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Separated decisions☆

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ABSTRACT

We use experiments to test the incentive compatibility of the "random problem selection" payment mechanism, in which only one choice out of many is randomly chosen for payment. We find that the mechanism is not incentive compatible when all decisions are shown together in a single list. But when the rows of the list are randomized and shown on separate screens, incentive compatibility is restored. This causes more apparent intransitivities in choice ("multiple switching"), but, since the experiment is incentive compatible, these intransitivities must be inherent in subjects' preferences.

1. Introduction

Consider an experiment in which subjects make multiple decisions. If they are paid for every decision, payments from one decision may affect their preferred choice in another. It has been proposed that the random problem selection (RPS) mechanism avoids this problem by paying for only one randomly-chosen decision.[1] Recent theoretical work has achieved a fairly complete understanding of the conditions under which this mechanism is "incentive compatible", meaning observed choices accurately reflect underlying preferences.[2] But empirical tests of incentive compatibility for the RPS mechanism have generated mixed results. We provide here a reconciliation of these mixed results: When choices are shown together in a list, incentive compatibility is sometimes violated in the data. When choices are separated (for example, each displayed on a separate computer screen), incentive compatibility is restored.

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[1] This mechanism has many names. Perhaps the most common is the "random lottery incentive mechanism" (Safra et al., 1990). We adopt RPS—which comes from Beattie and Loomes (1997)—because the Azrieli et al. (2016) framework we employ does not require randomness to be represented by objective lotteries.

[2] See the characterizations of Azrieli et al. (2016), and the references listed in footnote [12] below.

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We generate these results using two different experiments. In the first we test the RPS mechanism in a multiple price list setting often used for eliciting risk preferences (e.g., Holt and Laury, 2002). Our multiple price list consists of 20 binary choices over lotteries, presented on a computer screen as one large list. Our experiment (whose design we describe below) shows that the RPS mechanism is not incentive compatible in this setting. Subjects do not reveal their underlying preferences truthfully.

We hypothesize that the failure of the RPS mechanism is due to the presentation of the problems in a list format. In our second experiment we replicate the first experiment exactly, except that we randomize the order of the 20 binary choices and show each on a separate screen. In this setting our data cannot reject incentive compatibility of the RPS mechanism. Our review of the literature (see Section 6) is consistent with this conclusion: the only tests that have shown the RPS mechanism to fail also use a list presentation.

In our experiments we use a test of incentive compatibility that controls for framing effects in a way that many other tests in the literature do not. To illustrate, consider the following example of an experimental test employing a "One Choice" treatment and an "RPS" treatment. Subjects in the One Choice treatment choose one option from the set $D_1 = \{x, y\}$. Subjects in the RPS treatment make choices from both $D_1 = \{x, y\}$ and $D_2 = \{x^+, y^-\}$, where x^+ is clearly better than x, and y^- is clearly worse than y. For example, x is an average-priced glass of Cabernet and x^+ is an expensive Cabernet (both offered for free). And y is an average-priced Merlot and y^- is a cheap Merlot (again, both free).[3] If, in D_1, subjects predominantly choose x (average Cabernet) in the One Choice treatment but choose y (average Merlot) in the RPS treatment, then one might be tempted to conclude that the "true" preference is for the Cabernet, and the RPS mechanism causes subjects to misreport that preference. In other words, it is not incentive compatible. But an alternative explanation is that the typical subject in the One Choice treatment prefers the Cabernet while the typical subject in the RPS treatment truly prefers the Merlot. This could arise because the presence of the expensive Cabernet makes the average Cabernet look less appealing while the presence of the cheap Merlot makes the average Merlot look more appealing. The "true" preferences over D_1 are altered by the presence of D_2. We refer to this as a *framing effect*. And note that an experiment like this cannot distinguish between an incentive compatibility failure and a framing effect.

To avoid this confound, the experimenter can add a third treatment in which subjects make choices in both D_1 and D_2, but are only paid for their choice from D_1. We refer to this as the "Framed Control" treatment. Paying only from D_1 ensures that subjects reveal their true favorite item in D_1. And the presence of D_2 presumably shifts preferences to $\succ'$ (instead of $\succ$), which is the same preference subjects have in the RPS treatment. Thus, if choices in the Framed Control treatment are different than in the RPS treatment, we know that it must be the payment mechanism that distorted choices.[4]

Similarly, comparing the Framed Control treatment to the One Choice treatment provides a clean test of the framing effect. Both treatments pay the same (only from D_1), but differ in whether subjects see D_2 or not. If subjects in the One Choice treatment reveal $x \succ y$ while subjects in the Framed Control treatment reveal $y \succ' x$, then we know that preferences are changed from $\succ$ to $\succ'$ by the addition of D_2.

In the experiments reported in this paper we run the three treatments described, but using a 20-row multiple price list. Thus, our actual experiment consists of twenty binary decisions $(D_1, \ldots, D_{20})$, not two. Our One Choice treatment has subjects view only the fourteenth row of the 20-row list (D_{14}) and make only that one choice. Our RPS treatment has subjects make choices from all 20 rows and selects one randomly for payment. Finally, our Framed Control treatment has subjects make choices from all 20 rows, but pays them only for their choice on the fourteenth row (D_{14}). Comparing choices from D_{14} across treatments provides our tests of incentive compatibility and framing.

In our first experiment we run all three treatments, presenting the twenty decisions as a single 20-row list on the computer screen. We find significant differences in D_{14} choices between the Framed Control treatment and the RPS treatment. This indicates a failure of incentive compatibility of the RPS mechanism; however, our p-Value for the test is 0.041, indicating a statistically significant but not overwhelming failure. In our second experiment we re-run the Framed Control and RPS treatments, but this time showing each choice on a separate screen and in random order. With this separated presentation we clearly fail to reject the null hypothesis of equality between treatments; our p-Value is 0.697.[5] Thus, the separated presentation restores incentive compatibility of the RPS mechanism.

We can also test for framing effects with and without the list presentation by comparing the Framed Control treatment to the One Choice treatment. Here we find marginal differences with the list presentation, and insignificant differences with the separated presentation. Thus, we conclude that there is suggestive evidence of a possible framing effect under the list

[3] This example is based on two of the treatments run by Cox et al. (2014a), where x, y, x^+, and y^- are lotteries, x^+ stochastically dominates x, and y^- is stochastically dominated by y.

[4] This assumes that the mechanism itself does not alter underlying preferences; we refer to this as "mechanism invariance". Also, the Framed Control treatment is designed only for the purpose of testing incentive compatibility; it obviously wouldn't be useful in other experiments where choices from D_2 are of interest.

[5] One concern is the power of our statistical test. We chose our sample size of 60 subjects per treatment *ex-ante*, based on a power calculation in which we targeted 70%% power and assumed the effect sizes found in Starmer and Sugden (1991). Specifically, we assumed the proportion of subjects choosing the riskier lottery in D_{14} in our Framed Control and RPS treatments would mirror those of Treatments C (55%%) and D (32.5%%), respectively, from that paper. We chose to use the Chi-squared test because it can be partitioned in a way that allows us to test all three treatments; details appear below. The choice of 70%% power (instead of 80%%) was driven by budget concerns.