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Tenure Track Faculty Search, Department of Statistics

Dear Members of the Search Committee,

I write to express my interest in your call for tenure track faculty in statistics. I am an Assistant Professor of Instruction in the Department of Political Science at Northwestern University, where I teach courses on statistics, statistical computing, and computational social science and conduct research on applied statistics in the social sciences. My work is published or forthcoming in leading social science outlets, including *Political Analysis*, the *British Journal of Political Science*, *World Development*, and the *Journal of Experimental Political Science*.

My research agenda focuses on using statistics to improve research design before data collection. My current focus is on statistical precision. This is overlooked in the statistics, econometrics, and social science methodology literature in favor of identifying unbiased estimators. Implicitly, this literature assumes that one can improve statistical precision by just increasing sample size. This is not feasible in many social science applications due to practical or ethical considerations.

Focusing on survey and experimental data, this agenda seeks to shape applied research by focusing on cases where one can seemingly improve statistical precision without sacrificing unbiasedness. As I show in my work, this usually implies unforeseen costs in other dimensions.

For example, in "Balancing Precision and Retention in Experimental Design" (*conditionally accepted at Political Analysis, the primary outlet for developments in statistical methods for political science*), we discuss how implementing alternatives to the standard experimental design, such as block randomization or repeated measures, may attenuate expected precision gains via explicit or implicit sample loss, a concern that prevents researchers from applying these techniques widely. Through three replications and six reanalyses of previously published experiments in leading political science journals, we show how precision gains from alternative designs can withstand significant degrees of sample loss.

As another example, in a solo-authored publication in the *Journal of Experimental Political Science*, I discuss the unforeseen costs of implementing double list experiments. This is a variant of the list experiment that promises narrower confidence intervals but comes with under-explored questionnaire design complications in the form of carryover design effects, a special kind of question order effect. I introduce statistical tests to diagnose this effect, which in turn facilitate the implementation of a more efficient technique.

One of the core lessons from my research program on statistical precision is that combining different techniques helps overcome their respective limitations. For example, in work in progress, we combine list experiments with questions from the network scale up method (NSUM), a popular technique in the health sciences, to improve the estimation of sensitive attitudes and behaviors. On the one hand, list experiments suffer from low statistical precision. On the other hand, generalizing to a population of interest through NSUM requires assumptions that are untenable in social science applications. By using NSUM questions as auxiliary information to the list experiment, we improve precision without introducing cumbersome assumptions.

My research also influences substantive work in the social sciences. In a working paper, we follow on our efforts to incorporate NSUM into social science applications by documenting the prevalence of criminal governance strategies in Uruguay. This is the basis of an European Research Council grant application (*PI Lucia Tiscornia at UCD, interview scheduled in June*) seeking to understand criminal governance in least-expected contexts from a comparative perspective, which will in turn serve as a platform for further methodological innovation.

My teaching focuses on making statistics accessible to diverse audiences through a combination of flexibility and accountability. At Northwestern, I am the central person teaching statistics courses in the department. I teach the first course in the PhD methods sequence, focusing on probability and statistical inference, and an undergrad-level introductory course that helps political science majors become informed consumers of data analysis. I also lead the math camp for incoming political science and sociology students and run a year-long statistical computing workshop that introduces cutting-edge statistical programming practices. This quarter, I am teaching a seminar on evidence-informed decision making in academia, policy, and industry, focusing on how experimentation and machine learning are used in academia, government, and industry, to justify organizational change. Next year, I will add an advanced graduate seminar on machine learning to my portfolio.

Before joining Northwestern, I taught data analysis for public policy and public opinion at McMaster and evidence-based policy to address social and political challenges in developing democracies at Tulane. Both courses emphasized the use of applied statistics to generate credible evidence. Beyond the classroom, my previous role as the methods editorial assistant for the *American Political Science Review* gave me the opportunity to shape and influence the development of cutting-edge methods in the field, a goal that I continue to pursue through service and mentoring.

I am prepared to teach both departmental and service courses on courses on probability and statistics, design-based causal inference, machine learning, data visualization, and statistical computing. You can find copies of current and future syllabi in my website.

I believe my expertise makes me an excellent fit at PUC. Moreover, it would be an enormous privilege to return to my alma mater as faculty. If you have any questions, you can contact me via email or phone.

Sincerely,

Gustavo Diaz
Assistant Professor of Instruction
Northwestern University