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A new methodology for surveys and its application to forced response

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HIGHLIGHTS

- A new methodology for response techniques is proposed.
- The interviewer has private information in contrast to prior research.
- One of the response techniques provides a dominant strategy for respondents to obey.
- Warner's method is improved without any loss of information transmission.
- The paper demonstrates the importance of using utility models over privacy measures.

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ABSTRACT

The response technique in this paper provides a researcher with private information, which causes participants to be unsure which response associates them with the stigmatized characteristic, encouraging honesty and obedience. To prevent the researcher from exploiting the information, the paper suggests restrictions on its structure. Unlike most prior literature, this paper models the survey as a Bayesian game. In the application to forced response, participants should always obey commands as it is a dominant strategy. By applying this methodology to Warner's method, respondents have a stronger incentive to reply honestly without any loss of information.

1. Introduction

> "You have no power over the dice. When they fall on twelve, then you have to say no. Something is being forced on you. And then it's just like eating, you have to eat spinach but you don't like it. Well, then I won't do it. That thing [the computer] is a dead thing. It obliges me to press a key I don't want to. My answer belongs to me."
>
> –Lensvelt-Mulders and Boeije, 2007

The participant refuses to obey a command in a survey technique known as forced response in the quote above. Answering "no" associates the participant with a stigmatized group even if she does not belong to the group! The quote comes from a sociological study on the effectiveness of the forced response technique—a statistical technique used to measure the proportion of a population with a stigmatized characteristic. The technique sometimes instructs respondents to obey a command in order to provide cover for those answering a question where the answer could have legal or embarrassing consequences. To overcome the problem of disobedience, this paper develops a technique where following a command is always optimal regardless of how other respondents in the survey behave. Obedience in the technique is critical to providing an accurate estimation of the percentage of the population in the stigmatized group.

In order to incentivize obedience with forced response, the researcher has private information on the distribution of questions and commands given to respondents unlike any other response technique methodology. For example, an interviewer may know there is a two-thirds chance a respondent receives a particular question while the interviewee only knows that there is *either* a two-thirds or one-third chance of receiving that particular question. Because of the private information, respondents are unsure which response, "yes" or "no", associates them with a stigmatized group. This uncertainty prevents respondents from knowing the benefits to both dishonesty and disobedience, and thus, discourages them from such behavior. Since the researcher has private information and performs the technique, one may worry that the researcher always endows himself or herself with the most favorable private information (that which extracts the most information from the respondents); however, the design of the technique makes the researcher indifferent to all types of private information, which prevents the researcher from exploiting it.

Though the focus in this paper is an altered forced response technique, the paper provides a general methodology of implementing surveys where the researcher has private information, as

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such surveys can incentivize honesty and obedience without any loss of statistical information. Specific limitations on the structure of the private information are suggested in order to prevent the researcher from having strong preferences regarding the private information, which ensures the researcher performs the technique honestly. The paper uses another method, referred to as the modified Warner technique, to demonstrate that these techniques can provide respondents with a stronger incentive to respond honestly without any informational loss.

I analyze the technique I develop in this paper with a utility model as recommended by Ljungqvist (1993). Using a utility model allows me to demonstrate that obeying a command is a dominant strategy—a choice that is optimal regardless of how the other respondents behave. Other models of analyzing forced response techniques, known as privacy measures, usually fail to distinguish the incentives with this technique versus one where obeying a command is not a dominant strategy, and, consequently not necessarily optimal. The utility model also demonstrates the stronger incentive to respond honestly under the modified Warner technique, which again cannot be demonstrated with privacy measures.

The next section explains how to implement the standard forced response technique and covers much of the previous literature on the subject. Section 3 describes the model of the paper applied to the forced response technique. In Section 4, I discuss a natural way to implement the modified technique. In Section 5, I demonstrate that following a command is a dominant strategy and give the incentive constraint required to ensure that answering a question honestly is also optimal. Section 6 provides some drawbacks of the technique developed in this paper. Section 7 discusses a more general way to introduce incomplete information to response techniques; however, it also suggests restrictions on the ways to implement the technique. I also introduce the modified Warner technique in Section 7. In Section 8, I provide a discussion on why many of the privacy measures commonly used fail to apply to the method developed in this paper. Lastly, Section 9 concludes.

2. Background

In the forced response technique, respondents *privately* use a randomization device to determine whether to answer a sensitive question or obey a command, either "Just say yes." or "Just say no.". For example, a researcher interested in learning the proportion of citizens who voted in the prior elections may use the technique as some citizens may lie if asked directly, due to embarrassment or some other reason. To discourage lying, the researcher could give a respondent a die to use as a randomization device. The respondent answers the question "Did you vote in the last presidential election?" when the die lands on one through four, follows the command "Just say no" if the die lands on five, and follows the command "Just say yes" if a die lands on six.[1] If a respondent answers with a "no", the researcher is unsure whether the respondent failed to vote or simply followed a command.

Researchers use the technique instead of a standard survey where they directly ask participants questions, a technique referred to as the direct response technique, because the technique creates uncertainty about which group a participant belongs to regardless of response. When the researcher observes a "yes" or "no" response, the researcher fails to know whether the respondent answered the question or simply obeyed a command. The uncertainty helps protect the respondent from embarrassment, judgment, or possibly even legal action (a survey on tax evasion for example). When respondents obey commands and answer honestly, the method reduces both estimation bias from lying and selection bias as those in the stigmatized group should be more willing to participate in the survey.

If survey participants fail to obey commands in the forced response technique, participants in the stigmatized group may forgo participation or lie when given a question since the uncertainty provided by those obeying a command no longer exists. In the voting example above, if respondents fail to obey the "no" command, those receiving the question that failed to vote no longer have any privacy protection. Thus, disobedience could create estimation bias, as disobedience creates an incentive to lie for those receiving the question, and selection bias, those who failed to vote may no longer wish to participate in survey. This eliminates the purpose of introducing the technique. If participants always have an incentive to obey a command as under the technique in this paper, those in the stigmatized group will be more inclined to answer honestly.

In order to create this incentive for obedience, the interviewer has private information on the underlying question. For example, the respondent is uncertain whether the question is "Did you vote in the last presidential election?" or "Did you abstain from voting in the last presidential election?". Because of this uncertainty, the respondent cannot determine which command is more associated with the stigmatized group, "yes" or "no"; thus, the respondent may as well choose to obey since disobedience provides no expected benefit.

Though largely overlooked by economists, response techniques are a way to communicate personal information of a sensitive nature; thus, they can be modeled as a Bayesian game, in particular a communication game. Crawford and Sobel (1982) initiated a substantial amount of research over the past few decades in communication games; however, this research has been largely been theoretical, and I hope this paper inspires more research to the practical application of communication games, especially response techniques. The theoretical work in this literature most closely related to response techniques is that of Blume et al. (2007) who show that noise can sometimes improve communication. One can view the forced response technique as noisy since it prevents the researcher from knowing whether a participant responded to a command or a question. Just as in Blume et al. (2007), the noise in the forced response technique should also improve communication since it creates uncertainty about whether the participant belongs to a stigmatized group regardless of response.

Warner (1965) developed the first model that introduced randomization in the survey process to protect the privacy of the individuals surveyed. Several variants of the technique have been developed in the decades since, including the forced response technique.[2] Kuk (1990) developed a response technique with multiple decks of cards as this paper does; however, Kuk (1990) does not keep any information about those decks private as my procedure does, and he only uses questions instead of both questions and commands with his procedure. Researchers have used the many response techniques to measure doping (Striegel et al., 2010), induced abortions in urban North Carolina (Abernathy et al., 1970), cigarette smoking among adolescents (Lauer et al., 1982), angler noncompliance with fishing regulations (Schill and Kline, 1995), and dear poaching (Wright, 1980). Karlan and Zinman (2012) use a response technique in development economics on the use of microfinance loans. Though response techniques, such as the forced response technique, theoretically reduce selection and estimation bias, academics debate whether the technique actually works well in practice.

In order to test the validity of the technique, researchers use the "more is better criterion" or direct validation studies. The more is better criterion simply states that a higher incidence of reporting using a response technique versus direct questioning indicates that

[1] Holbrook and Krosnick (2010) test the validity of a different response technique by using an approach similar to this.

[2] See Chaudhuri (2010) chapters 3,5, and 8.