

Research Funding and Careers: Individual and Contextual Factors

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Research funding shapes academic careers in multiple ways and across the career lifetime. The ability to acquire research funding can be instrumental in an individual researcher's career trajectory. Funding creates opportunities and visibility, but also poses potential costs. This paper is the development of a chapter on research funding and careers in the forthcoming book *Handbook of Research Funding* (editors: Lepori, Hicks and Jongbloed). This chapter takes the perspective that how research funding is acquired, and its consequences in academic careers involves both individual and contextual issues. The last decade has seen an increased in studies of grant seeking and getting behaviors, and participation in funded research activities. While issues of productivity are important, the impacts of research funding on careers goes well beyond who pursues and who is successful. We ask: What is the current state of empirical research on grant getting and research funding specific to academic careers? How do existing policy and evaluative mechanisms to support research funding activities reflect current knowledge? This chapter is organized around three intertwining focal points relevant to research funding and academic careers: Individuals; Context; and Evidence. The purpose of the chapter is to synthesize empirical evidence and theoretical foundations for the study of career effects of research funding.

The core of the chapter will focus on individuals, and the teams with whom they collaborate. Ultimately, pursuing research funding is an individual-level behavior, where success (or failure) in this process has implications for career advancement (e.g. Bloch et al, 2014), collaborative development (Abramo, 2014) and reputation (Herman, 2018). Further, these implications take different forms across the stages of an academic career (Laudel and Glaser, 2008) and across different approaches to a research career (Canibano et al, 2019). Using these two frameworks of career stage and type, this chapter will review recent empirical literature to examine the pursuit, acquisition, and impacts of research funding on academic careers. Issues of propensity to pursue and achieve success, as well as early (increased collaboration (to longer term (career advancement) outcomes will be addressed. The approach will be to review and categorize the theoretical foundations and corresponding research questions and findings across a multi-disciplinary literature. For example, theoretical foundations for these studies often include the STHC (scientific and human capital) model (Bozeman, Dietz, and Gaughan, 2001), or role theory (Biddle, 2013). A centerpiece of this section will be a detailed table of literature, with corresponding discussion. The review is also interdisciplinary, but focused on STEM and medical disciplines.

A second aspect of this chapter examines the policy and institutional contexts relevant to research funding at different career stages. While a small body of empirical research has examined successful recipients of, for example, early career awards (e.g. Huber et al., 2015; Escobar-Alvarez, 2013), and corresponding career effects, there has been less attention to the policy mechanisms themselves. How funders prioritize career stage opportunities, and/or articulate expected career-specific outcomes of funded research is also relevant to understanding the relationship of research funding to careers. Yet, it is unclear of the extent to which these funding mechanisms reflect existing body of knowledge on research funding and careers. Policy prioritization of funding opportunities for early career (e.g. ERC Starting Grants in Europe, and NSF Early Career Awards in the U.S.) offers unique and prestigious opportunities. In 2020, a new U.S. NSF mid-career research award program at the associate professor level was established with goals of reducing the barriers to full professorship. Related are efforts to cap the amounts that faculty can get at any one time (either through limits on

time on project, to number of awards) as ways to level the playing field and enable access for others. Notably, there is very little literature on the development of these mechanisms outside of policy and agency documents. This section of the chapter will discuss a selection of these policy mechanisms, their criteria and any literature on the career impacts of gaining these awards. The review of policy mechanisms will distinguish between targeted opportunities (discussed above), and career-relevant language in standard research grant solicitations (U.S. NSF and NIH) that specify inclusion of different groups, and attention to early career stage researcher support and outcomes

A third focus is on evidence. This section will also include a discussion of critical data gaps that exist at the institutional and national levels that prevent understanding funding behavior and outcomes relevant to career stages and trajectories. This is relevant at multiple levels. Of particular relevance to careers is that institutional reporting systems can have an effect on career advancement and opportunities within universities. How data are compiled and valued by decisions makers and leadership reflects on the community of researchers at all career levels. Yet, criticism of university performance measurement systems point to the inadequacy of existing systems to account for more robust understanding of participation in and outcomes of research funding (Kallio & Kallio, 2014; Kallio, Kallio, & Grossi, 2017). How researchers incorporate research funding strategies, different collaborative partners, and substantive research focus is not well evidenced in existing institutional data. This has some implications for summative assessment of research at institutions, but even greater implications for formative input relevant to institutional strategies and programming to foster research excellence and productivity, particularly for certain subsets of faculty and researchers. These issues of effective measurement will be discussed within the context of faculty and other researchers at various career stages.

Finally, the chapter will conclude with a synthesis of the existing body of work on how research funding matters for careers, and its level of congruence with research policy/funding initiatives intended to further careers. Suggestions for a future research agenda are presented, with potential research questions that address the gaps in the existing body of empirical research regarding research funding and academic careers. Policy implications are also presented. How institutions and research funders develop incentives, opportunities and structures to target career advancement at different stages should be better informed by empirical evidence.

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Gender and Underrepresented Minorities Differences in Research Funding

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This paper will examine gender and race/ethnicity differences in the research funding allocation process. At each phase there are factors that may contribute to disparities in funding outcomes across groups. The paper will review the literature on race/ethnicity and gender differences in research funding and will explore the contribution and cumulative effects of each stage of the process on the potential emergence of funding outcomes' differences. The paper will start describing the aims and scope of the work and some conceptual clarifications regarding the concepts of disparities, differences, inequality and gaps, as they relate to gender and underrepresented minorities (URM).

Our approach will require paying attention to the effects of prior differences in the structure of opportunities across groups, differences that occur at least in three spheres: participation rates, performance and reputation. Previous research has shown that there is a lower participation of women in STEM, and, although the gap has been diminishing, women are still underrepresented in some fields (Ceci et al 2014, Cruz-Castro & Sanz- Menéndez 2020). Participation by URM scientists is much lower than by gender (Ginther et al 2011). The traditional empirical claim is that men publish more and obtain more recognition (Ceci et al 2014), but this research also shows that there very little difference in average citations to publications. Additional research has shown that in the US, Black researchers publish less than whites, and this could explain about half of the Black/White funding gap (Ginther et al 2018). Women and underrepresented minorities also differ in factors that represent more reputation than merit but which are nevertheless important in funding evaluation such as earlier grants, quality of networks, PhD granting institution as well as postdoctoral training. As a result, our analysis will begin by examining the factors associated with gender and race/ethnicity differences in academic careers.

Differences in application behavior also play a role (Ley and Hamilton 2008). There is some empirical evidence about the lower application rates of female researchers compared with their representation in academia but much less data about researchers from underrepresented minorities. Previous studies have shown that URM women are less likely to reapply for grants

after receiving a rejection (Ginther, Kahn & Schaffer 2016). An interesting explanatory line that is valid for both groups refers to the role of institutional and occupational segmentation and how eligibility partly depends on institutional affiliation (teaching versus research) and occupational status (non-tenure, part-time, etc.). We will review what the literature says about the use of bibliometric (and other) indicators regarding gaps in performance. Our research will also touch upon the limited work related to intersectionality, to examine whether the combination of race/ethnicity and gender lead to even greater disparities in research funding.

Some researchers have argued that peer review leads to the gender and race/ethnicity differences in research funding (Erosheva et al 2020). Peer review differs across funding agency as well as across countries. The paper will address the role of peer review in the process of evaluation and allocation of limited resources, starting with some empirical literature about differences in success rates in the research funding in the variables of interest. The aim would be to identify processes, mechanisms, methods or features of the review process that may disadvantage certain type of researchers. The consideration of instruments and the agencies' assessment criteria for funding introduce important elements that could shape the generalization of findings.

Panel peer review is the main method by which research funding is allocated; thus panel composition has been identified as relevant too. The evidence about the effects of increasing the number of women in the panels in the success rates of female applicants is mixed (Cruz-Castro & Sanz- Menéndez 2020). What seems more important according to the literature is the role of institutional connections and cognitive proximity regarding research ideas between panelists and applicants. Features of the evaluation process and the extent to which are associated with the existence of bias will be addressed too.

If space allows, the paper will briefly look at the policies that agencies put in place to reduce funding gaps and promote the funding of certain groups. Throughout the paper and in the conclusion we will highlight divisions in literature regarding the causes of disparities, identify methodological challenges, gaps and research avenues for the future.

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