Canadian online survey on fundamental research

16 September 2016

Introduction In addition to the official data presented in Chapters 2 and 3, we also developed and ran a quantitative online survey to query researchers about their perceptions of, and experiences with, funding for fundamental research. An important aim of the survey was to provide an understanding researcher's personal experiences and outlook on the research funding landscape in Canada. We had an excellent response to the survey, with over 1300 Canadian researchers completing it, suggesting that fundamental research funding is a high priority topic for Canadian researchers. Herein, we detail the survey questions and results.

Methods

Online Survey

The survey was open to researchers from all disciplines (e.g. science, social sciences, humanities, engineering, medicine) and career stages, with the proviso that they had some experience applying for research funding. The survey gathered detailed information in four major areas: 1) the types of research the scholars conduct (fundamental, use-inspired, applied), 2) the extent of external partnerships in their research, 3) their grant success rates, and 4) how important they perceive fundamental research is to the Canadian federal government and its future prospects in Canada. The survey also enquired how each of these factors have changed over time for the researchers. Finally, the survey gathered basic information from each respondent about gender, discipline, career stage and the year their PhD was obtained. The full survey is provided in Appendix 2.

The online survey was open from the end of May through early October 2016, and ran on the Fluid Surveys platform (fluidsurveys.com). Note that the survey was open to researchers from any country in the world because it is was run as part of a global survey through the Global Young Academy. To disseminate the survey to Canadian researchers, we gathered email addresses from Canadian university websites for as many faculty members as possible and emailed individual researchers directly. We also shared the survey broadly on social media, as well as through the Global Young Academy network, on scientific list serves, and through personal connections.

Survey Data Analysis

To extract survey responses for Canadian researchers, we selected all respondents who reported 'Canada' as their country of work, as well as those respondents who did not report a country of work (i.e. field was blank) but whose location was within Canada. We conducted all statistical analyses in the open source software R (Version 3.3.1). **Note that numbers not all the same because respondents did not always answer every question**

Results

In total, 1303 Canadian researchers completed the online survey. Of these, almost three quarters were male (74%) and one quarter were female (25%); a very small proportion either did not input their gender or selected other. Almost all of the survey respondents (94%) were either senior academics (65%), defined as those researchers with more than ten years experience applying for research grants since completion of their PhD, or early career academics (29%) (Figure 4.1). A small proportion of responses also came from post-doctoral researchers (4%), non-academic researchers (2%), or those who did not indicate their career stage (0.4%).

Researchers from many different disciplines were represented in the survey. Almost sixty per cent of responses came from either the natural or physical sciences (Figure 4.2). The remaining responses were spread amongst the medical and life sciences (20%), engineering (13%), interdisciplinary research (5%), and social sciences and humanities (3%).

—— Rmd FILE IS FIXED DOWN TO HERE *4.1 Type of Research Conducted* Canadian survey respondents included researchers conducting all three types of research: fundamental, use-inspired, and applied. Very few researchers considered themselves to only do one type of research: insert %s of who think they do all of f, u, or a. X% of researchers consider that over half of their research program is in fundamental science. . . . . .

SOMEHOW HAVE TO MAKE SENSE OF THE RESPONSES AND PLOT FOR THE % OF RESEARCH IN THE THREE CATEGORIES. Almost one third of researchers reported that the types of research they

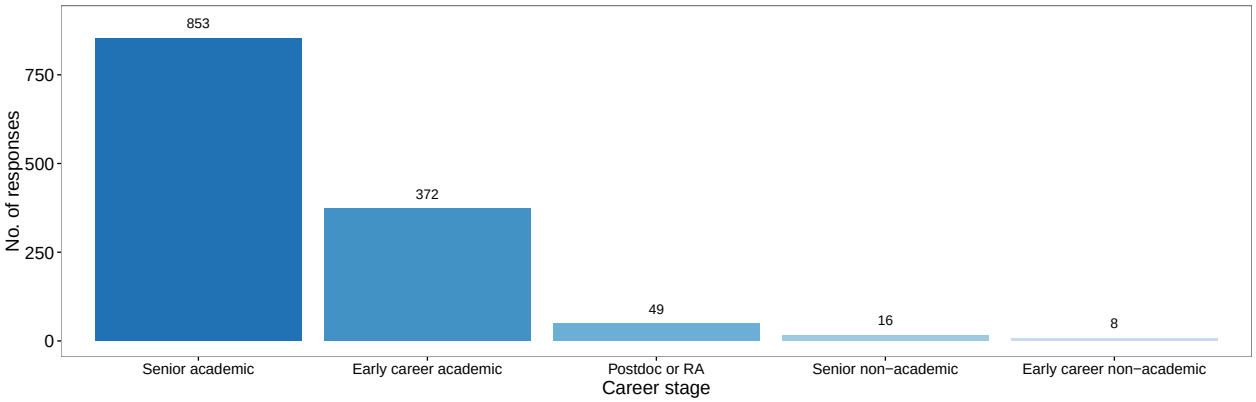

Figure 1: Figure 4.1 Number of Canadian survey respondents by career stage

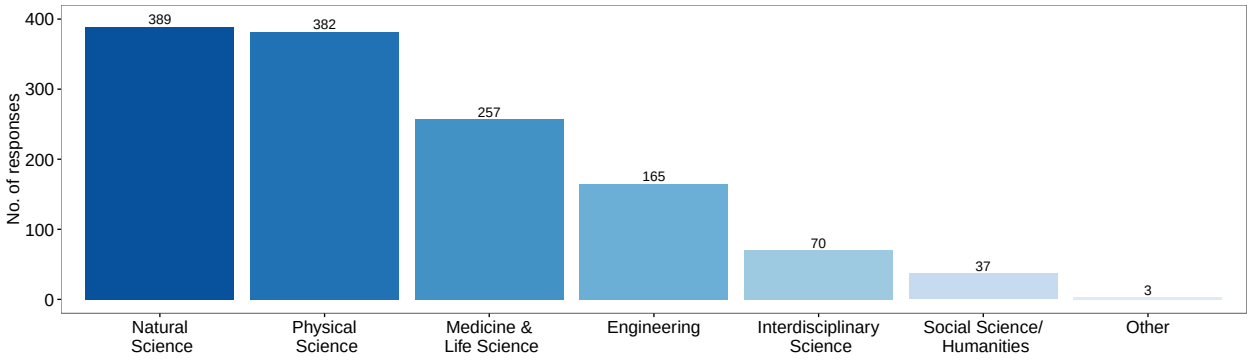

Figure 2: Figure 4.2 Survey responses by field of research

conduct has shifted over the past ten years (Figure 3). By far, the most reported reason for this change was funding (Figure 4). This suggests..... However, opinions about these changes were varible, with one quarter of respondents viewing them as slightly negative, one quarter slightly positive and one quarter very positive (Figure X).

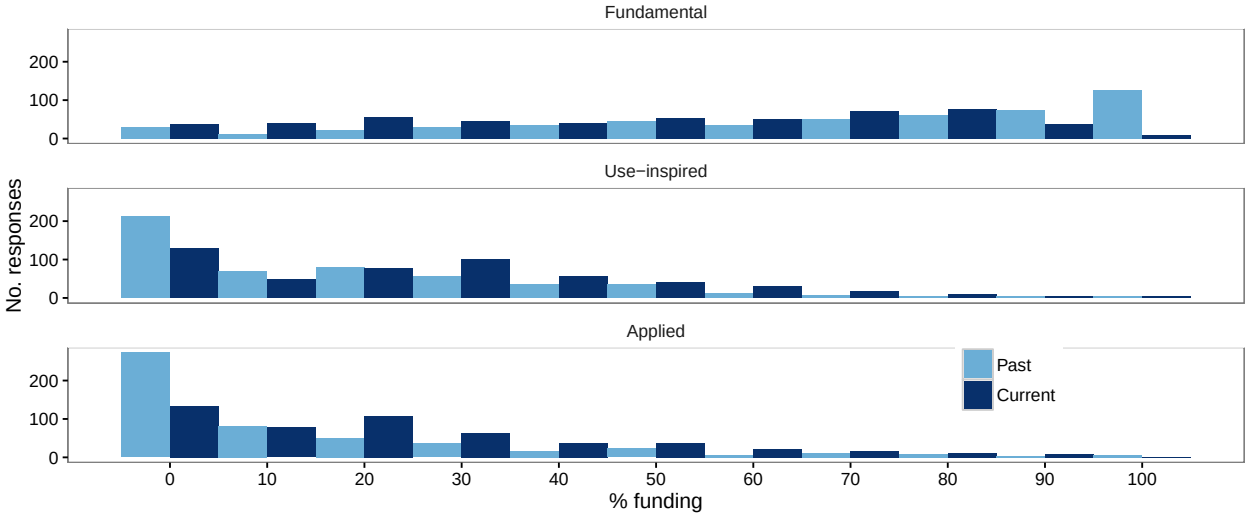

Figure 3: Figure 4.3 Funding allocation to fundamental, use-inspired and applied research categories. Reseachers were questioned about the percentage of funding allocated to Fundamental, Use-inspired or Applied research in the past and in their current research.

Part 2 - External Partnerships

4.2 External Partnerships
The extent to which research is conducted with partners outside of academia, including in industry and non-governmental sectors, may also be considered as an indicator of use-inspired or applied research. Almost all respondents (88%) reported that their current research includes external partners to some degree: fifty-nine per cent reported some partnerships and a further quarter (27%) reported strong partnerships (Figure 4.6). Less than 1% reported conducting their research exclusively with partners outside of academia.

Over the past decade, there has been a sharp decline in the number of researchers with no external partnerships: only 12% of respondents reported having no partnerhips in their current research program, whereas almost half of respondents (44%) reported having no partnerships in the past (Figure 4.6). The number of strong external partnerships also has increased over time from 11% to 27% (Figure 4.6).

Funding was the driving force behind the shift towards external partnerhips. Half of Canadian respondents reported that they developed external partnerships in order to secure funding (Figure 4.7). The remaining half of respondents developed partnerships out of interest (24%), or for career (12%) or social reasons (<1%) (Figure 4.7).

Perspectives on these changes were mixed (Figure 4.8). Interestly, almost half of respondents (49%) viewed the change in external partnerships as slightly or very positive. Twenty per cent were indifferent to the change and thirty-one percent of respondents viewed them as slightly or very negative.

Research Grants [STILL TO COME]

The majority of respondents believe that it is now either mandatory or very important to suggest practical applications of their research in order for their grant applications to be successful. This has shifted over time, with researchers reporting that between 2006 and 2010 it was only somewhat important to do so (Figure X).

Similarly..... including partners from for-profit or non-governmental sectors in grants to be successful (Figure X).

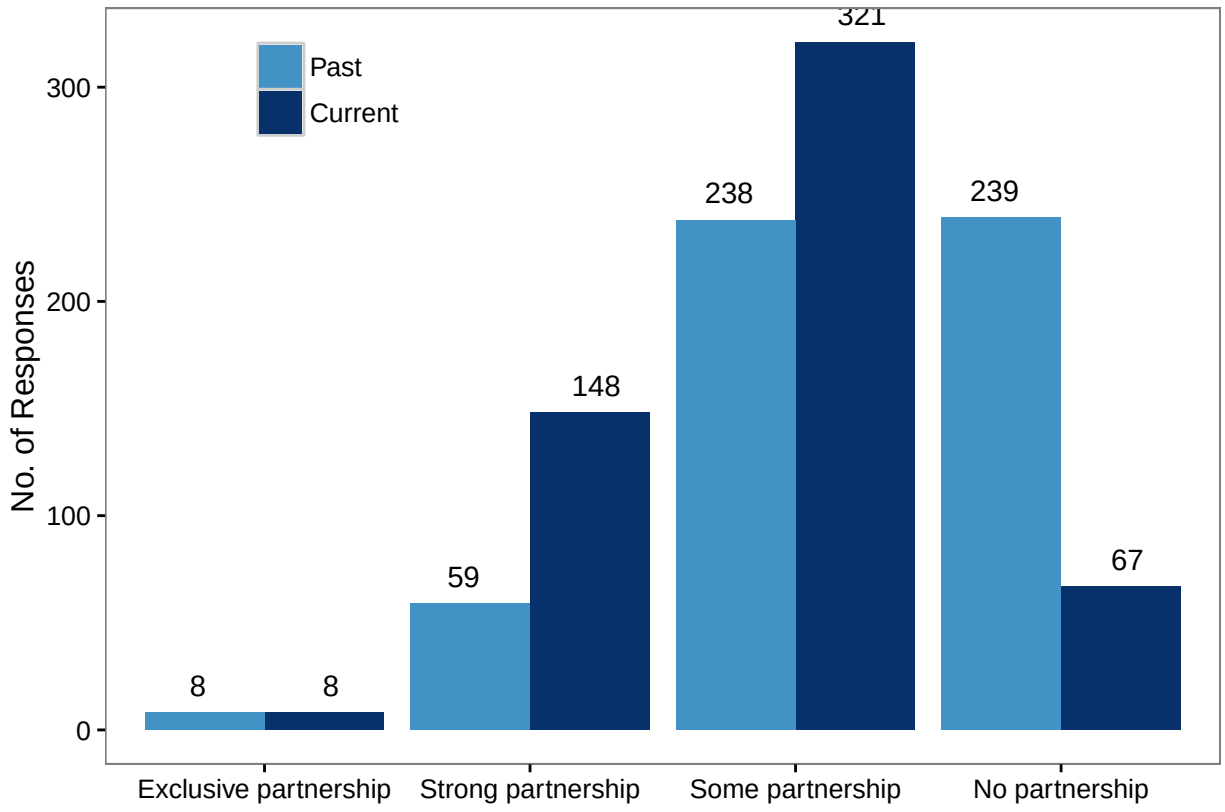

Figure 4: Figure 4.6 Current vs past level of partnership outside of academia. Researchers indicated the level of partnership that their current and past (10 years ago) research program had outside of academia).

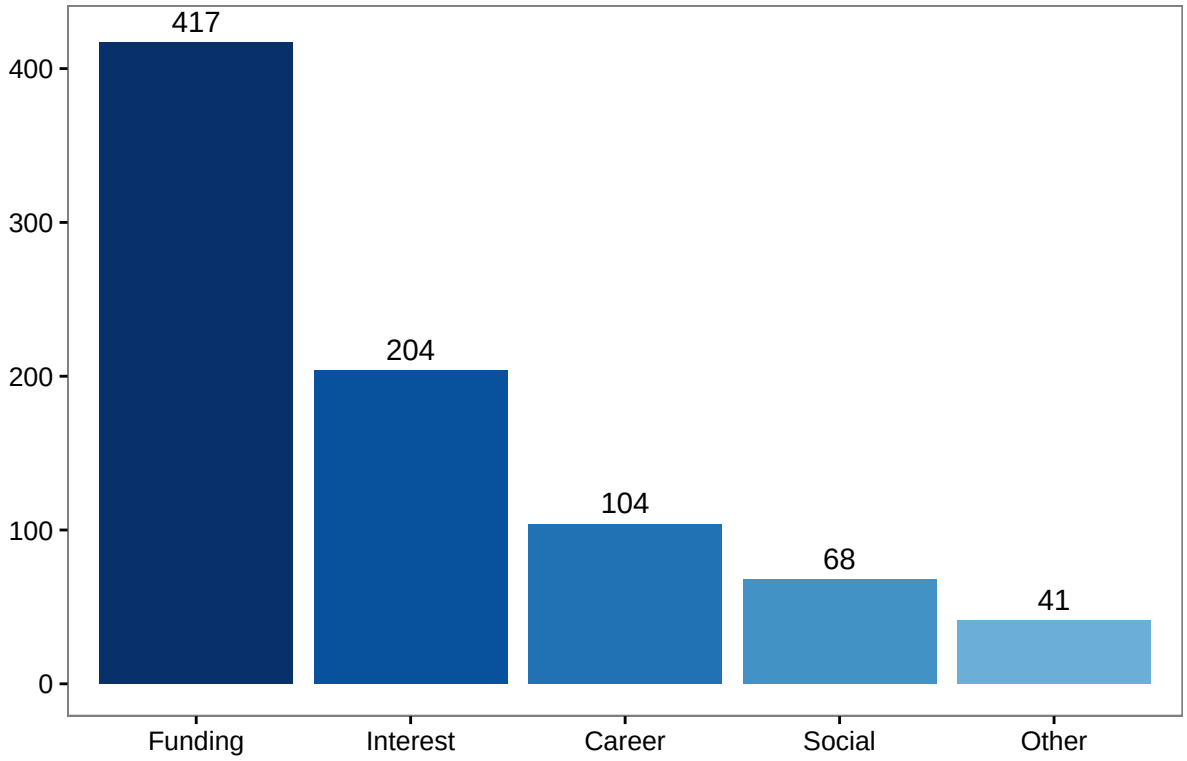

Figure 5: Reasons for change in level of external research partnerships over the past decade.

Perspectives on the State of Fundamental Research in Canada Over half of Canadian researchers who responded said that fundamental research is either very important or somewhat important to our government. Differences by career stage, discipline,ggender. . . .

At the same time, almost three-quarters of respondents said that applied research became a higher priority for our government over the past decade.

Summarize finding on how they think availabiltiy of research funding will change over the next five years:

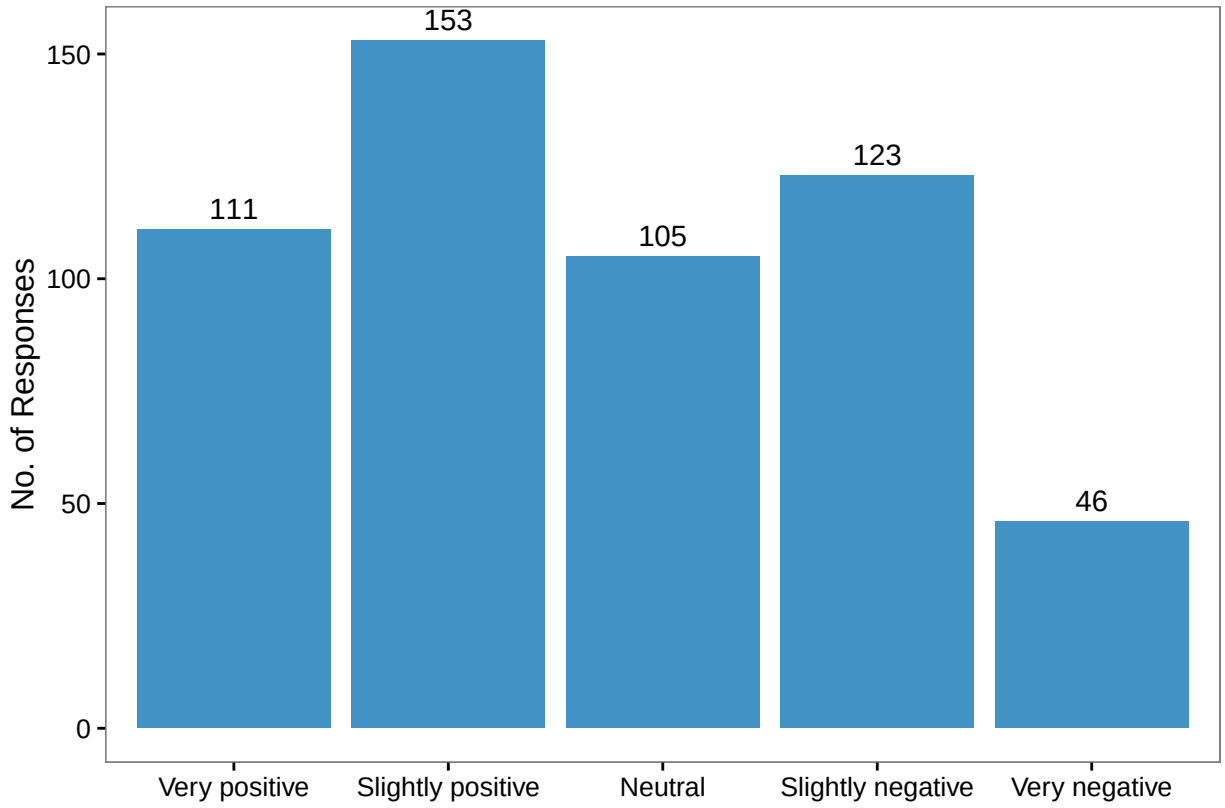

Figure 6: View of change in external partnerships. Researchers were asked how they viewed the change in the level of partnership with external groups.

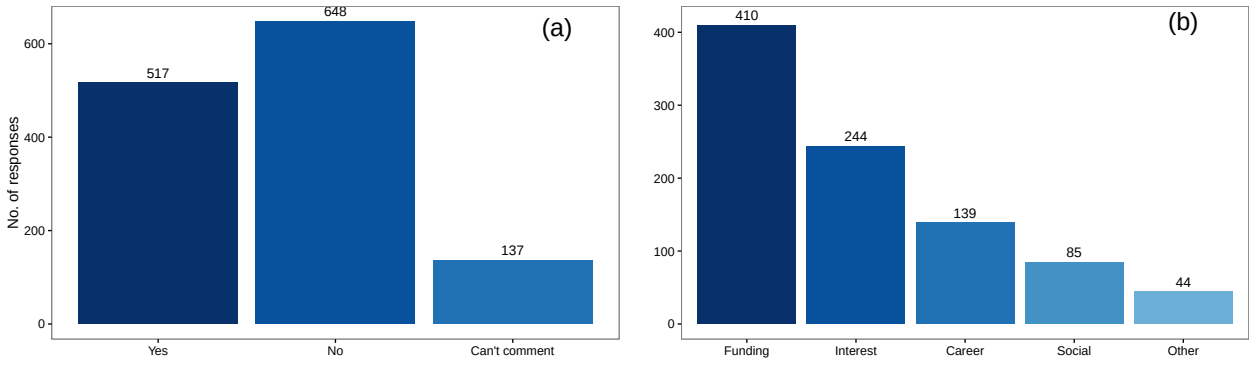

Figure 7: Reason for change in research over past 10 years. Researchers were asked if their funding proportions had changed in the past ten years (a), and what the main reason for a change in their research category (b).

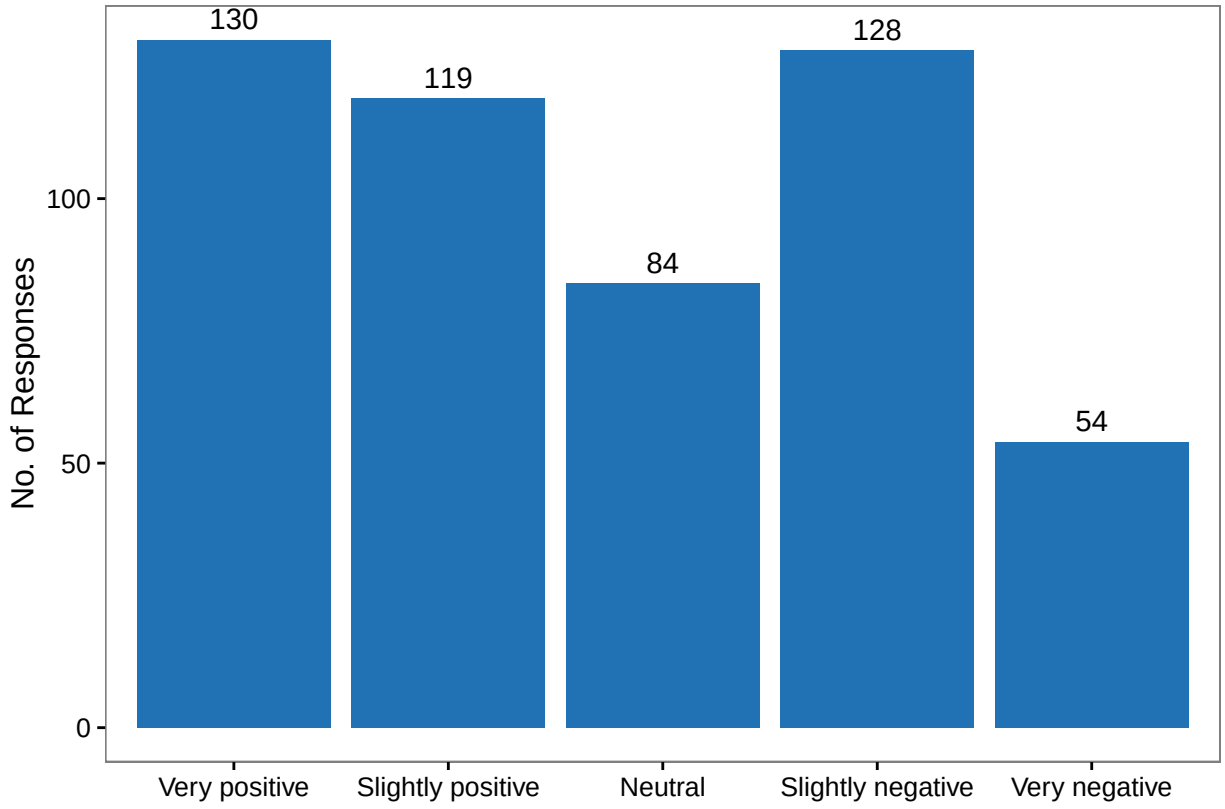

Figure 8: Opinion of change in research over past 10 years. Researchers were asked how they viewed the change in research type.