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Credibility and use of scientific and technical information in policy making: An analysis of the information bases of the National Research Council's committee reports

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ABSTRACT

Often researchers are disappointed by the limited extent to which peer reviewed STEM research seems to contribute directly to high level public policy decision-making. However, does the perception of the limited use of formal scientific and technical information (STI) accord with empirical reality? How does the choice of various types of information relate to the use and impacts of science policy reports and recommendations? While there is a prodigious literature on the use of formal information in decision-making, our focus is on the use of STI in science, technology and innovation (S&T) policy, a domain in which there is virtually no empirical literature. This study examines the use and impacts of STI in the context of a single, but arguably quite important, S&T policy domain: the US National Research Council (NRC) reports. This is an especially important target institution for analysis because NRC committees have extensive information access and resources, as well as decision-makers who are well equipped to deal with a variety of information types, including STI. To understand the information ingredients of high-level S&T policymaking and advice, we have coded information about the report, policy area, committee and reviewers, STI, and use of the report by Congress. Results indicate that STI is widely used in the NRC report-writing process, but, although nearly half of all NRC reports are explicitly conveyed to Congress, STI use does not figure significantly in this conveyance. These findings imply different internal and external credibility orientations.

1. Introduction

The importance of bringing the "best" information to bear on critical public decision-making is a value about which there is near universal consensus. There is somewhat less consensus on the need to insure that scientific and technical information (STI) is the primary element brought to bear on public decisions. Some observers (e.g. Hoppe, 1999; Morlacchi and Martin, 2009; Lodge and Matus, 2014) are simply not convinced that STI should take precedence over information types such as: expressed political values, perceived self-interest of individuals and groups, experiential knowledge, or other information sources that may contribute to the perceived credibility of information used in decision-making. However, it is the rare professional scientist or engineering researcher who does not feel that STI should have a prominent, and perhaps, even a privileged place and the corpus of information sources related to public decision-making. Thus, there is a long history of lamentations by notable researchers (for a recent overview see Schwandt et al., 2012) generally opining that STI should have a wider use in policymaking and that policymaking would almost certainly be improved were STI to play a larger role.

In this study, we are agnostic about the value of STI relative to the many other sources of information that could creditably be brought to bear decisions. However, a better empirical understanding of the extent to which STI is utilized, and the different degrees and types of STI used to make to public policy, seems merited. Does the perception of the limited use of formal scientific and technical information (STI) accord with empirical reality? What types of information "compete" with STI for inclusion in science policy-making, the realm in which one might intuitively expect greatest receptivity? Most important, how does the choice of var-

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ious types of information relate to the use and impacts of science policy reports and recommendations?

Our study examines the use and impacts of STI by focusing on a single, but arguably quite important, S&T policy domain: National Research Council (NRC) reports. This is an especially important target institution for analysis because NRC committees have extensive information access and resources, as well as decision-makers who are well equipped to deal with a variety of information types, including STI. To understand the role of STI in high-level S&T policymaking and advice, we primarily draw on a new database which we created from the characteristics of nearly 600 NRC reports. Our analysis shows that STI is increasingly used in NRC reports, and that its use is associated with a variety of report characteristics, aspects of the public policy environment, committee characteristics, and the origin of the request. On the other hand, STI does not make NRC reports more likely to be used by Congress.

2. Background

2.1. Studies of STI use

While there is a prodigious literature (O'Reilly, 1982; Huber, 1990; Pettigrew, 2014) on the use of formal information in decision-making, a tradition dating back at least to Herbert Simon's (1944) (1991) pioneering work, our focus is on the use of STI in science, technology and innovation (S&T) policy, a domain about which there is remarkably little literature. For purposes of this study, we are using the term STI in a manner somewhat narrower than is typical in the literature (see McClure, 1988; Walker and Hurt, 1990). We are concerned here with open scientific and technical literature appearing in peer-reviewed academic journals or proceedings. Hammond et al. (1983) observe that use of scientific information in policymaking is constrained by the situational context of policy-making processes, the cognitive limitations of policy makers, and the nature of scientific information. Policymaking procedures are subject to barriers in the usage of STI (Thomas et al., 1985). One early study of STI in policy-making (Bozeman, 1978) suggests that organizations making effective use of STI resemble in some ways the characteristics of R&D labs, focusing on gatekeepers and human brokers more than users' own access to formal STI (Liebeskind et al., 1996; Tsai, 2002).

Sabatier (1978) focuses less on information flow dynamics than on characteristics of the organization and its environment (see also Sabatier and Jenkins-Smith, 1988). He notes that the amount and type of technical information presented to decision-makers are affected by: (1) the resources available, (2) the characteristics of the activity or issue being discussed, (3) the legal and political context, and (4) the anticipated reaction of the decision-makers. Likewise, the influence of technical information on policy decisions is affected by: (1) the resources of the information source, (2) the content of the message, (3) the timeliness of the message, (4) the political and policy context, and (5) the resources and perspectives of the decision-maker. Ultimately, STI is most likely to be "influential when it involves high-quality research on a specific issue by a prestigious scientist who has excellent credibility with the decision-maker" or "for legitimating purposes when it is presented at a late date on a highly controversial issue dominated by normative or political considerations" where there is a lack of consensus among scientists (Sabatier 1978 p. 410–411).

Sabatier's work has proved influential, with a number of more recent studies (e.g. Landry et al., 2001, 2003; Amara and Lamari, 2001; Boswell, 2009) focusing on many of the same structural and institutional issues concerning the use of STI. However, another line of research, closer to our focus, considers psychological (e.g. Newell et al., 2015; Scheufele, 2000 and group interaction (e.g. Blum et al., 2013) factors as elements in the credibility and the use of information. Moreover our own study focuses less on the structure of sets of organizations, chiefly because we focus on a single institution, albeit a complex and socially significant one.

We focus on STI use exhibited by one of the most prominent and reputable science policy institutions in the US, the National Research Council (NRC). The NRC enables research work for the production of reports on science and technology issues within the National Academies. The National Academies play a unique role in the US science policy advisory system based on the organization's history, structure, and process. First, the National Academies is one of the oldest science policy advisory bodies in the US, having been established in 1863 during the US Civil War to advise the US Congress on scientific issues. Second, because the US research system is large and decentralized with policy shaped in a bottom-up manner through the activities of departments and agencies with large R&D budgets, various agencies provide coordination and assistance either as part of a branch of government or as non-governmental advocacy organizations. The executive branch is served by the Office of Science and Technology Policy, which resides in the Executive Office of the President and provides budgetary coordination as well as advice, the President's Council of Advisors on Science and Technology, which is comprised of university presidents and industry CEOs and is supported through OSTP, and the Science and Technology Policy Institute, which is a Federally Funded R & D Center (i.e., public research organization) designed to serve OSTP, with budgetary and administrative oversight delegated to the National Science Foundation. The US Congress receives advice from the Congressional Research Service and the General Accountability Office on matters including but not exclusive to science policy. There are also private non-profit organizations that weigh in on science policy primarily as advocacy organizations. The National Academies stands in contrast to these agencies, centers, and organizations in that, although it was chartered by Congress, it specializes in providing scientific and technical advice to both Congress and executive branch agencies. Although it is funded primarily by executive agencies and Congress, in the amount of $230.5 million in grant and contract revenues in 2014 from US federal government agencies and Congress, the National Academies are structured as a private nonprofit organization, which gives the organization some independence.

Third, the National Academies does not operate from an advocacy framework; rather it adheres to a formal study process that draws heavily on the information collection and peer review approach of scholarly research. NRC studies are performed by a committee of specialists in the topic area under investigation (usually not members of the National Academy) and members of the National Academy. Academy members are renowned scholars who have been elected to the Academy to honor their research achievements. The study process begins with information gathering which includes public meetings, submissions from external specialists, committee investigations, and scientific literature reviews (Fig. 1). Thus the NRC gives scientific and technical information an explicit place in the process. The committee takes the information it has gathered, deliberates and then, with support from National Academies staff, develops a draft report which has the consensus of the committee. The report is then sent to experts for final review, changes are made in response, and the report is transmitted, including opportunities for informal briefings and formal testimony to Congress, and released (National Academies, 2006).

Despite its long history and important contributions to science and public policy in the United States, surprisingly little research attention is given to the body. Literature on the NRC chiefly focuses on policy processes and secondarily on social, political or organizational aspects (Boffey and Nader, 1975; Ellefson 2000; Policansky 1999; Parascandola 2007), issues with the review process in sci-