

Preregistration and Incentives

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Summary

Widespread failure to replicate published findings across the life and social sciences has sparked a movement toward increased openness and transparency [1]. A primary goal is to correct the prevailing incentive structure in science seen as rewarding strong, clean, and positive results, often at the expense of credibility [2]. Chief among the proposals calls researchers to preregister their study designs in public registries, thereby removing temptation to depart from best practice after the empirical outcomes become known [3]. However, this logic for preregistration has not yet been formally examined. There are also reasonable concerns that committing to a study design may limit the scope of what can be learned from a study [4].

Question. Does preregistering a study design lead to more informative research outcomes when a researcher is strategically motivated to publish?

Answer.

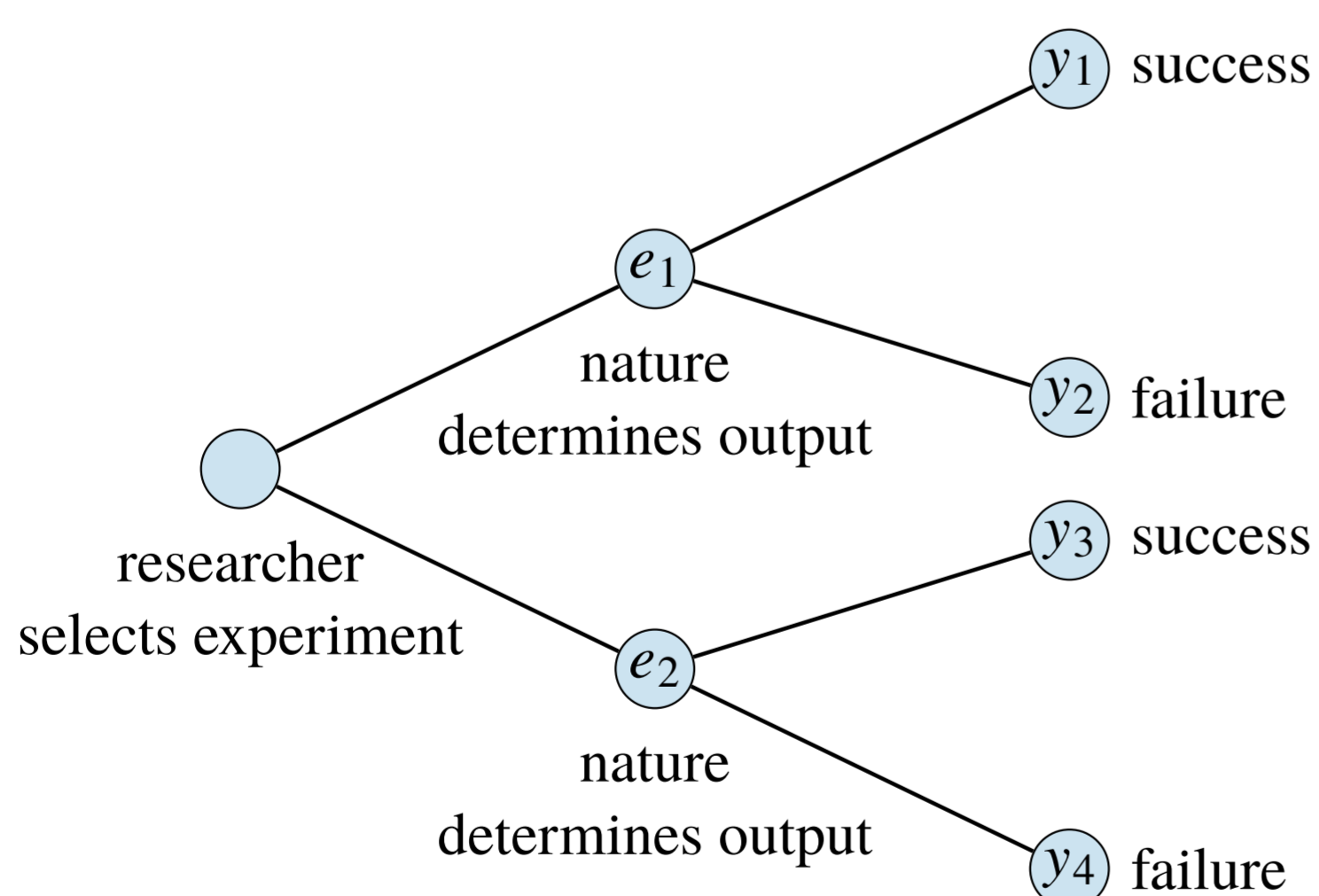
1. If the researcher and the evaluator of the study (e.g. referee) begin equally informed about the research environment, then preregistration is generally unhelpful and potentially harmful when it constrains learning.
2. If the researcher knows more about the research environment, then preregistration can credibly communicate this information to the evaluator, improving the informativeness of research outcomes.

Model

The researcher performs a study and discloses the results in a report to an evaluator who decides whether not to publish it. Before starting out, the researcher submits a pre-analysis plan with verifiable information for how the study will be carried out. The researcher's goal is to publish the report. The evaluator reads the report and only publishes it if (1) the study follows the pre-analysis plan and (2) the report is sufficiently informative.^a

- An *analysis* $x \in X$ captures the design choices and results of the study.
- A *report* $r \subset X$ describes analysis $x \in r$. R is the set of reports.
- A *pre-analysis plan* $m \subset R$ commits to submit a report $r \in m$.

The study's results shed light on the state of the world. The researcher and evaluator begin "equally informed" if they start out with the same prior over the state. Otherwise, the researcher begins with a more informed prior.



Example of a study. The researcher selects an experiment and nature determines the outcome, interpreted as either "success" or "failure." An *analysis* includes the choice of experiment and the outcome $x = (e_i, y_j)$. Reporting "success" translates to $r = \{(e_1, y_1), (e_2, y_3)\}$. Preregistering the first experiment translates to $m = \{r_1, r_2\}$ with $r_i = \{e_i, y_i\}$ for $i = 1, 2$.

^aAs defined in Frankel and Kasy (forthcoming) [5].

References

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Equally Informed

The reasons why preregistration does not help when both the researcher and the evaluator hold the same information are as follows.

1. Committing to disclosure is unnecessary. Withholding results expected by the evaluator would lead to skepticism and a greater chance of rejection.
2. Committing to experimental design choices is also unnecessary. The same design choices made when writing the pre-analysis plan would be made over the course of the study.
3. In general settings, if the researcher is tempted to depart from the pre-analysis plan, then it must be beneficial to the evaluator.

Better Informed Researcher

Through personal experience or by having run a pilot study, the researcher may begin with a more informed hypothesis or a better sense of which design is best. In this case, preregistering a design can credibly relay this information to the evaluator. Even if the researcher is never tempted to depart from the pre-analysis plan, preregistration can serve as informative *cheap talk*, for instance, indicating which statistically significant testing outcomes have good prior reasons to be taken seriously is more credible before the outcomes are observed. Preregistration can also serve as a *costly signal*—committing to a confirmatory study to test a single hypothesis can signal the researcher's confidence that it is true.

Example. An experiment records multiple outcome variables and the researcher privately knows which variable is most likely to be truly associated with the treatment. Indicating this as the "primary outcome of interest" in the pre-analysis plan is more credible than doing so in the report after the results are known. It is also incentive compatible when true associations are more likely to produce positive results.

Conclusion

Preregistration has been suggested as a tool for improving scientific credibility in the face of incentives to "publish or perish." A formal examination finds:

- Committing to a study design is not useful per se.
- Preregistration can help when a pre-analysis plan conveys information useful for interpreting the results.

The type of information preregistration helps convey can result from personal experience, as it would when an economist relies on her familiarity with the inner workings of a government or the particulars of a cultural group when deciding how to measure the effect of a policy intervention. Information asymmetry can also emerge endogenously in the research process, say, by first running a pilot study and then using what is learned from this to preregister a more robust design for the main study. There are also sample-splitting techniques in which a portion of the data is freely examined in order to formulate and preregister informed hypotheses, which are then tested on the remainder of the data [6]. In these cases, there is an incentive to relay information by committing to a design when it is more likely to produce desirable results than its alternatives.

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