0.00€	6.00€	2.10€
15	81%	10.0€	19%	0.00€	7.00€	1.10€
17	81%	10.0€	19%	0.00€	8.00€	0.10€
19	81%	10.0€	19%	0.00€	9.00€	-0.90€
21	81%	10.0€	19%	0.00€	10.00€	-1.90€

Table 10. Pairs of options offered in CE^S_{16}

Pair		S			CE	EV_S-CE
7	81%	10.0€	19%	0.00€	3.00€	5.10€
9	81%	10.0€	19%	0.00€	4.00€	4.10€
11	81%	10.0€	19%	0.00€	5.00€	3.10€
13	81%	10.0€	19%	0.00€	6.00€	2.10€
15	81%	10.0€	19%	0.00€	7.00€	1.10€

Table 11. Pairs of options offered in CE^S_5

Pair		S			CE	EV_S-CE
1	81%	10.0€	19%	0.00€	0.00€	8.10€
3	81%	10.0€	19%	0.00€	1.00€	7.10€
5	81%	10.0€	19%	0.00€	2.00€	6.10€
7	81%	10.0€	19%	0.00€	3.00€	5.10€
9	81%	10.0€	19%	0.00€	4.00€	4.10€
11	81%	10.0€	19%	0.00€	5.00€	3.10€
13	81%	10.0€	19%	0.00€	6.00€	2.10€
15	81%	10.0€	19%	0.00€	7.00€	1.10€

Table 12. Pairs of options offered in CE^S_8

Risky lotteries:

Pair		R			CE	EV_R-CE
1	19%	45.0€	81%	0.00€	0.00€	8.55€
2	19%	45.0€	81%	0.00€	1.50€	7.05€
3	19%	45.0€	81%	0.00€	3.00€	5.55€
4	19%	45.0€	81%	0.00€	4.50€	4.05€
5	19%	45.0€	81%	0.00€	6.00€	2.55€
6	19%	45.0€	81%	0.00€	7.50€	1.05€

7	19%	45.0€	81%	0.00€	9.00€	-0.55€
8	19%	45.0€	81%	0.00€	10.50€	-2.05€
9	19%	45.0€	81%	0.00€	12.00€	-3.55€
10	19%	45.0€	81%	0.00€	13.50€	-5.05€
11	19%	45.0€	81%	0.00€	15.00€	-6.55€
12	19%	45.0€	81%	0.00€	16.50€	-8.05€
13	19%	45.0€	81%	0.00€	18.00€	-9.55€
14	19%	45.0€	81%	0.00€	19.50€	-11.05€
15	19%	45.0€	81%	0.00€	21.00€	-12.55€
16	19%	45.0€	81%	0.00€	22.50€	-14.05€
17	19%	45.0€	81%	0.00€	24.00€	-15.55€
18	19%	45.0€	81%	0.00€	25.50€	-17.05€
19	19%	45.0€	81%	0.00€	27.00€	-18.55€
20	19%	45.0€	81%	0.00€	28.50€	-20.05€
21	19%	45.0€	81%	0.00€	30.00€	-21.55€
22	19%	45.0€	81%	0.00€	31.50€	-23.05€
23	19%	45.0€	81%	0.00€	33.00€	-24.55€
24	19%	45.0€	81%	0.00€	34.50€	-26.05€
25	19%	45.0€	81%	0.00€	36.00€	-27.55€
26	19%	45.0€	81%	0.00€	37.50€	-29.05€
27	19%	45.0€	81%	0.00€	39.00€	-30.55€
28	19%	45.0€	81%	0.00€	40.50€	-32.05€
29	19%	45.0€	81%	0.00€	42.00€	-33.55€
30	19%	45.0€	81%	0.00€	43.50€	-35.05€
31	19%	45.0€	81%	0.00€	45.00€	-36.55€

Table 13. Pairs of options offered in CE^{R}_{31}

Pair		R			CE	EV_R-CE
1	19%	45.0€	81%	0.00€	0.00€	8.55€
2	19%	45.0€	81%	0.00€	1.50€	7.05€
3	19%	45.0€	81%	0.00€	3.00€	5.55€
4	19%	45.0€	81%	0.00€	4.50€	4.05€
5	19%	45.0€	81%	0.00€	6.00€	2.55€
6	19%	45.0€	81%	0.00€	7.50€	1.05€
7	19%	45.0€	81%	0.00€	9.00€	-0.55€
8	19%	45.0€	81%	0.00€	10.50€	-2.05€
9	19%	45.0€	81%	0.00€	12.00€	-3.55€
10	19%	45.0€	81%	0.00€	13.50€	-5.05€
11	19%	45.0€	81%	0.00€	15.00€	-6.55€
12	19%	45.0€	81%	0.00€	16.50€	-8.05€
13	19%	45.0€	81%	0.00€	18.00€	-9.55€
14	19%	45.0€	81%	0.00€	19.50€	-11.05€
15	19%	45.0€	81%	0.00€	21.00€	-12.55€
17	19%	45.0€	81%	0.00€	24.00€	-15.55€
19	19%	45.0€	81%	0.00€	27.00€	-18.55€
21	19%	45.0€	81%	0.00€	30.00€	-21.55€
23	19%	45.0€	81%	0.00€	33.00€	-24.55€
25	19%	45.0€	81%	0.00€	36.00€	-27.55€
27	19%	45.0€	81%	0.00€	39.00€	-30.55€
29	19%	45.0€	81%	0.00€	42.00€	-33.55€
31	19%	45.0€	81%	0.00€	45.00€	-36.55€

Table 14. Pairs of options offered in CE^R_{23}

Pair		R			CE	EV_R-CE
7	19%	45.0€	81%	0.00€	9.00€	-0.55€
9	19%	45.0€	81%	0.00€	12.00€	-3.55€

11	19%	45.0€	81%	0.00€	15.00€	-6.55€
13	19%	45.0€	81%	0.00€	18.00€	-9.55€
15	19%	45.0€	81%	0.00€	21.00€	-12.55€
17	19%	45.0€	81%	0.00€	24.00€	-15.55€
19	19%	45.0€	81%	0.00€	27.00€	-18.55€
21	19%	45.0€	81%	0.00€	30.00€	-21.55€
23	19%	45.0€	81%	0.00€	33.00€	-24.55€
25	19%	45.0€	81%	0.00€	36.00€	-27.55€

Table 15. Pairs of options offered in CE^R_{10}

Pair	R				CE	EV_R-CE
1	19%	45.0€	81%	0.00€	0.00€	8.55€
3	19%	45.0€	81%	0.00€	3.00€	5.55€
5	19%	45.0€	81%	0.00€	6.00€	2.55€
7	19%	45.0€	81%	0.00€	9.00€	-0.55€
9	19%	45.0€	81%	0.00€	12.00€	-3.55€
11	19%	45.0€	81%	0.00€	15.00€	-6.55€
13	19%	45.0€	81%	0.00€	18.00€	-9.55€
15	19%	45.0€	81%	0.00€	21.00€	-12.55€
17	19%	45.0€	81%	0.00€	24.00€	-15.55€

Table 16. Pairs of options offered in CE^R_9