

*Replication of***< Insert Title of Original Study >***by* < Insert Names of original authors in Kedron, P.J. format >*in:* Journal, Volume(Issue), pages**Created**

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Briefly describe the original analysis – type of study, research design, analytical approach, and results; motivation of the replication; and outline of the replication study

Research Hypotheses to Replicate

H1: Separately list each research question and associated hypotheses being replicated. If a hypothesis is directional, state the direction. Identify the spatial coverage over which each hypothesis is expected to hold, and the spatial coverage at which each hypothesis will be tested (e.g., within a specific sub-region).

Original test: Briefly summarize the primary method/statistic used to test the hypothesis

Original Study Information

Description: Present a short narrative that summarizes key information about the original study. Include information about all of the following

1. Provide a written description of the study location and extent. Whenever possible, provide specific geographic coordinates bounding the study extent or a spatial reference file.
2. Identify and describe the spatial support (spatial resolution, unit of analysis) of the original analysis was conducted
3. What type of sample/data did the original study use?
4. Are the data and code used in the original analysis available/used in this replication?

Analytical Plan: Describe all elements of the analytical plan of the original study that are relevant to the research questions and hypotheses being re-examined by the reproduction. Include information for each of the following sub-sections as appropriate.

Sampling Plan and Data Description: Describe the data used in the original study

1. Describe any dataset(s), or sub-set(s) of those datasets, used in the original study. If the dataset(s) were not made available by the authors of the original study, but are accessible:
 - a. Explain how the data was acquired by the original authors including – source (with DOI if possible), date of access
 - b. If selected datasets or sub-sets cover only portions of the overall study area or study period, clearly identify which datasets are associated with which locations and times.
 - c. Explain how the data was acquired by the original authors including – source, data of access
2. Describe if/how the original study excluded or adjusted the initial dataset
 - a. Identify any data that was excluded from the original analysis report –reason for exclusion, exclusion criteria, sample size before and after exclusion, location of excluded data (e.g., is exclusion likely to reduce/eliminate coverage in a particular sub-region)
 - b. Explain how the original authors addressed missing data and details about any interpolation procedures used by the authors.
 - c. Describe any sample weighting that was used in the original study. Separately identify an spatial component used in the weighting scheme.

Variables: Describe the variables used in the original study to address the research questions and hypotheses that are the focus of the reproduction.

1. Identify any experimentally manipulated variables and include details about how these variables were manipulated during the original study.
2. Identify any measured variables examined in the original study
 - a. Identify both the response(s) and predictor variable(s) associated with each hypothesis
 - b. Describe any variable transformations (e.g., log-scaled, categorical)
 - c. Describe any spatial aggregation/disaggregation that was applied to any variables
3. Describe any adjustments made to the variables to account for
 - a. first-order spatial effects (sub-regional differences in means)
 - b. second-order spatial effects (spatial dependencies)
 - c. spatial anisotropies (directional trends)

Analytical Specification: Describe the exact analytical specification that was used to test each hypothesis

1. For computational studies include information about the hardware and software environments of both the original study
2. Identify the coordinate system(s) and projection(s) used during the original analysis
3. Specify if/how edge effects were addressed. Provide details regarding the extent of any buffer or guard areas used.

4. Describe the type of model, the specification of that model, distributional assumptions of the model, and any post-hoc analyses used to test each hypothesis. Key aspects of some common geographical analyses include:
 - a. If a spatial weighting scheme was used, provide a functional description of that scheme
 - b. If a spatial model was used, provide detailed description of that model
 - c. If a classifier was used, provide details about the selection of training data, validation data, and if any independent test data
 - d. If a spatial multi-level model was used, identify the spatial scale of each level, the variable included at each level, and the levels any spatial structures or cross-scale structure are estimated at.

Inference Criteria, Results, and Robustness: For each separate hypothesis, provide a description of the results of the original study and the relevant inference criteria and robustness checks

1. Describe the specific criteria (e.g., *p*-values, effect size, model fit) and thresholds that were used to make inferences.
 - a. Identify any adjustments made for multiple testing (e.g., Bonferroni, Sidak) and how they were implemented.
2. Describe the result associated with each hypothesis.
 - a. Identify the size and direction of the effect, measure of variance of the effect, statistical assessments
3. Describe any robustness checks that were completed to assess the strength and reliability of inferences for each hypothesis. Identify any spatial components varied during robustness checks.

Materials and Procedure

Describe how the reproduction study will be implemented and identify any materials and procedures used to complete the reproduction.

1. For computational studies include information about the hardware and software environments of both the original study and the replication attempt.

Protocol: Explain how the analysis of the reproduction will proceed and identify if the analysis plan will match the original study. For many reproduction this section may be quite short if the procedures used in the original analyses are followed closely. In those cases, this section can simply explain how key elements will be followed.

Differences from the Original Study: Identify any ways in which the reproduction needed to depart from the original study -- a) data acquisition b) measures/variable construction, c) analytical techniques. Changes should be minimal and occur only when unavoidable.

1. Provide the motivation for each change that is made to the original study.

Assessment Criteria: Identify the criteria that will define whether the replication attempt was successful (e.g., matched statistical significance, direction of effect, similar magnitude of effect)

Reproduction Results

For each hypothesis examined, present separately the results of the reproduction attempt.

1. State whether the key measures and inferences related to each original hypothesis were or were reproduced
 - a. Provide key statistics produced by the reproduction.
 - b. Provide key measures (e.g., matching effect direction/size, significance) used to make comparisons between the original and the reproduction.
 - c. Highlight any contradictory results with a brief explanation

Unplanned Deviations from the Protocol

Identify and describe any unplanned deviations from the original reproduction protocol that occurred during the course of the replication. Explain the rationale behind any deviations. Finally, provide the

details and results of any sensitivity analyses conducted to assess whether these deviations may have impacted the results of the reproduction.

Discussion

Provide a summary the key findings of the reproduction along with any limitations or areas in need of further investigation. If the attempt was a failure, discuss possible causes of the failure. *Practical Causes* – related to lack of data, code, details in the original analysis; *Informative Causes* – related to absence of effect, change in population, or location.

References

Include any referenced studies or materials

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