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CUR Focus

Assessing Outcomes of National Science Foundation Grants in the Social Sciences

Abstract

In 2013, the U.S. Congress passed legislation that heavily restricted new political science grants administered by the National Science Foundation (NSF). Using this policy debate as a learning opportunity, a team of undergraduate researchers empirically assessed the outcomes of NSF grants in five social science disciplines—economics, linguistics, political science, social psychology, and sociology—during a two-year period to determine if political science grants differed significantly from other social science disciplines. The results indicate that political science grant outcomes did not substantively differ from other social science disciplines. However, political science grants were the least expensive grants awarded, on average, and they were more likely to be awarded to assistant professors. A survey of principal investigators provided an additional opportunity to measure grant outcomes not measured by the NSF. The methods employed in this study could be adapted to assess grant outcomes in a variety of disciplines, including computer science, mathematics and statistics, engineering, and the natural and physical sciences.

Introduction

In March 2013, the U.S. Congress enacted a stop-gap budget measure that funded the federal government through the end of the fiscal year and temporarily avoided the threat of a government shutdown. Passing this legislation, however, required much negotiation on the part of congressional Democrats and Republicans. In an effort to gain Republican support and ensure the bill's passage in the Senate, Democrats permitted the introduction of an amendment by Republican Senator Tom Coburn of Oklahoma that heavily restricted National Science Foundation (NSF) funding for political science. For several years, Coburn and some other members of Congress had questioned the need for NSF grants in political science, claiming they were an example of wasteful government spending. In 2009, Coburn made clear his disdain for social science research that examined political behavior, saying "Theories on political behavior are best left to CNN, pollsters, pundits, historians, candidates, political parties, and the voters, rather than being funded out of taxpayers' wallets" (Uscinski and Klofstad 2013, 557).

Senator Coburn's amendment required the NSF director to certify that all political science grants awarded during fiscal 2013 promote "national security or the economic interests of the United States" (Uscinski and Klofstad 2013, 558). Due to uncertainties about implementing this requirement, the NSF canceled its call for new political science grant proposals in the summer of 2013 (Mole 2013). Although NSF funding for political science was restored for the following fiscal year, political scientists and other social scientists expressed concern over possible future restrictions or cuts in NSF funding, particularly if lawmakers did not see value in a given line of research. Since that time, numerous professional associations—including the American Political Science Association, Midwest Political Science Association, American Psychological Association, and Consortium of Social Science Associations—have lobbied Congress and the White House to ensure the preservation of NSF grants in the social sciences.

This policy controversy provided a valuable learning opportunity for undergraduate students. Instead of relying on subjective perspectives regarding the value or importance of NSF grants, a team of undergraduate researchers could employ social science research methods and empirically assess the outcomes of political science grants and those in other social science disciplines. Students could develop their own empirical measures of the value of research grants—which could be conceptualized and operationalized in a variety of ways—to determine if there are statistically significant differences among academic disciplines in the social sciences in terms of the recipients and outcomes of NSF grants. This, in turn, could provide quantifiable evidence to help taxpayers, interest groups, and government officials make an informed decision regarding NSF funding levels.

In completing our analysis, we not only examined who received a grant and how much was spent on a given research project, but we also determined whether grants resulted in conference papers or published manuscripts, and whether the research was included as part of undergraduate and/or graduate courses at a college or university. It is our hope that this type of analysis will provide policymakers with an example they can use to evaluate grant programs in future budget deliberations, and provide a starting point for determining the importance or value of completed NSF-funded research. Further, the research methods employed are not unique to the examination of social science grants. Our approach could

be adapted and implemented in a variety of fields, including computer science, mathematics and statistics, engineering, and the natural and physical sciences. Students worked collaboratively to conceptualize and operationalize variables, code and analyze data, and presented their findings in a professional manner.

In the following, we discuss our research methods, substantive findings, and offer suggestions for further research by other teams of undergraduates. Ultimately, we found that political science grants did not differ significantly from other grants in the social sciences, with a few exceptions. We did find that political science grants, on average, were the least costly of the five disciplines we analyzed. In addition, 26 percent of the recipients of political science grants were junior faculty members, a statistically higher percentage compared with the other social science disciplines we assessed. Regardless of academic discipline, we found that principal investigators regularly incorporate their NSF-funded research into college and university courses.

Methods

Our research team consisted of three undergraduates and a faculty member (author Kopko) who received a grant as part of the Summer Scholarship, Creative Arts and Research Program (SCARP) at Elizabethtown College during the summer of 2014. SCARP was instituted in the summer of 2013 as a means of providing students with an opportunity to engage in supervised research with a faculty mentor. The program provides free room and board to student participants living on campus, in addition to a weekly stipend to help provide income that might otherwise be earned from summer employment. The SCARP initiative is part of Elizabethtown College's commitment to developing "Signature Learning Experiences," which ensure that every student can engage in at least two of five high-impact educational practices before graduation. These experiences are supervised research, cross-cultural experience or exchange, internship/field experiences or practicums, community-based learning, and capstone courses, projects, or development portfolios. Elizabethtown College recently was recognized by the Association of American Colleges and Universities for its commitment to these high-impact educational practices (Strikwerda 2015).

When beginning this SCARP project, we sought to assess the outcomes of NSF-funded grants in five social science grant categories—economics, linguistics, political science, social psychology, and sociology. We selected these particular grant categories for two reasons. First, these programs were all housed within the NSF's Directorate for Social, Behavioral

and Economic Sciences, and therefore were part of the same administrative unit within the NSF. Second, because political science represented its own grant program that was not multi-disciplinary (such as "law and social sciences" or "science, technology, and society"), we wanted to select four other grant programs that were similarly situated to ensure consistency and reduce the potential for bias when comparing outcomes across fields.

Initially, we wanted to determine if political science grants differed significantly from those in the other four social science grant categories. We reasoned that if the outcomes of political science grants differed significantly from other social science grants, that difference could justify changes in political science funding levels. As we began our preliminary work, we sought to identify several dependent variables that would help government officials, interest groups, and the general public to better understand and evaluate the outcomes of NSF-funded grants in the social sciences. Collectively, we developed the following list of research questions that sought to provide context and background information on these grants and to measure grant outcomes based upon investigators' publications and conference presentations:

1. How many grants were awarded in each field?
2. On average, how long did grants last (in months)?
3. On average, how much total money was awarded in each grant field?
4. How many grants were awarded to principal investigators at "very high research" institutions?
5. What were the professional characteristics of the principal investigators who received grants (i.e., professional rank for those grant recipients employed as professors)?
6. How many grants involved one or more co-investigators?
7. How many grants produced publications?
8. How many grants produced conference presentations?

We reasoned that questions 7 and 8, concerning the number of publications and conference presentations, were an intuitive way of measuring grant outcomes. Presumably, the dissemination of research findings through publications and conference presentations should indicate the importance and quality of NSF-funded research.

To gather the preliminary data necessary to conduct our anal-

ysis, we relied on the NSF’s Research.gov website to access the “project outcomes reports” (PORs) for grants awarded in all five research categories (National Science Foundation “Research and Spending Results”). According to the NSF, the project outcomes reports:

...should serve as a brief summary (200-800 words), prepared specifically for the public, of the nature and outcomes of the project. The report should describe the project outcomes or findings that address the intellectual merit and broader impacts of the work as defined in the NSF merit review criteria. The POR does not need to contain publications resulting from the award as NSF automatically includes publications that are provided as part of the annual and final project reports as part of Research.gov’s Research Spending and Results. (National Science Foundation 2013)

While researchers do not need to include publications in their PORs, that information is to be automatically added to the publicly searchable database of PORs, based upon other reports that researchers are obligated to file with the NSF. This led us to believe that the POR online database provided an excellent opportunity to examine who received grants and what happened as a result of the NSF-funded research.

Ideally, we would have preferred to conduct our analysis over an extended period of time, perhaps five or 10 years, but unfortunately this was not possible due to data-availability issues. PORs were not required to be filed and made publicly available until January 4, 2010, under the America COMPETES Act (Section 7010: Reporting of Research Results). This legislation required that “all final project reports and citations of published research documents resulting from research funded in whole, or in part, by the [National Science] Foundation, are made available to the public in a timely manner and in electronic form through the Foundation’s Website” (National Science Foundation 2013).

Given this limitation, we gathered data for only a two-year period—from January 4, 2010, to January 3, 2012—on any NSF grants that had an expiration date within this timeframe. We examined grants with expiration dates within this timeframe because completed grants would be most likely to have produced publications and/or conference presentations. Additionally, researchers would have had ample time to update the POR with addenda to reflect new presentation or publication outcomes. We downloaded the grant data for this time period and began our statistical analysis.

Findings

The Research.gov website yielded a total of 735 social science grants that expired within this two-year period. Table 1 presents the number of social science grants per discipline, average award per grant, length of the grant in months, and average award amount per month. As noted in Table 1, there were 155 political science grants that expired during this period, and the average grant award was \$103,243. Political science grants represented the smallest average awards when compared to the other social science disciplines, and the average cost was statistically distinguishable from all other social science disciplines, except sociology (which had a fairly large award range). This result came as a surprise. We initially thought that political science grants would be among the most expensive awards, given that they were the focus of congressional action said to be driven, in part, to reduce wasteful government spending. And when examining the length of the grant award (in months), we found that political science grants lasted for a statistically shorter period of time compared with grants in economics, linguistics, and social psychology. Further, the average cost per month was statistically distinguishable from grants in economics and social psychology.

Table 1: Summary of NSF Grants and Average Grant Award

Discipline	Number of Grants	Average Grant Award	Average Length of Grant (Number of Months)	Average Award Amount Per Month
Economics	226	\$166,922*	41*	\$3,995+
Linguistics	128	\$133,204+	37*	\$2,982
Social Psychology	56	\$241,098*	39*	\$5,509*
Sociology	170	\$166,907	25	\$4,064
<i>Political Science</i>	155	\$103,243	26	\$3,391
Total/ Combined	735	\$153,269+	35*	\$3,938

* p < 0.05; + p < 0.10, two-tailed test.

Note: Statistical significance t-test results are in relation to the NSF political science grant awards.

We then analyzed the Research.gov data to determine if there were systematic differences in who received these grants—based upon investigators’ institutional affiliation (very high research institution versus other institutions); professorial

rank (for recipients who were professors at the time the grant was awarded); and whether there were one or more co-investigators. (We excluded dissertation awards from this analysis to ensure consistency across categories, resulting in a new sample size of 540 grants.)

As Table 2 indicates, the level of research activity at institutions whose investigators received political science grants did not differ substantively from the other disciplines. The majority of NSF grants were awarded to principal investigators at “very high research activity” institutions as determined by The Carnegie Classification of Institutions of Higher Education (“Research and Spending Results”). However, a difference-of-means test indicated that more political science grants were awarded to scholars at very high-research universities compared to grant recipients in social psychology.

When examining grant recipients by professorial rank, not surprisingly, senior faculty members were more likely to receive an NSF grant in all five social science disciplines. But in political science, 26 percent of its grant recipients were junior faculty members—assistant professors. The t-tests in Table 2 confirm that a statistically significant larger percentage of assistant professors in political science received an NSF grant than in any other discipline analyzed. This suggests that potential cuts in NSF funds for political science could disproportionately affect the junior faculty members who are just beginning to establish their careers and research agendas.

We also examined differences in the number of grants that involved one or more co-investigators. One could argue that

the involvement of co-investigators signals a proposal that addresses an important research question. Upon further analysis, our results indicated that political science grants did not differ statistically from grants in linguistics and sociology with regard to the inclusion of one or more co-investigators. Grants in economics and social psychology were statistically less likely to include co-investigators when compared with political science grants.

We then examined publications and conference presentations for all social science grants. The POR data indicated that there were only 247 grants (33.6 percent) that resulted in a publication, and only four grants (0.5 percent) that resulted in conference papers. These numbers seemed impossibly low given that NSF grants are typically awarded to researchers who not only present an important research question, but who also have convinced a panel of peer reviewers of the merits of their grant proposals. We operated under the assumption that these data were incorrect for unknown reasons; either principal investigators did not notify the NSF of these outcomes or the NSF failed update the POR database. This was disappointing because we could not be certain of our ability to answer research questions 7 and 8. This situation, however, presented a “teachable moment” for the student researchers. Instead of giving up, we dug deeper and gathered more data using another method—an online survey of principal investigators to measure the grant outcomes.

The scope of the research project shifted at this stage to look at the social science outcomes somewhat more broadly. Specifically, after securing approval from our institutional review board, we employed an online survey to determine the number and percentage of grants that resulted in published research findings in articles, books, or other scholarly outlets, and the number and percentage of grants that resulted in conference presentations.

Questions regarding publications and conference presentations were based upon the 2004 National Study of Postsecondary Faculty Survey, as administered by the National Center for Education Statistics (2004). Our survey also provided an opportunity to measure outcomes not as-

Table 2: Characteristics of NSF Grant Recipients

Discipline	Very High Research Institution (% of Discipline)	Assistant Professors (% of Discipline)	Associate Professors (% of Discipline)	Full Professors (% of Discipline)	Grants with One or More Co-Investigators (% of Discipline)
Economics	155 (77%)	11 (6%)*	37 (18%)+	152 (76%)*	47 (23%)+
Linguistics	77 (80%)	12 (13%)*	24 (26%)	52 (55%)	30 (31%)
Social Psychology	36 (64%)*	3 (5%)*	18 (32%)	33 (59%)+	12 (21%)*
Sociology	71 (82%)	12 (14%)*	16 (19%)	49 (58%)	25 (29%)
<i>Political Science</i>	<i>83 (84%)</i>	<i>26 (26%)</i>	<i>27 (27%)</i>	<i>45 (45%)</i>	<i>33 (33%)</i>
Total	422	64	122	331	147

* $p < 0.05$; + $p < 0.10$, two-tailed test.

Note: Statistical significance t-test results are in relation to the NSF political science grant awards. Percentages rounded to nearest whole number. Excludes dissertation grant awards. Sample size of 540 grants.

sessed in the PORs. We included additional questions that included, for example: how often the research findings were included in the recipient’s classroom teaching (if the recipient was a professor), whether the recipient’s institution publicized the grant, whether the results were publicized by news media, and whether the grant recipient used the findings to serve as an expert witness or to testify before a legislative body.

We gathered far more information in the survey than can be included in this article, but for the purpose of assessing outcomes and conceptualizing a grant’s “value,” we focus our attention here on measuring the number of publications and conference presentations that result from an NSF grant, and how often this information is incorporated into undergraduate and/or graduate courses. All of these measures tap, to some extent, the dissemination of information. Admittedly, there are many ways of conceptualizing the value and importance of an NSF grant and the dissemination of information, but to demonstrate how this project progressed, we focus upon the following measures.

Of the 735 principal investigators surveyed, we received responses from 180 researchers, resulting in a response rate of 24.5 percent. Of these 180 respondents, 27.7 percent (n=50) reported that their primary field was economics, followed by sociology (19.4 percent; n=35), linguistics (18.3 percent; n=33), political science (14.4 percent; n=26), and social psychology (13.8 percent; n=25). Another 6.1 percent (n=11) reported that they were now in another disciplinary field or declined to provide an answer. In Table 3 we provide the frequencies and percentages of respondents whose grants resulted in a publication or a conference presentation.

Table 3: Frequencies of Publications and Conference Presentations for NSF-Funded Social Science Research

Respondent’s Grant Resulted in:	Survey Analysis: Number of Respondents (% of Respondents)	C.V. Analysis: Number of Sampled Grants (% of Sampled Grants)
At Least One Publication	144 (80%)	60 (60%)
At Least One Conference Presentation	149 (83%)	23 (23%)
Total Number of Respondents/ Sampled Grants	180	100

Note: Percentages rounded to nearest whole number.

As noted in the second column of Table 3, a far greater percentage of respondents reported publications and conference presentations relating to their NSF grant than were listed in the PORs in the Research.gov database. In total, 144 respondents (80 percent of respondents) indicated that their NSF grant resulted in at least one publication, and 149 respondents (83 percent of respondents) indicated that their grant resulted in at least one conference presentation. Certainly, these survey results cast doubt on the accuracy of the comparable data contained in the PORs.

However, we also must proceed with caution when solely relying on the survey results. One could argue that those researchers who are more likely to publish or promote their work would also be more likely to respond to our survey request, thus overstating the extent to which the POR database is inaccurate. This situation provided students the opportunity to implement another method to measure the number of grants that resulted in publications or conference presentations—an examination of primary investigators’ curricula vitae (C.V.’s) as listed on their professional website. But relying on a researcher’s C.V. also is not without complications. First, not all researchers publicly post their C.V.’s, and even when they do, a C.V. may omit some publications and conference presentations for the sake of brevity. Second, C.V.’s are not always updated regularly; some C.V.’s that we examined were several years out of date. Third, determining which publications and conference proceedings resulted from an NSF grant can introduce some subjectivity into the analysis.

With these complications in mind, we opted to randomly sample 20 curricula vitae available online from each of the five social science disciplines. We then reviewed all these individuals’ publications and conference presentations during the grant period and for two years thereafter to determine if any of these publications or presentations were the result of a given NSF grant. We only coded grants that resulted in at least one publication or conference presentation when the author specifically noted that the research was funded in whole or part by the NSF grant, which is an NSF requirement (National Science Foundation 2004).

The findings of this subsequent analysis are reported in the third column of Table 3. We found that 60 percent (n=60) of the sampled C.V.’s listed at least one publication that was the result of an NSF grant, and at least 23 percent (n=23) resulted in a conference presentation of some sort. Given that not all curricula vitae were current as of 2015, and some did not list conference presentations, these findings should be considered a conservative report of the number of publications and conference presentations. Still, this sample suggests that the actual number of grants resulting in a publication or confer-

ence presentation far exceeds what is listed in the NSF's POR database. If the PORs are the primary tool by which members of the public, interest groups, and policymakers evaluate the effectiveness of NSF grants, then the PORs provide incomplete information for these groups. This incomplete information could have bearing on policy debates regarding funding levels for NSF research.

Table 4 presents the percentages of respondents who reported that their NSF-funded research was incorporated into undergraduate and/or graduate courses in some way during a typical academic term. Such information is not included in the PORs, but these data provide another means by which to measure the importance of a grant's research findings. Since not all NSF grant recipients were college/university professors (for example, some were employed by professional associations), we limited our analysis in Table 4 specifically to those principal investigators who were employed as a college or university professor, resulting in a sample of 164 survey respondents.

Table 4: NSF Research Findings Incorporated into College/University Courses

Type of Course	Number of Respondents (% of Respondents)
Undergraduate Courses Only	8 (5%)
Graduate Courses Only	38 (23%)
Both Undergraduate and Graduate Courses	102 (62%)
Any Course	148 (90%)
Total Number of Respondents	164

Note: Percentages rounded to nearest whole number.

Of the respondents who were college/university professors, the vast majority (90 percent; n=148) incorporated the findings of their NSF-funded research into their undergraduate and/or graduate courses. The survey results also indicated that more than two-thirds of respondents (67 percent; n=110) incorporated their NSF grant findings into undergraduate courses at their respective institutions. These findings provide evidence that the results of NSF-funded research are not solely used to inform graduate students. While most respondents incorporated their research findings as part of graduate-level courses (85 percent; n=140), many researchers also discuss their findings with the undergraduates they teach. Exploring the dissemination of NSF-funded research among undergraduate and graduate students is an area that could be explored in future research.


Discussion and Conclusion

By utilizing social science research methods to address a timely and controversial policy topic, this research project served as a significant learning experience for undergraduates. The students involved in this project took great care in coding data into appropriate statistical programs for analysis (each member of the research team cross-checked their peers' work to ensure intercoder reliability). They also crafted appropriate survey questions, submitted a proposal to Elizabethtown College's institutional review board, collected survey data, and relied on multiple methods and databases to answer a series of research questions. While learning to employ these research skills is important, perhaps another substantial lesson to be gained from this experience is that students learned that when evaluating public policy, they should prefer the objective analysis of empirical data, rather than relying on the subjective views of political actors.

To our knowledge, members of Congress did not conduct a systematic analysis of the outcomes of NSF grants in political science or other social science disciplines before restricting the use of NSF appropriations in early 2013. While some members of Congress relied on subjective judgments regarding the worth of an academic discipline, student researchers instead opted to utilize empirical data to determine if political science grants differed substantively from those in other social science disciplines. Based on the data provided in the PORs, political science grants did not differ substantively from other grant disciplines. However, political science grants were the least costly grant program, on average, and more junior faculty members in political science received an NSF grant compared with junior faculty members in economics, linguistics, social psychology, and sociology.

As noted above, this finding in regard to junior faculty members could be troubling for political scientists, because any future cuts in NSF funding could disproportionately affect the discipline's "rising stars." And the discovery that the publicly available PORs contain incomplete information is also worth noting. If the public only has access to incomplete information regarding grant outcomes, that could prevent individuals from engaging in an informed discussion of NSF funding priorities. Finally, this inquiry also demonstrates that there are a variety of ways of measuring the importance and value of NSF-funded research. Our analysis demonstrates that NSF research findings are regularly published, presented at academic conferences, and incorporated into undergraduate and graduate courses.

Although this research project focused exclusively on five social science disciplines, the methods that were employed in

this study could be replicated and expanded to include dozens of other disciplinary categories, including those in mathematics and the natural and physical sciences. Furthermore, the costs and resources associated with subsequent research projects of this nature are minimal. Since NSF's PORs are publicly available from Research.gov, researchers only need access to the Internet and appropriate statistical software to code the POR data. And given that the PORs contained incomplete information regarding publications and conference presentations, future research could determine if the PORs in other disciplines are similarly flawed. If so, researchers could follow our example and field an online survey of principal investigators or analyze curricula vitae, with little added cost. By conducting further analyses of NSF grant outcomes, researchers can provide a public service with implications for federal science policy. 

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