# Reproducibility and Replicability

The ultimate goal of scientific research is to build reliable knowledge. While errors are inevitable, the reproducibility and replicability of findings are essential for ensuring the credibility and trust in science.

These two key pillars allow findings to be tested, confirmed, and trusted by researchers, policymakers, and the general public.

However, to effectively assess and communicate these concepts, especially in economics, it's crucial to establish a common definition and clear typology of reproducibility and replicability. Such a framework ensures accurate comparisons and appropriate methodologies. It also aligns terminology with broader social science standards, fostering better coordination and clarity among researchers. By adopting a common language, we can enhance the foundation of scientific integrity and knowledge.

What is...

### ...Reproducibility?

Reproducibility refers to the ability of a researcher to obtain the same results as a prior study by using the same data, analysis code, and procedures as the original study. This involves regenerating the original findings through identical methods and statistical analyses, ensuring that the results are consistent and verifiable.

## ...Robustness?

Robustness refers to the consistency of study results when tested using different methods or analytical approaches on the same data. It ensures that findings remain valid even when alternative techniques or assumptions are applied, helping confirm the reliability of the conclusions by reducing the influence of biases or limitations inherent in any single method.

### ...Replicability?

Replicability refers to the ability to obtain consistent results and conclusions when a study is repeated using new data while following the same methods and procedures. It ensures that the findings observed in the original study can be applied to different datasets, confirming the reliability and generalizability of the results across various empirical contexts.

### ...Generalizability?

Generalizability refers to the ability to extend the findings of a study to different populations, settings, methods or times beyond the specific conditions of the original research. It ensures that the results are not limited to a narrowly defined context but can be extended to broader and more diverse situations, enhancing the applicability of scientific discoveries.

# Same Data Different Data Reproducibility Replicability Robustness Generalizability

Credits: Based on Schloss (2018) and Holzmeister (2024)

Applications of the Reproducibility & Replicability Typology in the Literature



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# Typology of Reproducibility and Replicability Studies



A typology, based on <u>Dreber and Johannesson (2024)</u>, is presented below. This framework offers a refined approach in response to previous definitions. The proposed typology seeks to clarify and refine the usage of these terms, addressing the need for a more consistent and applicable framework across disciplines.

While some terms are well-established in the literature, others, such as robustness reproducibility, are newly introduced to address emerging research areas. This typology contributes to a deeper understanding of these critical concepts in scientific inquiry.

### Reproducibility

### **Computational Reproducibility**



Verifying whether the data and code from a published paper can produce the same results as reported by the original authors.

### Robustness Reproducibility



Testing whether the results of an original study remain consistent when different analytical methods or specifications are applied to the same data.

### Recreate Reproducibility



The process of attempting to reanalyze the results of an original study as closely as possible without access to the analysis code and/or the exact data used in the original study.



### Subtypes:

No Code: Access to the original dataset but not the analysis code

**No Dataset:** Access to the original analysis code but not the dataset

No Code and Dataset: No access to either the analysis code or the dataset

### Replicability

### **Direct Replicability**



Testing whether the results of an original study can be repeated on new data using the same research design and analysis methods.

### **Conceptual Replicability**



Testing whether the results of an original study can be repeated on new data using alternative research designs or analysis methods to test the same hypothesis.

### Same Population:

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The replication study uses a sample from the same population as the original study.

### **Similar Population:**



The replication study uses a sample from a population similar to the original study's (e.g., university students at a different university).

### Different Population:



The replication study uses a sample from a different population than the original study (e.g., general population instead of university students).

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