Northwestern | INSTITUTE FOR POLICY RESEARCH

IPR Working Paper Series

WP-23-25

Limiting "Garbage Can" Bias: Time and Not Resources Affects Research Perseverance

Philip Moniz
University of Texas at Austin

James Druckman
Northwestern University and IPR

Jeremy Freese
Stanford University

Version: July 6, 2023

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Abstract

What factors contribute to researcher productivity? Scholars have documented various biases in the publication process, perhaps most notably the file drawer bias (i.e., an inability to publish null results, leading them to be put in the file drawer). Much less attention is paid to a distinct bias, what Moniz, Druckman, and Freese coin the “garbage can” bias: where a researcher abandons a project (i.e., throws the entire idea in the garbage can) due to an inability to acquire funds needed for data collection. They leverage a survey with applicants to a National Science Foundation funding program—Time-Sharing Experiments in the Social Sciences—to identify variables that facilitate perseverance (i.e., the pursuit of a project after being declined, thereby avoiding the garbage can). They find that much more important than alternative financial resources is having the time to pursue the project. This suggests that institutions need to ensure scholars, particularly those early in their career, have sufficient time to recover from what are often the sunk costs of a failed grant application.

The practice of science has notably evolved in the twenty-first century. Transparency and reproducibility have received more attention (Christensen et al. 2019), team science has expanded its reach across disciplines (Jones 2021), and the genesis of innovation is better understood (Liu et al. 2023). Concomitant with these trends is renewed attention to productivity; that is, what factors lead scholars to be more productive? This work shows that work environment (as opposed to individual attributes) plays a crucial role in affecting productivity (Way et al. 2019, Zhang et al. 2022). Yet, these results apply largely to physical science disciplines with research group collaboration norms (Zhang et al. 2022), which is not the case in most social sciences (Zhang et al. 2022: 12). Social science research consequently may face distinct hurdles.[1]

In addition, most work on productivity measures it with metrics such as publications, citation counts, and other observables. But this conjoins the *pursuit* of a research idea with *success* in having the idea published. This concatenation is likely problematic, as the factors that influence publication and post-publication processes may be different from those involved with the perseverance often necessary to conduct and complete research projects in the first place. Research has long considered publication dynamics including biases such as an aversion to null results (Franco et al. 2014), and the utility of social networks (Carrell et al. 2022). Yet, much less is known about the earlier step: what variables affect whether a researcher perseveres on a topic?

We address this question, in part, by using unique data to identify when a researcher continues to pursue a research idea after having a grant to collect data on the project declined.

[1] The relevance of the social sciences to individual and societal well-being also has come into stark relief given challenges such as persistent discrimination, democratic backsliding, ineffective science communication in response to COVID-19 and climate change, etc. (on COVID-19 and social science, see van Bavel et al. 2020).

This puts aside other parts of the research pursuit process including having the initial idea and doing the work to apply for a grant. Yet, it captures a vital component: *perseverance*.

Its obverse, desisting from a project, may also be seen as a precursor to the well-known "file drawer" problem, in which finished research fails to be published, typically because of null results. In our case, when planned research does not move forward, whatever results would have been obtained do not even get to the point of ending up in a file drawer. Rather, the project is simply dropped and thus can be thought of as ending up in the garbage can—we coin this a "garbage can bias" (i.e., the bias induced by abandoned research plans).

Often in research, investigators face a setback and can either discontinue the research project or continue to pursue it despite the rejection. Identifying variables that contribute to perseverance is meaningful since they very well may affect the pursuit of valuable ideas and projects or even, if not, ensure the production of knowledge since even ill-conceived projects can offer insight into what path to not take. The challenge is that perseverance decisions are typically unobserved since studying them requires information from researchers who pursued and then abandoned projects. We next discuss how we overcome this hurdle and what variables we considered.

Time-sharing Experiments in the Social Sciences (TESS)

Time-sharing Experiments for the Social Sciences (TESS) is a platform for conducting social science survey experiments fielded on probability-based samples of United States adults (https://www.tessexperiments.org/). Established in 2001 with support from the National Science Foundation, TESS has provided, on a competitive basis, more than 800 social scientists with the opportunity to test a broad range of innovative hypotheses. Investigators seeking to conduct an experiment using TESS submit a 5-page proposal (plus additional pages that detail the exact

experimental treatments and measures) that is sent out for review, typically by two other scholars. The principal investigators use these reviews to decide which proposals to field; historically (over the course of the entire project), the ultimate acceptance rate for submitted proposals has been roughly 14%.

Our interest is in what factors affect whether applicants of declined TESS proposals subsequently continued to pursue the project. To explore this, we invited applicants to complete a survey that asked about the trajectory of their proposed project. This enables us to identify a typically unobservable outcome—whether a proposed project ended up in the garbage can or the researcher persevered.

Survey of TESS Applicants

We identified the population of 894 TESS applicant-proposals from October 2012 to January 2019.[2] We chose those dates as they encompassed a change in TESS's principal investigators to a point when it seemed reasonable to assess whether the respondent had pursued a declined project. We collected data from July 22, 2020, to September 23, 2020, sending multiple reminders and offering $10 to $25 for completion of the survey.[3] We received a total of 544 responses for a 61% response rate.[4] Of those who responded, 437 had their proposals declined; these are the responses on which we focus. For these respondents, we asked them to

[2] This population includes only those for whom we had or could locate a current e-mail address. We also only include projects with a final decision (e.g., not those with a revise-and-re-submit at the time).
[3] Compensation was higher for those who had multiple proposals; we also increased compensation offers with later reminders.
[4] If a respondents applied to TESS multiple times, they were asked about each application separately. Thus, our unit of analysis is applicant-proposal. A total of 61 respondents had multiple declined applications. We also included every co-author on a given proposal since it is viable that a project could be pursued by one co-author but not another. Our analyses control for whether the project included co-authors. Of the researchers who had at least one declined proposal, 84% were White, 57% were male, and 52% had children. Their average age was 38 years.

report whether they abandoned or pursued the project.[5] This constitutes our main outcome variable.

We studied the effect of four types of variables. First, we included various demographics and social characteristics including race/ethnicity, gender identification, age, whether the respondent had children, highest parental education level, and risk orientation (i.e., extent of risk-proneness). Work in the health context highlights the relevance of demographic variables, particularly race, in shaping one's research trajectory (e.g., Working Group on Diversity in the Biomedical Research Workforce 2012, Erosheva et al. 2020). We included the risk-proneness variable since pursuing a project after a negative evaluation inherently involves taking some risk as the project's success is far from ensured. Second, we added two variables to measure access to the most straightforward substitute to a TESS grant: money. This included the size of one's annual discretionary research budget (on a 1-7 scale with higher values indicating a more sizeable budget) and the extent of opportunities to apply for internal institutional grants (on a 1-5 scale with higher scores indicating more opportunities). Third, as pursuing the next steps in a research project requires time to do so, we asked respondents the percentage of time they devoted to research (versus administration, teaching/advising or other). We also asked about the number of Ph.D. students advised, although here we recognized the possibility for contradictory predictions. The team-based nature of many sciences would lead one to expect that more Ph.D. students, in those disciplines, will facilitate the pursuit of research ideas. But, even though team-based models have notably grown, they remain relatively rare in most of the social sciences, with

[5] Answer categories differentiated distinct stages for those who pursued a project such as having collected and analyzed data, having collected but not yet having analyzed data, or not yet having collected data (and whether the project stayed the same or changed somewhat). We merge these categories into "pursued the project" since, as we note below, there was little variance between categories (most had collected and analyzed data).

students pursuing independent research. In this situation, advising more students would take time away from an advisor's own work and work against perseverance. Given this is the ostensible current reality for the social sciences, this may be the more likely effect. Finally, we included a host of contextual variables about which we do not have clear predictions including the number of articles published in the last three years, the number of books published in the last three years, whether the person's department offered a Ph.D., whether the proposal included a co-author(s), and whether the respondent had tenure (e.g., an Associate or Full Professor).

Results

We found that 74% of those who had their projects declined reported persevering.[6] Thus, a large majority did in fact pursue the projects despite the rejection. The lack of a sizeable garbage can bias is a positive finding given there are no clear alternative programs to TESS, and thus it was conceivable that many would not proceed. While we did not measure how they subsequently collected data, we presume most turned to cheaper non-probability data sources.

We present our main results in Table 1 that regresses perseverance on our independent variables.[7] As interesting as what is significant is what is not. We find no evidence that access to resources influences perseverance. Neither having a larger discretionary research budget nor access to internal grant opportunities significantly influenced perseverance. This may be surprising given that a TESS study represents a nontrivial grant. Yet, as mentioned, the availability of cheaper data sources probably enables researchers to continue with their projects and avoid garbage can bias.[8]

[6] Of those, 85% reported having collected and analyzed the data (with the rest either not having yet finished data collection or not having finished analyses).
[7] The N reduces due to missing values, mostly on age (25) and race (19). The results are robust if we exclude those variables.
[8] Of those who collected data, 45% used their personal funds, 45% used internal funding, and the remaining 9% acquired external funding.

Table 1: Predicting Perseverance

Variable	Estimate (SE)
Demographics	
Age	0.08 (0.03)**
Asian-American/Pacific Islander (reference = White)	-0.05 (0.55)
Black (reference = White)	0.68 (1.22)
Hispanic (reference = White)	-0.40 (0.42)
Other race (reference = White)	0.61 (1.16)
Female	0.10 (0.26)
Parent has BA (reference = no BA)	0.30 (0.37)
Parent has adv. Degree (reference = no BA)	0.03 (0.28)
Children	-0.43 (0.27)
Risk prone	0.48 (0.18)**
Money	
Research budget	0.01 (0.09)
Internal grant	0.09 (0.13)
Time	
Research time	0.02 (0.01)**
Students advised	-0.03 (0.01)*
Professional Context	
Dept. confers PhD	0.18 (0.30)
Coauthors	0.28 (0.26)
Tenure	0.45 (0.58)
Published articles	-0.04 (0.02)**
Published books	-0.07 (0.18)
Intercept	-4.17 (1.26)***
Number of observations	398
***p<0.001, **p<0.01, *p<0.05 for two-tailed tests. Logistic regression model of persevering with project after TESS rejection. Estimates are logit coefficients. Standard errors are in parentheses.	

Our results indicate that what matters most for perseverance is time. Those with more research time and those who advise fewer Ph.D. students (which as explained, likely reflects having more time) were significantly more likely to persevere. To proceed with a project, including figuring out a data collection plan after the one hoped for proves unavailable, takes

time which makes it a more valuable resource than money. Interestingly, we also found that having children falls just short of significance ($p = .12$) in a negative direction, presumably also reflecting a time constraint. To get a substantive sense of our results regarding time, consider that the predicted probability of persevering for the average researcher who devotes 40% of their time to research (the 25th percentile) is 71.1%. A similar researcher with 80% of their time allocated to research (the 75th percentile) has an 81.8% chance of persevering, nearly an 11-percentage point increase. The substantive effect of advising students is far smaller, given that most researchers advise fewer than 4 students. The predicted probability of persevering for the average researcher with no advisees (the 25th percentile) is 77.8%, while one with 3 (the 75th percentile) is 76.2%.

Another important predictor was our measure of risk-proneness, with those who described themselves as willing to take risks also being much more likely to proceed with a project. In terms of the 5-point scale we used, movement from "rarely willing" (2) to "frequently willing" (4) leads to a 17.6 percentage point increase in persevering (65.7% vs. 83.3%).

In contrast, we found little evidence that demographic variables matter—race and ethnicity, gender, and parental education are not significant. Older respondents were significantly more likely to persevere, perhaps reflecting increased experience that facilitates pursuing projects (age is extremely highly correlated with years since Ph.D., $r = .93$).[9] In terms of predicted probabilities, the difference between the 25th and 75th percentile—a 32-year-old vs. a 41-year-old, corresponds to a 13.7 percentage point increase (66.5% vs. 80.2%).

Among other variables, the researcher's number of published articles exhibited a significant negative effect. This is intriguing as one could imagine the inverse impact insofar as

[9] We opted to include age instead of years since Ph.D. because the overall model fit was better with the inclusion of age versus years since Ph.D.

the more one publishes, the more they might have a set routine for pursuing projects. That said, a possible reason for the negative relationship is that more articles indicate investment in more projects and thus lower opportunity costs for dropping one given project. None of the other explanatory variables we considered—books published, department offering a Ph.D., have a co-author(s), tenure status—were significant.

Conclusion

The research process is defined by challenges. The initial hurdle involves developing an idea—asking a question and innovating hypotheses (Oliver 2004, Druckman 2022: 118-126). For many, the next stage involves data collection, and this is where grants become relevant. While factors that shape who obtains grants have been studied (e.g., Working Group on Diversity in the Biomedical Research Workforce 2012, Erosheva et al. 2020), much less is known about perseverance in the face of grant failure. We coined dropping a project after a grant rejection a garbage can bias—if scholars discard the idea, data do not exist to even put in a file drawer. Understanding the sources of such bias is important for organizations and institutions that want to encourage continued pursuit of ideas, and to researchers who seek to understand what seems to matter for perseverance.

Our results are limited to one type of work (survey experiments) in the social sciences, and one grant program. Nonetheless, they offer a rare opportunity to study the extent of garbage can bias and the correlates of perseverance. We find a relatively small amount of garbage can bias—about one fourth of the projects. We also find that time and risk orientation play the key role in stimulating perseverance. If confirmed by future work, these findings have actionable implications. For instance, universities and departments could consider ensuring those early in their careers have time as it may matter more than resources; it also suggests mentors be

conscious of time pressures in talking to early career scholars. The point here is to transform the sunk costs of the failed grant into an investment in a project pursued. With regard to risk orientation, it does not follow that scholars should be encouraged to be overly risky, but it does highlight the relevance of discussing the risk of pursuing a particular project and calibrating the likely outcome. Overall, persevering in the face of failure constitutes a difficult reality for researchers and isolating factors that influence it can only help stimulate increased, worthwhile knowledge production and career development.

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