Reproducible Research Repository

Decarbonization Investment Strategies in an Uncertain Climate

Second Submission: PP_WLD_2024_340
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This review verifies the reproducibility of the exhibits included in the paper *"Decarbonization Investment Strategies in an Uncertain Climate"*.

Contents in this review:

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Main findings

- **Every exhibit has been reproduced accurately.**
- The code was successfully executed on a new computer after:
  1. Setting the environment.
  2. Creating an account and Getting the Gurobi Academic License here
  3. Downloading Gurobi optimization here
  4. Running in bash script by script.
- The output demonstrates consistent stability across multiple runs. Specifically, executing the code two times consecutively yielded identical results.
- The code takes approximately 4 hours to run.
- We conducted our reproducibility analysis using the updated version of the paper provided by the authors on April 28.
- **Reproducibility Summary**:
  - **Data**: All data sources are publicly available and included in the reproducibility package.
  - **Code**: All code files are included in the package.
  - **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.
  - **Dependencies environment**: The reviewers reproduced an existing environment for dependencies using dependency files or an environment metadata file provided by the authors.

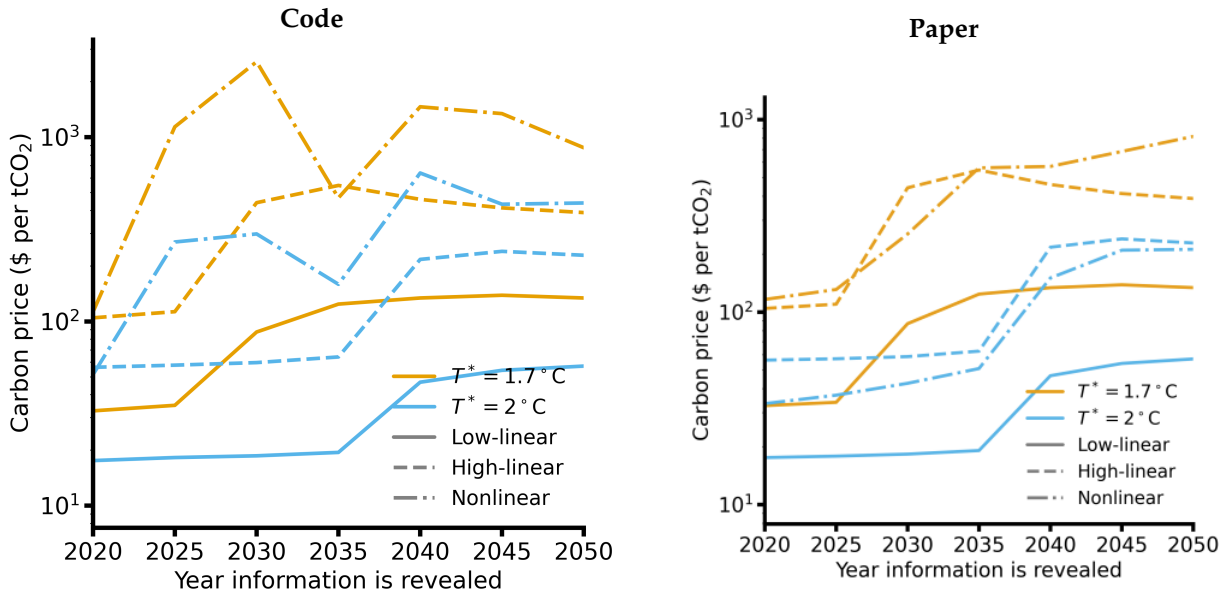
List of exhibits and reproducibility status

Results in the Main Section of the Paper

- **Figure 1** Reproduced. Figure: simp.
- **Figure 2** Reproduced. Figure: mac-cal.
- **Figure 3** Reproduced. Figure: ar6-pfig-value-of-learning-quadbox
- **Table 1** Does not show analysis results.
- **Figure 4** Reproduced. Figure: ar6-temp-redist.
- **Figure 5** Reproduced. Figure: ar6-sec-inv-eff-lt-t17.
- **Figure 6** Reproduced. Figure: carbon-price-dists-data-t17.

Results in the Supplementary Material

- **Figure 1** Reproduced. Figure: ar6bs-pfig-value-of-learning-duobox-withbs.
- **Figure 2** Reproduced. Figure: t17-inv-base-rec-comparision-cost-secs-withbs.
- **Figure 3** Reproduced. Figure: ar6emis-pfig-value-of-learning-quadbox.
- **Figure 4** Reproduced. Figure: ar6emis-temp-redist.
- **Table 1** Does not show analysis results.
- **Figure 5** Reproduced. Figure: ar6hi-pfig-value-of-learning-quadbox.
- **Figure 6** Reproduced. Figure: ar6hi-temp-redist.
- **Figure 7** Reproduced through virtual verification. This figure was not executed by the replicators due to solver issues encountered with the `ar6pow_17` specification. The verification was conducted virtually on May 7, 2025, and the resulting output will be included in the reproducibility package. Refer to the file: `ar6powe-pfig-value-of-learning-quadbox`.
- **Table 2** Does not show analysis results.
- **Figure 8** Reproduced. Figure: ar6pow-temp-redist
- **Table 3** Does not show analysis results.
- **Figure 9** Reproduced. Figure: ar6-pfig-value-of-learning-quadbox-t15.
- **Figure 10** Reproduced. Figure: ar6-temp-redist-t15.
- **Table 4** Does not show analysis results.
- **Figure 11** Some differences present, but these are documented and explained in the README. The replicator and the paper display different results for the nonlinear, and high-linear cases. These discrepancies are likely due to variations in operating systems and Gurobi solver versions. When the objective function is highly sensitive—as with the high-cost and nonlinear calibrations—the solver may produce different outputs. Example differences are shown below. These do not jeopardize the overall reproducibility of the paper.



Reproduction Environment

- Paper exhibits were reproduced in a computer with the following specifications:
  - OS: Windows 11 Enterprise
  - Processor: Intel(R) Core(TM) i5-1145G7 CPU @ 2.60GHz
  - Memory available: 15.7 GB
  - Software version: Python version 3.12.10, Gurobi 12.0.1