

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.

...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.

...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.

...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
Identical Methods	Reproducibility	Replicability
Different Methods	Robustness	Generalizability

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

Applications of the Reproducibility & Replicability Typology in the Literature



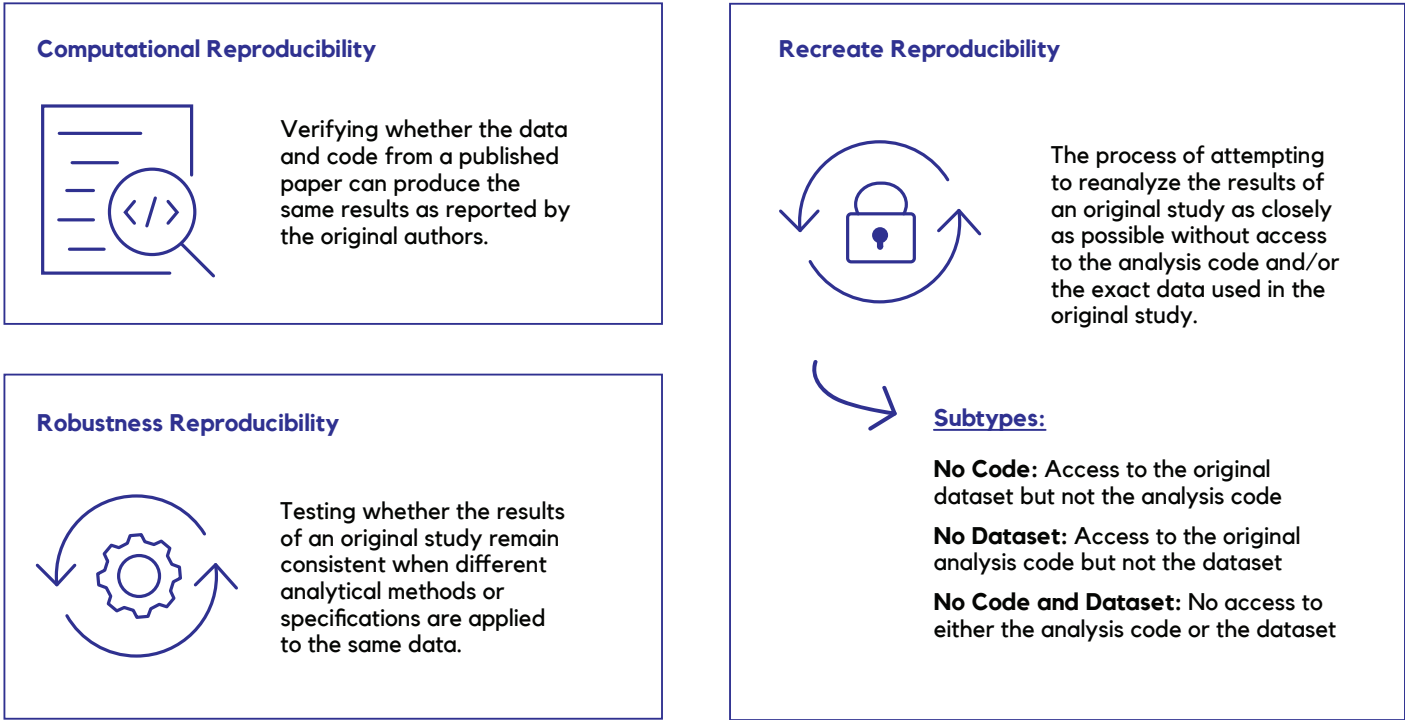
Scan QR for more information
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Typology of Reproducibility and Replicability Studies

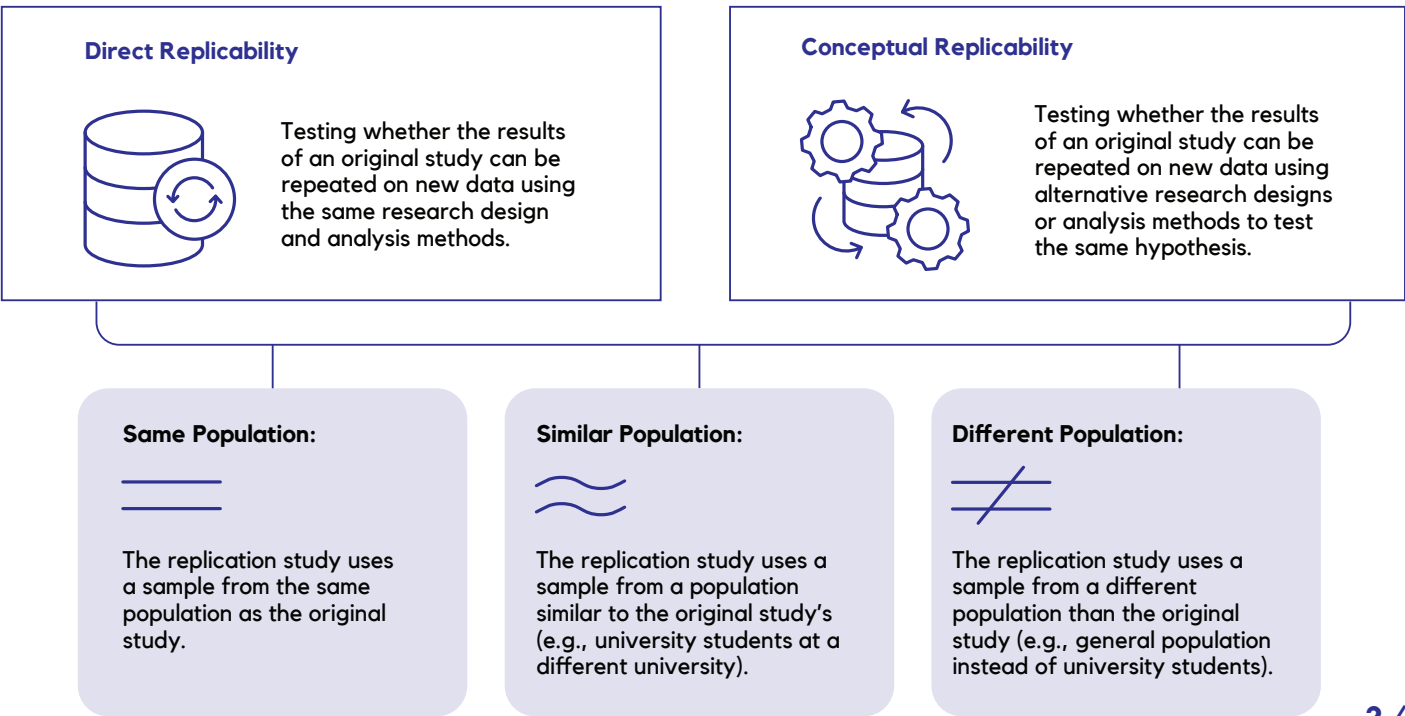
A typology, based on Dreber and Johannesson (2024), is presented below. This framework offers a refined approach in response to previous definitions. The proposed typology seeks to clarify and refine the usage of these terms, addressing the need for a more consistent and applicable framework across disciplines.

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



Replicability



The following figures present examples of notable recent efforts in this area to further highlight the importance of reproducibility and replicability in scientific research.

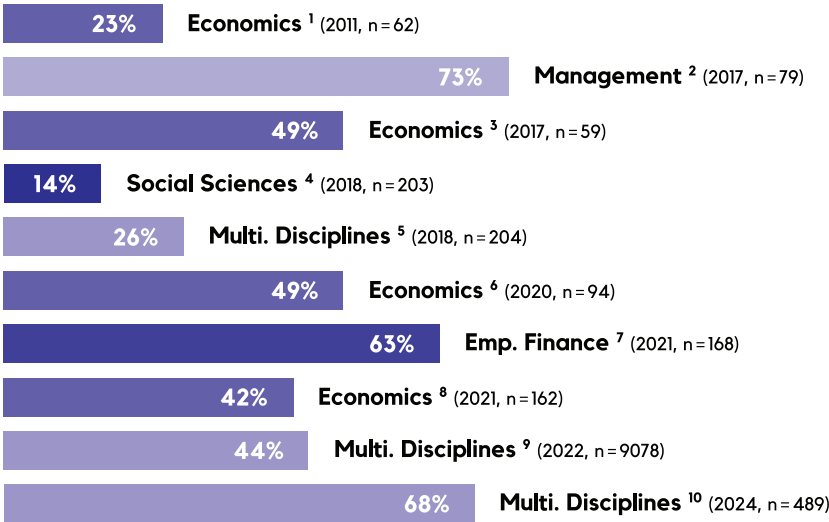
Systematic Reproducibility Studies

Percentage of papers reproduced across various disciplines in systematic reproducibility studies.

n = #of papers investigated

The low percentages of reproduced studies across disciplines point to a broader issue of scientific credibility. If findings cannot be consistently reproduced, it raises concerns about the reliability and trustworthiness of research.

¹ McCullough et al. (2006), ² Bergh et al. (2017), ³ Chang and Li (2017), ⁴ Gertler et al. (2018), ⁵ Stodden et al. (2018), ⁶ Vilhuber (2020), ⁷ Pérignon et al. (2022), ⁸ Herbert et al. (2021), ⁹ Trisovic et al. (2022), ¹⁰ Fišar et al. (2023).

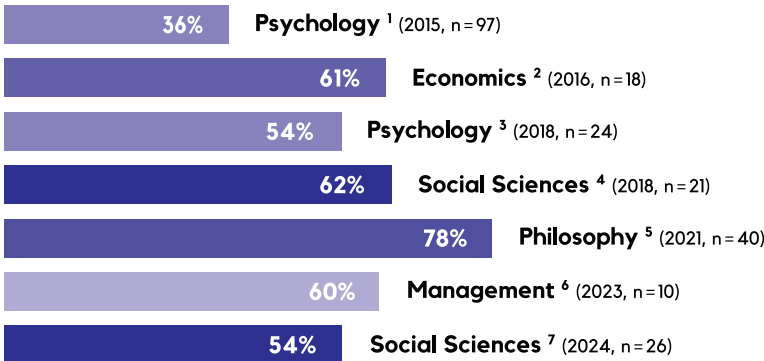


Percentage of papers that can be reproduced

Systematic Replication Studies

Percentage of papers replicated in systematic replication studies.

n = #of papers investigated



Percentage of papers that can be replicated

Similarly, the limited replication percentages suggest a potential credibility problem, as the inability to replicate results undermines confidence in the robustness and generalizability of scientific conclusions.

¹ Open Science Collaboration (2015), ² Camerer et al. (2015), ³ Klein et al. (2018), ⁴ Camerer et al. (2018), ⁵ Cova et al. (2021), ⁶ Davis et al. (2023), ⁷ Holzmeister et al. (2024).

Robustness Reproducibility

Fraction of the robustness tests that are found to be statistically significant.

n = #of robustness tests

Especially, Campbell et al. (2024) suggests the existence of substantial credibility problems for observational data studies in economics.

¹ Brodeur, Cook, et al., 2024, ² Campbell et al. (2024)

