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Procedures for eliciting time preferences☆

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ABSTRACT

We study three procedures to elicit attitudes toward delayed payments: the Becker–DeGroot–Marschak procedure; the second price auction; and the multiple price list. The payment mechanisms associated with these methods are widely considered as incentive compatible, thus if preferences satisfy Procedure Invariance, which is also widely (and often implicitly) assumed, they should yield identical time preference distributions. We find instead that the monetary discount rates elicited using the Becker–DeGroot–Marschak procedure are significantly lower than those elicited with a multiple price list. We show that the behavior we observe is consistent with an existing psychological explanation of preference reversals.

1. Introduction

Incentivized experiments that study choices among delayed rewards have been widely used to measure and test hypotheses about time preferences. Several elicitation methods have been viewed as "incentive compatible" means of eliciting precise information about time preferences. Three such procedures have become workhorse methods in experimental economics, psychology, and neuroeconomics: the multiple price list (MPL), the Becker et al. (1964) procedure (BDM), and the second price auction (SPA).[1]

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[1] The MPL has been used extensively in economics experiments, for example, Coller and Williams (1999), Harrison et al. (2002), Dohmen et al. Dohmen et al. (2012), and Filiz-Ozbay et al. (2015). The BDM has been used extensively in economics, psychology, and neuroeconomics; examples include Benhabib et al. (2010), Ifcher and Zarghamee (2011), Weber et al. (2007), and Cooper et al. (2013). The SPA has been used in economics and psychology; examples include Horowitz (1991) and Kirby (1997).

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We study the MPL, the BDM, and the SPA as procedures for eliciting preferences over delayed payments. The MPL is a *choice task*, in that subjects have to choose between a smaller-sooner and larger-later pair of outcomes. BDM and SPA are instead both instances of *matching tasks*, in which subjects name a 'sooner' amount they regard as indifferent to a later fixed reward. Regardless of these aspects, if the payment mechanism associated with each method is incentive compatible and subjects have preferences over delayed rewards that are invariant to the procedure by which they are elicited, we ought to recover the same distribution of time preferences from each method. With few exceptions, economic experiments using these three methods draw an interpretation of subjects' behavior that implicitly assumes *Incentive Compatibility* of the payment mechanism and *Procedure Invariance* of subject preferences. In this paper we instead treat these assumptions as testable, and we test their implications using a between-subject design.

Previous work in experimental economics has noted systematic differences in the rankings of lotteries inferred from their monetary valuations elicited using the BDM as compared to direct choices in choice tasks (e.g. Grether and Plott, 1979). However, this literature on 'preference reversals' has focused on choice under risk. To the best of our knowledge, there is no existing incentivized study that indicates whether analogous preference reversals occur in intertemporal choice. A leading economic explanation of preference reversals under risk is based on the interaction between the random component of the payment mechanism, the risky alternatives, and a failure of the Independence Axiom (e.g. Karni and Safra, 1987). But such an explanation is highly specific to choice under risk: there is no compelling reason to expect analogous preference reversals in intertemporal choice. On the other hand, existing work that compares different experimental techniques for studying time preferences does not use any incentives (Tversky et al., 1990 – Study 2; Read and Roelofsma, 2003; Hardisty et al., 2013), and thus do not offer direct information about economic choices. Incentivized work on methods for measuring time preferences has studied alternative ways to jointly measure a person's discount rate and utility function curvature (e.g. Andreoni and Sprenger, 2012; Andreoni et al., 2015; Laury et al., 2012), but has ignored the possibility that the elicitation procedure used might affect inferences about discounting even when restricted to the domain of dated rewards.

We find a significant difference in subject responses between the MPL and BDM. This is in spite of an implementation ensuring that a subject in each procedure faced exactly the same economic incentives. The direction of this effect is consistent with Tversky et al. (1988) scale compatibility hypothesis, according to which a subject responding with a monetary amount in a matching task like BDM will put more weight on monetary outcomes than in a comparable choice task like the MPL.

The paper is organized as follows. Section 2 describes our experimental design. In Section 3 we lay out Incentive Compatibility and Procedure Invariance as testable assumptions, we discuss their implications for our experiment, and we review the predictions of existing economic and psychological explanations of preference reversals for our experiment. We present our results in Section 4 and we discuss them in Section 5.

2. Experimental design

Our experiment implements a between-subjects design to study three procedures – the MPL, BDM, and SPA – for eliciting each subject's preferences between sooner payments and a fixed later payment.[2]

We ran four sessions for each of the three treatments, with 16 inexperienced subjects per session between June 2012 and March 2013. Subjects for each session were recruited from the CEEL database at Università di Trento. All subjects received a €5 participation payment at the end of the session on top of any payments based on their choices. Each subject could only participate in one treatment of the experiment. An average session lasted less than 45 min, and the average subject payment was €14.40.[3]

The subjects were given instructions that explained the task they would face and how they would be paid based on their choices. Then they completed a comprehension test on the instructions.[4] In each treatment, we use a single elicitation procedure (MPL, BDM, or SPA) to elicit the monetary amount paid tomorrow that would be indifferent to the receipt of a €20 at each of three possible delays (1, 2 and 4 months) for each subject. We implemented this by presenting subjects with a screen with three buttons, each corresponding to one of the time horizons. Subjects could enter money amounts in €0.50 increments in all treatments. To avoid any order effects, subjects were free to choose the order in which to tackle each task.[5] After completing each choice task, subjects were sent back to this screen with the buttons corresponding to the time horizons already completed appearing grayed out.

In order to incentivize subjects to report their economic preferences, 50% of the subjects in each group were drawn at random to receive a payment based on their choices. At the end of the experiment we drew from a uniform distribution which 8 subjects (out of 16 participants in each computerized session) would receive a payment in addition to the show

[2] We chose a between-subjects design in order to avoid any cross-task bias from responding to an economically identical task multiple times, and also to avoid having to explain three different procedures to subjects. See Charness et al. (2012) for a discussion of the relative advantages of between- vs. within-subject designs.

[3] In each treatment, 29–30 of subjects were female and subjects had an average age of 22 years.

[4] 20 participants were recruited for each session; to reduce the possibility of subject misunderstanding of the experiment driving our results, we only retained the first 16 subjects to correctly complete the comprehension test. The remaining four subjects in each session were paid a show-up fee and dropped from the session.

[5] We study subjects' choices of order by treatment in Appendix C.