Rigging the Scores: Corruption through Scoring Rule Manipulation in Public Procurement Auctions

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This review verifies the reproducibility of the exhibits included in the paper *"Rigging the Scores: Corruption through Scoring Rule Manipulation in Public Procurement Auctions"*.

Contents in this review:

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Main findings

- **This reproducibility report covers results and exhibits from the main paper, and a randomized set of results and exhibits from Appendices A to E and H to I (see "Results in the Annex" section). Appendices F and G were not run due to technology requirements limitations.**
- **Every exhibit has been reproduced accurately.**
- The code was successfully executed on a new computer after:
  1. Installing Mosek and RMosek as outlined here: https://docs.mosek.com/latest/rmosek/install-interface.html
  2. Obtaining a Mosek license
  3. Changing directory paths in rcode/Main.R, statacode/main.do, rcode/Appendix.R and statacode/Appendix.do
  4. Running the scripts in the order outlined in the README file.
- The code takes approximately 360 hours to run.
- We conducted our reproducibility analysis based on the paper shared by the authors by email on November 12, 2024.
- **Reproducibility Summary**:
  - **Data**: All data sources are publicly available and included in the reproducibility package. (Open Data)
  - **Code**: All code files are included in the reproducibility package. Scripts to scrape and pre-process the source datasets are not provided.

- **Outputs**: All outputs are generated by code included in the reproducibility package.
- **Reproducibility verification**: Reviewers had access to the same materials in the public reproducibility package. The reviewers did not verify if publicly available data matches the data in the reproducibility package.
- **Dependencies environment**: The reviewers created a new environment using the latest versions of dependencies available at the moment of the review.

List of exhibits and reproducibility status

Results in the Main Section of the Paper

- **Figure 1** Does not apply: does not show analysis results
- **Figure 2** Does not apply: does not show analysis results
- **Figure 3** Reproduced.
- **Figure 4** Reproduced.
- **Figure 5** Reproduced.
- **Figure 6** Reproduced.
- **Figure 7** Does not apply: does not show analysis results
- **Figure 8** Reproduced.
- **Figure 9** Reproduced.
- **Figure 10** Reproduced.
- **Table 1** Does not apply: does not show analysis results
- **Table 2** Reproduced.
- **Table 3** Reproduced.
- **Table 4** Results reproduced, but table or figure includes manual changes from code output
- **Table 5** Reproduced.
- **Table 6** Reproduced.

Results in the Annex

For the Appendix, we did not review every exhibit. Instead, we randomly selected 10 exhibits from the remaining datasets to assess the appendix. Our review was based on those 10 exhibits. Since they were chosen randomly, we are operating under the assumption that if all randomly selected exhibits are reproducible, then the rest should be as well. The seed used to generate the random selection was 212512, the Stata version used was 18, and the exhibits selected were: Figure A8, Figure A9, Table A6, Figure A12, Table A8, Figure B2, Figure D2, Figure D10, Figure D11, Table H1.

- **Figure A8** Reproduced.
- **Figure A9** Reproduced.
- **Figure A12** Reproduced.
- **Table A6** Reproduced.
- **Table A8** Reproduced.
- **Figure B2a** Does not apply: does not show analysis results
- **Figure B2b** Reproduced.
- **Figure D2** Reproduced.
- **Figure D10** Reproduced.
- **Figure D11** Reproduced.
- **Table H1** Reproduced.

Reproduction Environment

- Paper exhibits were reproduced on a computer with the following specifications:
  - Machine 1
    OS: Windows Server 2019 Standard
    Processor: Intel(R) Core(TM) i5-1145G7 CPU @ 2.60GHz
    Memory available: 10 GB
    Software version: Stata 18.0 MP, R Version 4.4.2
  - Machine 2
    OS: Windows 10 Enterprise 22H2
    Processor: Intel(R) Xeon(R) CPU E7-4890 v2 @ 2.80GHz 2.79 GHz (16 processors)
    Memory available: 64 GB
    Software version: Stata 18.0 MP, R Version 4.4.2
  - Machine 3
    OS: Windows 10 Enterprise 22H2
    Processor: Intel(R) Xeon(R) CPU E7- 4860 @ 2.27GHz 2.26 GHz (2 processors)
    Memory available: 1TB
    Software version: Stata 18.0 MP, R 4.4.2