Author's response to reviews

Title: Do federal and state audits increase compliance with a grant program to improve municipal infrastructure (AUDIT study): study protocol for a randomized controlled trial

Authors:

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Author's response to reviews: see over
Dear Editor-in-Chief,

Thank you for the opportunity to incorporate reviewer comments to the manuscript “Do federal and state audits increase compliance with a grant program to improve municipal infrastructure (AUDIT study): study protocol for a randomized controlled trial” by Ana De La O and Fernando Martel García. Below we discuss issues raised by reviewers and how we have addressed them.

Response to comments from Michael A. Nelson
We agree with the reviewer that by excluding some states from the experimental group our findings may not generalize to Mexico as a whole. Even so, our goal in this exploratory trial was not generalization so much as internal validity. To make this clearer we have added a note in the abstract under “Discussion” where we state: “This study will improve our understanding of local accountability systems for public service delivery in the 17 states under study, and may have downstream policy implications.”

The suggestion that geographic distance may also affect spillovers is compelling. We thought about it going into the protocol but decided that in the age of cellular phones, email, and political party gatherings, party affinity may be more important. Even so, in the section where we discuss interference we added the parenthetical comment: “(Geographic distance between municipalities may not be that important considering the degree of cell phone and email penetration in Mexico but we might consider it in a secondary analysis.)”.

Response to comments from Victoria Fan
The point about our use of subjective measures is well taken. Unfortunately it is not possible for us to include more objective measures at this stage. Besides, we are genuinely interested in how audits affect beliefs and perceptions, and how these translate into actions and outcomes. But we are aware of the difficulty in measuring these subjective beliefs using survey instruments. Unfortunately, there is not much that we can do about this other than include a mix of outcome data that speak to the
same outcome, and to pilot the survey carefully. We have done both. For example, four out of the fourteen hypotheses in Table 1 rely on administrative data, including key primary outcomes like how audits affect compliance with reporting and data accessibility rules.

Whether to use pair matching or a blocking design with more than one unit in treatment and control per randomization block has been a subject of debate. A good summary is provided by Imbens, who also discusses the advice by King et al. referenced by the reviewer (see “Experimental Design of Cluster Randomized Trials”, mimeo, and the discussion by Cyrus Samii (http://cyrussamii.com/?p=837)). According to Imbens it is a good idea to have blocks with at least two treated and two control so the variance can be estimated more precisely relative to pair matching (where there is only one treated and one control per block). (See also Abadie and Imbens “Estimation of the Conditional Variance in Paired Experiments”.) We have added the following sentence in the sample size section: “Finally, blocks with four or more units may have some advantages relative to pair matching” and cited the two aforementioned manuscripts.

**Response to comments by Dylan Small**

If the null of no treatment effect on the attrition is rejected, “a complete data analysis is only appropriate if the only cause in common between the latent unobserved outcome and the attrition (including each other) is the treatment.” The reason for this is explained in the manuscript cited at the end of the sentence but the intuition is simple. Consider the causal diagram $Y \leftarrow X \rightarrow R$, where $Y$ is the outcome of interest, $X$ the randomized treatment, and $R$ a binary indicator for attrition. Specifically, $Y$ is observed if $R = 0$ (i.e. $Y = y$) and observed as missing otherwise (i.e. $Y = \text{Missing}$). All other variables are fully observed. In this example treatment $X$ is a cause of the attrition yet it follows from d-separation that $P(Y = y|do(X = x), R = 0) \equiv P(Y = y|do(X = x), R = 1)$ as $Y \perp R|X$. Using do-calculus we can compute causal effects as:

\[
P(Y = y|do(X = x)) = P(Y = y|X = x),
\]
\[
= P(Y = y|X = x, R = 0)P(R = 0|X = x)
\]
\[
+ P(Y = y|X = x, R = 1)P(R = 1|X = x),
\]
\[
= P(Y = y|X = x, R = 0)P(R = 0|X = x)
\]
\[
+ P(Y = y|X = x, R = 0)P(R = 1|X = x),
\]
\[
= P(Y = y|X = x, R = 0)(P(R = 0|X = x) + P(R = 1|X = x)),
\]
\[
= P(Y = y|X = x, R = 0).
\]

The manuscript on attrition by Fernando Martel cited in the protocol considers the general case. Even so, we agree the sentence is unclear. The parenthetical comment “including each other” does a poor job of excluding the case $X \rightarrow Y \rightarrow R$. Instead we have written: “a complete data analysis is only appropriate if the outcome does not
cause attrition and the only cause in common between the outcome and the attrition is the treatment.” For a full statement please refer to the cited manuscript.

We agree the next sentence on computing different kinds of bounds etc. is overkill. We were only trying to pre-empt the possibility that reviewers will eventually ask us to do all of them. But following the reviewer’s suggestion we have rephrased it to state a preference. Specifically we have written: “For robustness we will draw inferences using extreme bounds, and consider trimmed bounds, multiple imputations and inverse probability weights analyses as secondary analyses”.

Finally the reviewer is correct on the implications of one- versus two-sided non-compliance. We have now corrected this oversight by adding the sentence: “If non-compliance is two-sided the instrumental variable approach will only estimate the effect on compliers, not the treatment on the treated effect.”

We want to thanks all reviewers for their kind comments and suggestions. Since this is an open review we will be happy to include reviewers in the acknowledgement section at their request.

Thank you for your kind consideration. I look forward to hearing from you soon.

Sincerely yours,

Fernando Martel García