Research Policy 52 (2023) 104868

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Exploring the effect of overlapping institutional applications on panel decision-making

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ARTICLE INFO

Keywords:
Funding decisions
Research grants
Distributional justice
Selection panels

ABSTRACT

The assessing of a pool of competing projects is a challenging task for scientific panels at funding agencies. Using large-scale and rich data from a broad set of panels from the UK's largest research council, we explore whether scientific panels treat overlapping applications from the same institution in a selection round differently. Building on previous research that suggested that panels may favour institutional diversity in funding outcomes, we find that applications at the margin of the funding decision are less likely to be funded when an application from the same institution is also funded. However, we find little evidence of welfare losses associated with this outcome. The implications of these findings for understanding the role of panels in shaping of scientific funding are also examined.

1. Introduction

One of the most challenging aspects of scientific funding decision-making is the allocation of funding between different projects. Research councils and funders expend considerable effort to enlist reviewers and convene panels to adjudicate on these funding decisions (Olbrecht and Bornmann, 2010; Van Arensbergen et al., 2014). This process requires time and effort on the part of reviewers and panel members, and taxes the administrative resources of funding agencies. Although there has been considerable research on the merits (or demerits) of peer review as a means of allocating funding (Li, 2017; van den Besselaar and Sandstrom, 2015), less attention has been placed on the role of panels shaping decisions about which projects to fund. Scientific panels typically draw together leading experts to debate and discuss a pool of applications (Lamont, 2009). It is understood that panels have discretion about suggesting which projects should be funded, as peer review scores are unlikely to pass through without careful deliberation by panels about the relative merits and balance of projects (Bol et al., 2022; Ginther and Heggeness, 2020). In considering different projects, panels must weigh the applications against one another and come up with a final ranking of projects, representing a collective view about the hierarchy of merits of a set of applications.

Although panels are seen as a mechanism to help overcome biases within individual decision-making and to bring together and incorporate differing perspectives, research on selection in science suggests that selection processes tend to favour some types of projects over others, such as those by high status individuals and institutions (Feinberg and Price, 2004), by men (Lerchenmueller and Sorenson, 2018), in domain areas that evaluators themselves are experts in (Boudreau et al., 2016; Li, 2017), by members of the funders' reviewer communities or colleges (Jang et al., 2017; Viner et al., 2004), by Principal Investigators (PI) with a more impressive track record (Arora et al., 1998), that are monodisciplinary (Banal-Estañol et al., 2019; Bromham et al., 2016), or incremental in nature (Ayoubi et al., 2021; Franzoni et al., 2021). Lamont (2009: 19) suggests that evaluation is a social process, which itself is "a fragile and uncertain endeavor" where "value is defined in reference to the other proposals under consideration, and by personal affinities and differences" among evaluators. Panel evaluations are also shaped by the 'technologies of evaluation', how the process is organized, documents produced and assessed, and the criteria used and understood (Lamont, 2012).

Taking prior work on scientific panels as our point of departure (Derrick, 2018; Lamont, 2009; Olbrecht and Bornmann, 2010; Van Arensbergen et al., 2014), we explore how the presence of applications from an institution may shape the attitude of panels towards other applications by the same institution. In theory, each project should be taken on its own merits; it should make little or no difference whether an application from the same institution was present or funded when

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https://doi.org/10.1016/j.respol.2023.104868
Received 29 March 2022; Received in revised form 28 July 2023; Accepted 31 July 2023
Available online 9 August 2023

considering another project from that institution. Research councils and agencies instruct their panels to focus on the assessment criteria, which primarily concern the scientific merit of the project rather than its institutional affiliation. However, panel members may deviate from these instructions and give credence to a range of factors in their decisions beyond the formal assessment criteria of research funding agencies (Laudel, 2006). In addition, research funders may themselves come under pressure to help ensure that scientific funding is distributed to a diverse range of institutions, representing different parts of the university system as well as regions. Indeed, highly unequal allocations focused purely on scientific merit might generate negative reactions. As Katz and Hicks suggest, such "merit-based decision making alone is insufficient because of inequality aversion, a fundamental tendency of people to avoid extremely unequal distributions" (Hicks and Katz, 2011: 149). As a result, decision-making in science may be influenced by other forms of allocation logics, which focus the distribution of rewards to a diverse set of institutions and investigators (e.g., Bol et al., 2022 in the case of gender).

Considering these pressures, we focus on the case where panels use their discretion to disfavour projects from the same institution in the same funding round, preferring instead to spread resources across institutions. This issue was first identified in Lamont (2009), in her observational study of panel decision-making in social science and humanities panels in the US and Canada. Building on this insight, we explore whether this pattern might be observed in a large scale set of panels in science and engineering. We suggest that the spreading of research funding across universities is a form of distributive justice to ensure institutional diversity, so that allocations are seen to be fair by not appearing to favour some institutions over others (Lamont, 2009). We also indicate that such an approach may help to please different audiences and stakeholders who might challenge or question the decisions. This distributive approach is akin to 'buggins turn', which is an expression that emerged in the late 1900s to describe the practice of appointments in the British Royal Navy being based on seniority or rotation rather than merit.

To explore this question, we draw on data from the UK's largest science funding agency, the Engineering and Physical Sciences Research Council (EPSRC). We combine information from the EPSRC with hand-collected data from publications and other sources to build a rich picture of the universe of funded and unfunded applications, membership of scientific panels, publications and backgrounds of applicants, and the ranking of proposals in specific funding rounds. Our analysis focuses on the likelihood of funding for an application conditional on the performance of other applications from the same institution in the selection pool, while controlling for a range of factors that previous research has shown may influence scientific funding decisions. Overall, we find evidence for this effect, as a second application from an institution in the funding margin that had an overlapping funded project was up to 22.5 % less likely to receive funding. However, we do not find evidence of welfare losses associated with this preference for institutional diversity, as rejected Principal Investigator's (PIs) with overlapping institutional applications at the margin perform no worse in terms of future citations and funding than those funded PIs from the same institution that were ranked more highly and funded, and nor do they perform worse than PIs with no overlapping institutional applications that were funded at the margin.

Our paper makes two contributions. First, we provide quantitative evidence that suggests that panels may give attention to institutional diversity in their assessment, as was proposed by Lamont's (2009) qualitative research. Such preferences are liable to be driven by the desire to enhance perceptions of distributive justice. In doing so, we shed light on how implicit preferences within the decision-making processes of science might favour some applications over others. Second, we highlight the key role of panels and the pool of applications they assess that may shape the funding outcomes we observe. As such, we extend prior work on how panels may seek to address gender diversity (Bol et al., 2022), suggesting that they may also pursue institutional diversity as a means to help overcome the concentration of resources inherent in the science system. We also show – using a quasi-replication of Banal-Estañol et al. (2019) on a bias against interdisciplinary projects – that once these panel effects are considered, no bias against interdisciplinary applications is present. This suggests that greater attention is required to the role of panels, and how they proactively shape the allocation of resources to achieve wider social and economic goals of these agencies and wider science system.

2. Understanding scientific panel decision-making and allocations

In allocating funding across different projects, scientific panels face multiple pressures. First, scientific funding is a high stakes activity, where funding decisions can have a profound impact on individual academics' careers (Bozeman and Gaughan, 2007; Ginther and Heggeness, 2020; Jacob and Lefgren, 2011a). In science and engineering, research grants are often essential for career advancement, providing the critical resources for the research, such as instruments, equipment, materials, and labour. Without external grants, researchers may fail to gain promotion or find themselves unable to grow or sustain their research trajectory (Lerchenmueller and Sorenson, 2018). Failure to win a grant might also discourage scientists from applying in the future (Bol et al., 2018). For universities, grant income is a common key performance indicator for senior managers, as research income provides central overheads and potential esteem in various ranking systems (Naidoo, 2018; Power, 2015). Moreover, panels hold significant financial resources at their disposal, as it is not uncommon for scientific panels to allocate over $1 million per panel member in a decision round. Since research funding is provided by the public purse, it is subject to considerable oversight and deliberation. Panel members need to observe a strict set of guidelines about the decision-making process, including its confidentiality and dealing with conflicts of interest.[1]

Second, scientific panels' work is often comparative, with members assessing the merits of each proposal in the pool against each other. For example, the European Research Council's Starter, Consolidator and Advanced grant panels review all applications during a call within one of 27 subject areas against one another, awarding funding to roughly one in seven applications.[2] In the case of the EPSRC, proposals are reviewed by five or more reviewers, it can be demanding on panel members' time and attentional resources to read over the proposals, the comments of reviewers, and then draw their own assessment of the project prior to the meeting. Although reviewer scores are critical for determining which project is considered fundable, panels have a degree of discretion about how to assess the merits of the proposal with respect to other projects (Van Arensbergen et al., 2014). Reviewers often disagree with one another on the same grant proposals (Abramo et al., 2018; Heyard et al., 2022), and panel members need to determine whether specific concerns raised by negative reviewers have merit. Investigators may also be given the opportunity to respond to reviewer comments, creating further material to be digested by panel members. For example, the ESPRC invites applicants who receive relatively high reviewer scores to write a short response to reviewers' comments prior to its consideration by the

[1] See for example US National Science Foundation rules, https://www.nsf.gov/od/ogc/panelist_coi.jsp, the Netherlands NWO rules, https://www.nwo.nl/en/code-dealing-personal-interests, Canada's Social Sciences and Humanities Research Council, https://www.sshrc-crsh.gc.ca/about-au_sujet/policies-politiques/index-eng.aspx, [Accessed: 01/03/2022].

[2] See https://erc.europa.eu/funding/advanced-grants, [Accessed: 01/03/2022].

panel.[3] The issues raised by reviewers may be highly specialised and require panel members to carefully weigh and debate the arguments of one set of reviewers against another and against those of the applicant.

Third, scientific panels need to reflect on and assess the merits of projects from often disparate topic areas and from a variety of disciplines (Lamont, 2009). Indeed, it is common for scientific panels to confront a set of proposals from fields that use different methods, analytical tools, and approaches. Adjudicating across these differences can create conflict between panel members, who have different levels of expertise of these areas and differing views about the value of different research approaches (Van Arensbergen et al., 2014). Moreover, as Lamont (2009: 47) explains, "It is generally understood that applicants who received the highest total rating prior to the meeting will receive funding, so those cases may be noted at the start of deliberations, but they are not usually discussed. Likewise, applications that received low ratings often are not discussed." Invariably, there will be a significant number of projects where the scores of the reviewers are broadly similar. It is in this middle ground where the panels concentrate their time and attention. These marginal cases require discussion and debate about the merits of each project against other projects of similar quality. Such borderline cases represent "the greatest challenge for panellists" as it requires these to compare projects of "incommensurate flaws" and "individual panellists tend to weight differently the proposals' relative strengths and weaknesses" (Lamont, 2009: 47). In these discussions, although panels may not know exactly where the funding line will be drawn by the funding council, they are liable to some awareness of the overall budget, and success rates across the funding council and in previous allocations. As a result, panel members may have some understanding which groups of projects in the ranking are liable to be funded or not. Deciding where projects go in the ranking can therefore create significant disputes between panel members, even ill-tempered conflict that can only be resolved by voting by panel members. Head-to-head comparisons are often necessary when considering a smaller set of proposals of relatively equal reviewer scores. Partly in response to the challenges of selecting projects at the margins, several research funders have introduced randomization above a threshold value or at the margin (Adam, 2019; Heyard et al., 2022).

Fourth, although panel membership is a signal of academic status and panel members are usually drawn from the pool of senior scientists or user representative groups, panel membership is often subject to rotation (Viner et al., 2004). Panel members may find themselves working with other academics who they do not know or have expertise in areas very far from their own (Van Arensbergen et al., 2014). Moreover, funding agencies are keen to ensure that panels represent a diverse set of institutions from different parts of a country, often trying to avoid placing two members of the same institution on the same panel. Research funders may also try to ensure that panels have sufficient levels of representation of women and/or minority groups. Although panels often have overlap in membership between rounds of assessment, they are liable to be reconstituted over time, renewing, and refreshing the mix of experts involved in the decision-making process. Membership of the panel is also likely to include representatives of the research agencies themselves, and these individuals might play an important role in shaping panel membership, discussion and allocations (Kolympiris et al., 2019). Such panel compositional diversity may signal to external audiences that the allocation process is fair and distributed.

Fifth, scientific panels need to be responsive to external audiences, as the names of panel members may be published after an allocation is completed. Panel members will be aware about how their decisions will be judged by others, including those who were funded and not funded, but also others in their field, senior managers at universities, and policy makers. Panel members may also feel accountable to research funding agency, helping ensure that the allocation does not create difficulties for the agency. This means adhering not only to the formal rules and procedures of the funding council, but also its informal expectations with respect to outcomes, such as 'corrective' interventions by panels to help create gender parity in funding allocation (Bol et al., 2022). As Lamont (2009: 25) finds "although many panellists emphasize in only a limited way the particular objectives of funding agencies, these goals influence panel deliberations." Indeed, Lamont suggests that administrators "will at times encourage panelists to 'factor in' various kinds of diversity in distributing awards" (ibid: 25).

Given this context and building on Lamont's (2009) observations, we suggest that panels may display a preference for institutional diversity when faced with applications from the same institution in the same pool. This is due to a concern that panel members might feel to ensure that their decisions, which also represent decision-making of the funding agency, will be perceived as fair by external audiences. Perceptions of fairness depend on what is considered appropriate in a context, and arise from a sense of whether decision-making processes are just, i.e. do they reflect adherence to the rules (Colquitt et al., 2001; Colquitt and Zipay, 2015; Gilliland, 1993). Justice can be defined across several dimensions, including procedural, distributive, interpersonal and informational, and can be understood as the downstream perceptions of fairness, which concern perceptions of appropriateness of a decision or outcome (Colquitt and Zipay, 2015; Gilliland, 1993). The case of the allocation of scientific funding most closely pertains to notion of distributive justice, "which reflects appropriateness in decision outcomes and includes equity, equality, and need" (Colquitt and Zipay, 2015: 76). It is also important to be aware that panel members are subject to accountability from a variety of audiences. Concerns about how allocations may be seen to favour specific institutions by awarding funding to multiple projects from one institution may lead them to discount or penalize projects from the same institution. By spreading funding across different institutions, the allocation will appear to have a more equitable distribution than an allocation which is concentrated in the hands of a small number of institutions (Ma et al., 2015; Mongeon et al., 2016). Such a distribution will increase the potential that external audience perceive that the panel decision-making generates distributive justice, a critical component of perceived fairness (McFarlin and Sweeney, 1992). Since only funded projects are publicly listed, panels will be acutely aware that an 'unbalanced' funding allocation will draw greater critical scrutiny. In contrast, rejected projects – which are often hidden from public view – are liable to play little role in appeasing external audiences, as audiences will be unaware of whether the allocation was a true reflection of the underpinning quality of the application pool. In effect, panel members may operate with an implicit quota for some institutions, assuming that an institutionally diverse set of funded projects is what funders and external audiences expect or want. Along similar lines, in her qualitative study of panels in social sciences and humanities, Lamont (2009: 127) found that some panel members engaged, in what she terms, "institutional affirmative action", trying to ensure that institutional diversity was taken in account in awarding grants. She states that "panellists practice institutional affirmative action because they believe that private, elite, and research-focused universities are privileged in the competition process", and as such, by ensuring diversity of funding across institutions panellists perceive that they can help to overcome these structural imbalances in terms of resources, power, and status between institutions. Moreover, by spreading funding across institutions, panellists will weaken potential coalitions of external actors who might jointly question their decision-making. Diversity implicates more institutions into the funding distribution, and therefore makes it less likely that one institution or set of institutions will question the panel decision-making process or outcomes. Building on these suggestions, we explore whether panels display a preference of institutional diversity, attempting to offer quantitative evidence to support and extend findings of prior qualitative research.

[3] See https://www.ukri.org/councils/epsrc/guidance-for-applicants/what-happens-after-you-submit-your-proposal/responding-to-reviewers-comments/, [Accessed: 01/03/2022].

3. Data and descriptive statistics

3.1. Setting

Our analysis builds on comprehensive data from the Engineering and Physical Sciences Research Council (EPSRC) matched with hand-collected data on academics' publications and funding histories. The EPSRC is the UK's largest research funding council. It has a broad and diverse mandate, covering applied subjects such as chemical and civil engineering, as well as basic research in mathematics and physics. It provided more than £700 million to UK researchers in 2020/21, operating a diverse range of funding systems. Its funding is allocated through >100 different panels and among >2000 applications each year. EPSRC panels are not standing but convened ad-hoc, with around 30 % of members drawn from previous panels to give some continuity (EPSRC, 2007; Viner et al., 2004).[4] Panellists tend to be senior scientists from a diverse range of institutions. They are subject to the requirement to declare conflicts of interest, follow the UK's Nolan Principles of public life,[5] and to respect the confidentiality of the proceedings. Although the allocation of funding at the EPSRC covers a wide range of UK institutions and different types of projects, over time it has become more concentrated into research intensive institutions and larger projects (Ma et al., 2015).

The EPSRC funding decision-making process consist of several stages, as summarised in Fig. 1.[6] First, the initial project application is sent out for peer review. There are typically three to five reviewers per proposal, with one reviewer drawn from applicants' nominees and others from the EPSRC peer review college, a pool of experts from which most reviewers and panel members are drawn ①. Reviewers, in addition to providing comments, are also asked to rate their own competency with respect to the topic of the proposal, and this information is made available to the panellists. Second, applications that meet a threshold for reviewer scores, which receive at least some "good", "tending to outstanding" and "outstanding" scores, are then considered by a panel ②. Before the panel meeting, applicants are given a chance to respond to reviewer comments. Third, the panellists assess all fundable applications, reviewers' reports, and the applicants' responses to reviewer reports. In their assessment, panellists weigh the reviewer reports, the reviewers' self-declared competency in the area of the proposal, against the response by the applicant. They are asked to rely on qualitative comments rather than quantitate scores when forming their own judgement of the application, giving a score from 1 to 10. This information is then tabulated prior to the meeting alongside the raw reviewer scores. The panel members' scores are used to create an initial rank order ③. Fourth, during the panel meeting, each proposal is discussed in turn, starting with the lowest ranked proposal. The discussion is led by introducer and second nominated speaker, and it involves open discussion among all panellists and head-to-head comparisons of proposals. The panel agrees a proposed ranking ④, which is then submitted to EPSRC. Fifth, after the panel meeting, the EPSRC identifies the financial cut-off point based on budget availability (EPSRC, 2007, 2022) and awards the funding ⑤.

There are some notable features of this process for this study. First, the panel has significant discretion about ranking of applications, as reviewer scores are judged in the context of disciplinary norms, other proposals in the pool, the responses of applicants to these reviews, as well as the expert judgement of the panellists. Panel members themselves score the applications and are "*instructed not to go on the [reviewers'] scores but to go on the comments*" (Panel Coordinator, 2023). Moreover, only potentially fundable projects are considered by the panel, not lower quality proposals. Second, since panellists must agree the ranking after completing a discussion of all fundable projects in turn and have access to information about the entire pool of the proposals, all panellists have some voice in the final agreed ranking. According to our informant, during these meetings, panellists extended most of their energy on the proposals in the middle of the distribution of scores, passing quickly over the bottom and top ranked proposals. To quote: "*Most of the time was definitely spent in the middle, sometimes the top ones. If there were three glowing reports and both the speakers were highly positive and it scored really highly, there were no issues. The ones at the bottom that didn't score that well and had major issues tend to be fairly quick as well …. The main part, the really difficult part of the panel meeting was when you've done that first run through. Everybody's aware that you know the top couple of proposals can be funded and then the next bit [those projects at the margin] is really important. So most of the time is spent discussing those and getting the ordering right*" (Panel Coordinator, 2023). Third, since institutional diversity is not a criterion for funding decision-making, panel coordinators seek to actively ensure that panel members focus on the published criterion and avoid inserting any other factor into the decision-making. Thus, there is no explicit attempt to steer funding outcomes to a particular distribution and, in theory, applications from the same institution should have no worse chances of being assessed highly than other applications.

3.2. Data

To explore our research question in this rich context, we make use of a database of all funded and unfunded projects reviewed by EPSRC funding panels in the year 2007. This year was associated with growing overall funding, close to the EPSRC peak in spending (Ma et al., 2015). We focus on stages 4 and 5 (see Fig. 1), that is the final rank order arrived at by the funding panel and the funding cut-off determined by the funder. For each application we know the name and institution of the principal investigator (PI) and all co-investigators (CI), the requested funding amount, prospective start and end dates, and any non-academic partner institutions. We matched this with information from the EPSRC *Grants on the Web* (GoW) facility which contains information on the EPSRC panel that reviewed the application, how the application was ranked by the panel and whether it was funded or not. For each panel, we also know the names of each panellist and, through web searches, determined their employer in 2007. In total, during the 12-month period for which data is available, 70 different panels composed of >600 different members allocated funding through 136 funding schemes, evaluating and ranking a total of 2260 applications, of which 698 (30.9 %) were awarded funding. The total value of funding allocated by these panels was approximately £300 million, across 70 universities.[7]

We exclude some of these evaluations from our analysis. Specifically, we require a minimum number of proposals to be evaluated and funded to observe any decision-making preferences within the panel. Therefore, we exclude small rounds which had five or fewer applications in the evaluation pool (66 evaluation rounds) and those where none or only one application was funded (10 additional evaluation rounds). We also exclude any evaluation round that did not fund the top seeded

[4] After 2012 national 'importance' was added as secondary major criterion for EPSRC funding.

[5] See https://www.gov.uk/government/publications/the-7-principles-of-public-life [Accessed: 09/02/2023].

[6] To better understand the panel decision-making process, we carried out an interview with a former panel coordinator and accessed public documents on the process.

[7] These numbers are lower than those reported by the EPSRC during the 2006/7 and 2007/8 funding periods. This is largely due to low quality submissions not being presented at a panel, and due to funding information not having been published for some of the panels in the first quarter of 2007. Also, information on fellowship grants was not available and these and some other smaller funding schemes were therefore not considered here. Funding rate as calculated based on the applications available for this study is consistent with overall funding rate as reported by the EPSRC (30.3 % in the 2007/8 period).

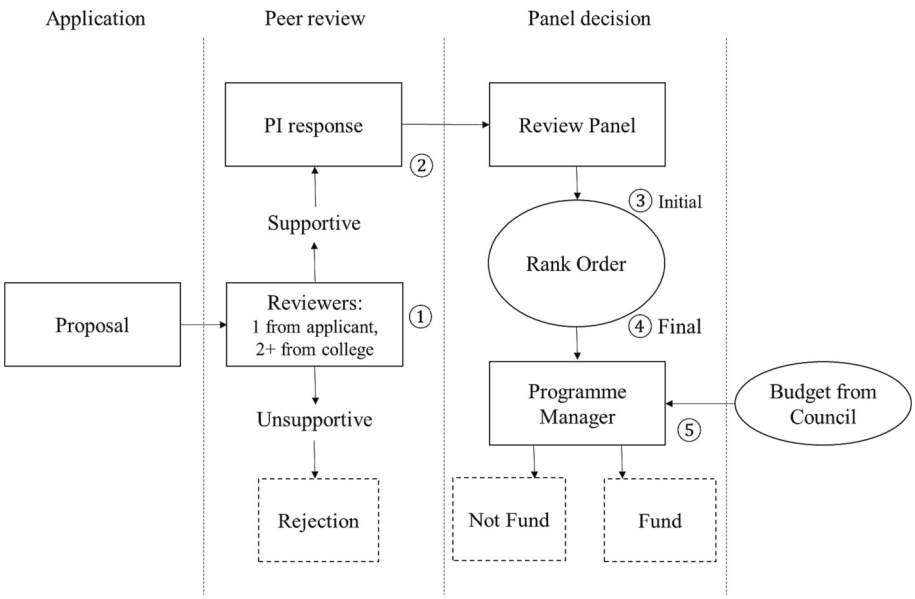

Fig. 1. EPSRC peer review process.
(Source: Authors' elaboration based on (King, 2010).)

application as we cannot know the reason for this decision (three panels). We are left with 48 panels taking decisions on 57 evaluation rounds and 1906 applications included in the analysis, which represents 84.3 % of the original sample.

We complemented this data with information on the EPSRC funding the PIs received prior to 2007 (from 1995 onwards), and with data from the *Gateway to Research* (GtR) portal which contains information on all grants awarded by UK research councils since 2006, thus including funding from funding councils other than the EPSRC (BBSRC, STFC, etc.). We further determined if a PI was a member of the EPSRC peer review college for the 2006 to 2009 period.[8] For all applicants (PI and CIs), we collected publication data from *Scopus* for all the years prior to application, cleaning data manually to ensure publications and authors are correctly identified. The publication data also enabled us to extract citations received by each published article in a 5 year window, and the scientific fields assigned to the journals in which articles appeared. They also allowed us to calculate the research orientation, i.e. basic vs applied, of PIs following the methodology proposed by Boyack et al. (2014).

Personal information is constructed from the available data. Given names were retrievable from GtR or via web searches, allowing us to determine applicants' gender based on UK birth data (from the *Open-GenderTracking* (OGT) project) and WIPO name dictionaries (Martínez et al., 2016).[9] Where a name cannot unambiguously be assigned to female or male, we conducted additional web searches. We further determined the ethnicity of a name using the software tool *Ethnea* (Torvik and Agarwal, 2016) and again conducted web searches for inconclusive records.

Fig. 2 shows the relationships between the various datasets.

3.3. Measures

3.3.1. Dependent variables

We construct a binary variable for each application which takes the value of one if the application is funded and zero if not.

3.3.2. Independent variables

To investigate whether an application from the same institution in the funding pool reduces the chances to receive funding, we construct a series of independent variables. First, we create a variable that takes the value one if there is an application from the same institution anywhere in the pool. Second, we set a binary variable to one if there is already a funded application from the same institution in the pool, i.e. ranked above the focal application and funded. Third, we consider the share of budget already allocated to the same institution in the funding pool, with a variable taking the value one if no funding was allocated to the same institution, two if <10 % (but more than zero) of the overall budget available in the round was allocated to the same institution, and three if >10 % has been allocated to the same institution already.

3.3.3. Control variables

All estimations control for panel, PI, and project characteristics. Drawing on the literature on panel decision-making, we consider the level of competition within the panel, that is, the amount of funding requested by applications in one pool over the funding allocated to the same pool; the workload of the panel, that is, the number of proposals evaluated within that pool (Criscuolo et al., 2017); and the number of panellists and the broad subject area of the panel: chemistry or materials, engineering or ICT, physics or maths, health or translation. Finally, we consider whether one of the panellists is from the same institution as the PI as this could bias selection (Jang et al., 2017).

For the PI, important controls include the number of past successful applications to the EPSRC as PI, as this has been shown in prior studies to significantly impact future success (Bol et al., 2018), and the number of any ongoing grants with other research councils in the UK, as this indicates other funding available to the PI. Since prior academic track record may influence funding decisions, we control for their research performance, considering the number of publications in the five years prior to 2007 (the year of application) and the average number of citations received by these publications. We take the log of both measures (plus the unit) to account for the skew in their distribution. Following

[8] The EPSRC peer review college were appointed every three years and most reviewers and panel members are drawn from the college. The 2006–2009 college, appointed in 2006, consisted of >4000 members. The directory was retrieved from the Internet Archive: https://web.archive.org/web/2009*/http://www.epsrc.ac.uk/ ResearchFunding/ReviewingProposals/College/College-Membership20062009.htm [Accessed: 10/02/2022].

[9] Of course, assigning a gender based on an individual's first name has many limitations, and our approach does not take account of the gender identity of the individual. Given the size of the population and the time scale of our study, it was unfeasible to collect this information using an alternative approach.

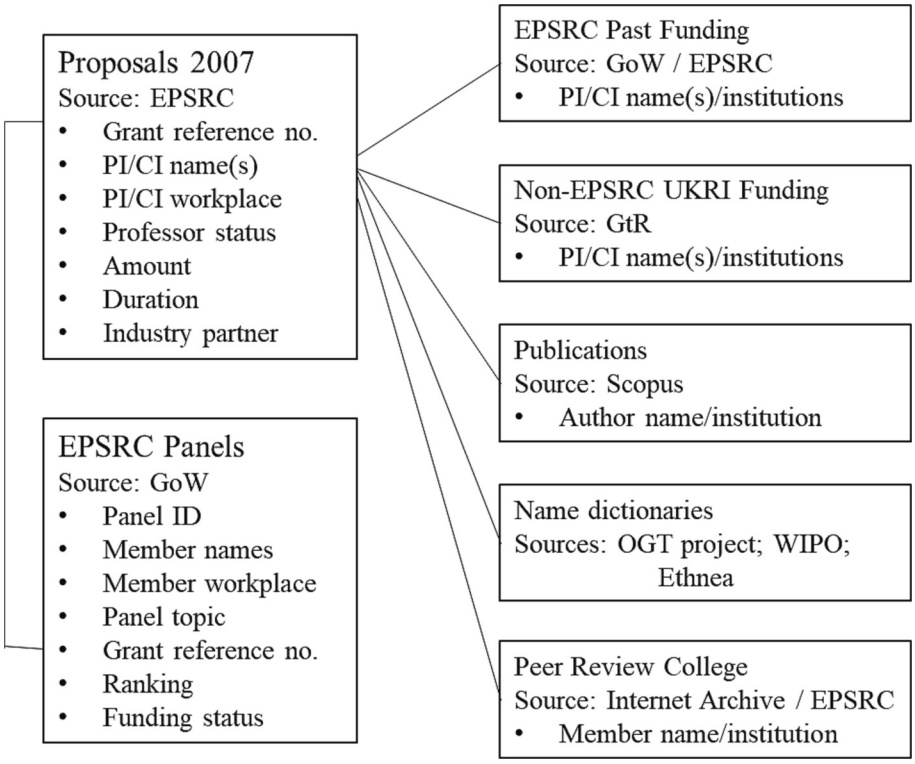

Fig. 2. Relationships between datasets.

prior studies we also consider the research orientation (basic or applied) of the PI (Banal-Estañol et al., 2019). We follow Boyack et al. (2014), and use text analysis of article titles and abstracts to determine the probability that an article is (1) applied technology, (2) engineering-technological mix, (3) applied research, or (4) basic scientific research, a classification first introduced by Narin et al. (1976). We then consider the average research orientation over all publications published in the five years prior to application. As a measure of research reputation and seniority, we consider if the PI is a member of the EPSRC peer review college appointed in 2006. Members are appointed through a nomination process and this is the pool from which reviewers and panel members are drawn. Such measures of elite membership or social capital have been shown to increase chances of funding success (Feinberg and Price, 2004; Viner et al., 2004). Membership also indicates experience with the review process. We further control for the PIs academic age, which we measure as the number of years since their first publication. This is set to zero for any PI who had not published prior to 2007. In addition, we control for gender as several studies have shown that women are less successful in grant acquisition compared to men (Lawson et al., 2021). Finally, we consider the ethnicity of the applicant. Specifically, we differentiate between three groups, those with a British name, those with another European name, and finally those with a non-European (Asia/Africa) name. Of course, this approach does not produce an accurate measure of ethnicity, which is a matter of personal identity. It does, however, reflect name origins. In the UK, there is some evidence that ethnic minority applicants are less successful in their research council funding applications compared to white applicants (UKRI, 2021), although this has also been attributed to minorities being concentrated in lower ranked institutions (Viner et al., 2004). We therefore also control for the rank of the applicant institution, which takes the value 1 if the PI was at an elite institution according to the QS world ranking of 2007. Four UK universities fulfil this criteria, appearing in the QS top ten. These are the Universities of Cambridge and Oxford, Imperial College London and University College London.

At the project level, we further consider factors used in prior research on funding success (e.g., Banal-Estañol et al., 2019): the institution of the CI, the duration of the proposed project, the per capita amount of funding requested, the project team size (number of CIs plus PI), whether the application includes an industry collaborator, and the subject diversity of the applicant team. We calculate the latter following prior research on diversity and interdisciplinarity (e.g., Banal-Estañol et al., 2019) as Shannon's diversity index of fields, considering publications in the previous five years and *Scopus* subject categories to calculate the measure. The measure is thus given by $-\sum s_i ln s_i$, where s_i is the share of members' publications in *Scopus* subject category i in the preceding 5 years.

Table 1 reports descriptions of all the measures and data sources.

3.4. Descriptive statistics

Descriptive statistics are presented in Table 2 and correlations in Appendix Table A1. The percentage of projects funded is 29 %. For 61 % of projects, there is another application from the same institution in the applicant pool; 28 % have a funded application from the same institution ranked above them and for 9 % of projects this means that other applications from the same institution have already received >10 % of the funding available on the panel.

The average panel workload, which represents the number of applications within one pool, is 61 (ranging from 6 to 122 proposals), and panels have on average 10 members. Our competition measure has a mean of four, which indicates that four times more money is being applied for than is finally awarded, though there is great heterogeneity between panels. About 22 % of applicants have a person from their home institution on the panel, and finally, 22 % of applications are reviewed by chemistry or materials, 39 % by engineering or ICT, 28 % by health or translation, and 9 % by physics or maths panels.

The project PI's number of successful past EPSRC applications is 2.4 and the number of ongoing non-EPSRC grants held by the PI is 0.05. On average, PIs published 37 papers in the previous five years and received eight citations per paper. The average research orientation is 3.2

Table 1
List of variables.

Name	Definition	Data source
Dependent variable		
Funded project	Dummy equal to 1 if application is funded	EPSRC/GoW
Independent variable		
Other project from same institution	Dummy equal to 1 if application from same institution in evaluation pool	EPSRC/GoW
Funded project from same institution	Dummy equal to 1 if funded application from same institution in pool and higher rank	EPSRC/GoW
Budget share allocated to home institution	Share of available funding allocated to same institution. Three categories: >10 %; <10 %, 0 %.	EPSRC/GoW
Controls – Panel		
Number panel members	Number of panel members	GoW
Panel workload	Number of proposals in evaluation pool	GoW
Panel competition	Ratio of funding requested over funding awarded within evaluation pool	GoW
Panel member from home institution	Dummy equal to one if at least one panel member is from PI institution	GoW/EPSRC
Chemistry/material	Panel topic	GoW
Engineering/ICT		
Health/translation		
Physics/maths		
Controls – PI		
Past funding success	Number of past EPSRC awards as PI	GoW
Other UKRI funding	Number of current non-EPSRC grants from UKRI	GtR
Number of publications	Number of publications in previous 5 years	Scopus
Average citations	Average number of citations per publication published in previous 5 years	Scopus
Average research orientation	Average research level of publications in previous 5 years (applied/basic)	Scopus/ Boyak et al.
College member	Dummy equal to 1 if member of the 2006–09 EPSRC peer review college	EPSRC/ Internet Archive
Top applicant institution	Dummy equal to 1 if PI institution is top 10 in 2007 QS world ranking	QS
Academic age	Number of years since first publication	Scopus
Female	Dummy equal to 1 if a woman	WIPO, OGT, Web
British name	Dummy equal to 1 if name origin is British	Ethnea, Web
European name	Dummy equal to 1 if name origin is other European	
Asian/African name	Dummy equal to 1 if name origin is Africa or Asia.	
Controls – Project		
Project duration	Duration of project in months	EPSRC
Team size	Number of project members	EPSRC
Funds per head	Ratio of requested funds over number of team members (in 10 k)	EPSRC
Industry partner	Dummy equal to 1 if project has an industry partner	EPSRC
Team diversity (shannon)	Shannon's diversity index of fields: $-\sum s_i ln s_i$, where s_i is the share of publications in field i	Scopus
CI top institution	Dummy equal to one if CI institution is top 10 in 2007 QS world ranking	QS

Table 2
Summary statistics.

Name		Mean	sd	Min	Max
Dependent variable					
Funded project		0.293	0.455	0	1
Independent variable					
Other project from same institution		0.617	0.486	0	1
Funded project from same institution		0.283	0.450	0	1
Budget share allocated to home institution	>0–10 %	0.190	0.392	0	1
	>10 %	0.093	0.290	0	1
Controls – Panel					
Number panel members		10.015	2.301	3	14
Panel workload		54.965	33.853	6	122
Panel competition		3.961	1.512	1.269	8.200
panel member from home institution		0.222	0.416	0	1
Chemistry/material		0.235	0.424	0	1
Engineering/ICT		0.391	0.488	0	1
Health/translation		0.286	0.452	0	1
Physics/maths		0.088	0.284	0	1
Controls – PI					
Past funding success		2.408	3.356	0	27
Other UKRI funding		0.047	0.270	0	5
Number of publications		37.269	41.372	0	418
Average citations		7.991	8.031	0	84.529
Average research orientation		3.241	0.916	0	4
College member		0.446	0.497	0	1
Top applicant institution		0.183	0.387	0	1
Academic age		17.812	8.602	0	47
Female		0.116	0.321	0	1
British name		0.671	0.470	0	1
European name		0.260	0.439	0	1
Asian/African name		0.069	0.253	0	1
Controls – Project					
Project duration		34.005	11.567	2	72
Team size		2.196	1.844	1	21
Funds per head		17.711	17.893	0.119	194.946
Industry partner		0.242	0.428	0	1
Team diversity (shannon)		0.755	0.453	0.000	2.082
CI top institution		0.017	0.129	0	1

(median = 3.69), thus leaning towards basic science. The average academic age is 18 years (start year of 1989), and 45 % are members of the EPSRC peer review college. Past funding success is highly positively correlated with these seniority variables. Just 12 % of PIs are women, and 7 % a name of Asian or African origin, while 67 % have a British name or 26 % a European name. Women and those with non-British names tend to be more junior (negative correlation with academic age). Of our PIs, 18 % are from one of the elite institutions according to the QS world ranking. About 57 % of proposals have at least one CI, and in 9 % of applications there is at least one CI from an institution other than that of the PI; 1.7 % of applications from non-elite institutions have a CI from an elite institution. Proposed projects have an average duration of 34 months, have two members, and request £177,000 per head. About 24 % have an industry partner. Team diversity in terms of the average Shannon index ranges from 0 to 2.08, with a higher score indicating a larger number of disciplines and greater evenness in their distribution.

In Table 3, we report some additional panel statistics by subject area considering the 57 separate panel rounds in our sample. It indicates that panels in chemistry/material and physics/maths have on average more members than those in engineering/ICT or health/translation. The workload is somewhat lower in physics/maths. Success rates are overall consistent across subject area and panels at 31 % to 38 %. The success rate for institutions applying for funding is also consistent at 41 % to 47 %. There are some significant differences in terms of the type of applications panels receive. Physics/maths panels review projects that are more monodisciplinary compared to all other subject areas. Together with chemistry/material they are also receiving more basic research applications. However, there is little to no difference in discipline diversity or research orientation of funded and unfunded applications for any of the subject areas.

Table 3
Panel characteristics ($N = 57$).

	Chemistry/material		Engineering/ICT		Health/translation		Physics/maths		ANOVA F-test
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	
Number panel members	10.100	2.234	8.652	2.166	8.533	3.314	10.444	0.726	n.s
Panel workload (10 k GBP)	13.015	6.432	10.437	8.913	14.405	14.588	5.456*	3.344	n.s
panel workload (# proposals)	44.700	22.485	32.435	27.346	36.333	33.683	18.667	9.772	n.s
Panel workload (# institutions)	23.000	6.307	20.652	12.716	20.733	13.398	13.111	6.092	n.s
Success rate (GBP)	0.317	0.143	0.344	0.183	0.374	0.177	0.343	0.106	n.s
Success rate (# proposals)	0.310	0.131	0.337	0.158	0.380	0.180	0.354	0.081	n.s
Success rate (# institutions)	0.417	0.141	0.418	0.203	0.472	0.168	0.408	0.080	n.s
Team diversity unfunded projects (shannon)	0.815	0.219	0.751	0.171	0.894	0.242	0.508***	0.083	7.89***
Team diversity funded projects (shannon)	0.821	0.207	0.718	0.205	0.910	0.245	0.461***	0.121	9.42***
Research orientation unfunded projects	3.496	0.204	2.805***	0.382	3.266	0.419	3.686	0.163	18.76***
Research orientation funded projects	3.633	0.207	2.985***	0.523	3.107**	0.374	3.636	0.214	9.55***

Chemistry/Material is the reference category.
* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

4. Results

Our empirical analysis is based on Probit regressions estimating the likelihood to receive funding. In a first step, we seek to establish the importance of panels in funding decision making and the need to consider the panel level in estimations of funding success. In Table 4, we therefore consider applications evaluated and ranked in a selection panel, first without including panel characteristics to provide baseline results, followed by three models that consider panel measures. Then, in a second set of regressions presented in Table 5, we limit the analysis to applications around the funding threshold, as this is where considerations of funding distribution are likely more critical. Specifically, we ignore the top one third of funded proposals and the bottom of the distribution and look at an equal number of rejected and funded proposals on each panel, as illustrated in Fig. 3, which results in 777 observations.[10] By comparing funded and unfunded projects close to the cut-off, we are able compare decisions for proposals of similar quality. We show three models at the margin to test for considerations of institutional diversity: 1) an application from the same institution is in the funding pool, 2) an application from the same institution ranked above received funding, and 3) the share of available funding already allocated to the same institution. We report average marginal effects (AME).

4.1. Decision panel effects

As a baseline, the results in Table 4 provide additional insights into factors associated with funding success. In Model 1, we undertake a quasi-replication of prior research, such as Banal-Estañol et al. (2019), that did not consider characteristics of the decision panel. In Model 2, we introduce clustered standard errors that account for non-independence between projects evaluated by the same group of panellists[11] and in Model 3, we add our panel controls. In terms of panel characteristics, we see in Model 3 that the degree of competition within a pool is important, with funding success being reduced when competition is high. The number of panellists and their affiliation to the PI's institution is not significant. Sharing an institutional affiliation thus does not appear to bias selection.

The comparison between the three models uncovers a change in statistical significance for our measure of subject diversity. While Model 1 suggests that more interdisciplinary teams are less successful, this correlation turns insignificant in Model 2 and the coefficient is further reduced in Model 3. The negative bias against interdisciplinarity reported in Banal-Estañol et al. (2019), which equally investigated EPSRC funding on a very similar dataset, is thus not confirmed once panel characteristics, which were not available to prior studies, are included.

Other factors do not exhibit such sensitivity and do largely confirm prior research. Funding received previously is weekly associated with funding success, corroborating prior findings on funding allocation (e.g., Bol et al., 2018; Lawson et al., 2021). The PI's research quality, as measured through citations, is positively associated with the likelihood of receiving funding, as is a more basic research orientation in Model 3, confirming Banal-Estañol et al. (2019). We also find, in line with e.g. Lawson et al. (2021) and Feinberg and Price (2004), that several esteem characteristics predict funding success: EPSRC peer review college membership and affiliation to one of the four top-ranked universities. Women are not less likely than men to receive EPSRC funding after taking into account other observables, which corroborates reports by UKRI (2021) on funding success of men and women being equal. However, there are lower application rates among women more generally, at PI and CI level (Viner et al., 2004), something that is not investigated here. We further find that applicants with a non-British and non-European name are less likely to be successful compared to those with a British name. This was already observed by Viner et al. (2004) and is also acknowledged in a recent UKRI (2021) diversity report. It is not clear if this is due to bias in the evaluation, in funding allocation, or an expression of accumulative disadvantages for ethnic minority groups in science in the UK. Project characteristics, on the other hand, do not predict success other than a reduced likelihood for longer (and thus more expensive) projects.

When we restrict the analysis to applications at the funding margin in Model 4 of Table 4, we equally do not find a significant sign for subject diversity, which is again in contrast with Banal-Estañol et al. (2019) findings. Despite not including panel control variables or clustered standard errors, the margin regression, by considering an equal number of projects above and below the funding threshold, takes partly account of the discretion of the panels. In this model, citation numbers are no longer significantly associated with funding success, suggesting that PIs at the margin are comparable in terms of their research quality. However, a more basic research orientation remains positive significant and slightly stronger, suggesting a tendency of panels to fund more basic research. EPSRC peer review college membership and affiliation to an elite institution remain predictors of success at the funding margin. The lower likelihood of success also remains for those from a non-white

[10] The uneven number is a result of some panels assigning the same rank to 2 or more proposals. Results are robust to different thresholds, e.g. considering 40 % or 50 % of top ranked application as outside the margin.
[11] Standard errors are clustered by 48 unique panels, not the 57 panel rounds (i.e. pools).

Table 4
Relevance of panels in funding success.

DV: funding success	(1) No panel considerations		(2) Clustered by panel		(3) incl. Panel controls		(4) projects at funding margin	
	AME	SE	AME	SE (clustered)	AME	SE (clustered)	AME	SE
Controls – Panel								
Number panel members					0.002	[0.005]		
Panel workload					−0.001***	[0.000]		
Panel competition					−0.055***	[0.006]		
Panel member from home institution					−0.004	[0.026]		
Controls – PI								
Past funding success	0.005	[0.003]	0.005*	[0.003]	0.005*	[0.003]	0.002	[0.006]
Other UKRI funding	−0.027	[0.036]	−0.027	[0.033]	−0.027	[0.034]	−0.046	[0.060]
Number of publications	0.014	[0.013]	0.014	[0.015]	0.008	[0.015]	0.010	[0.025]
Average citations	0.043***	[0.015]	0.043***	[0.013]	0.049***	[0.012]	−0.001	[0.027]
Average research orientation	0.016	[0.012]	0.016	[0.011]	0.022**	[0.011]	0.037*	[0.022]
College member	0.079***	[0.023]	0.079***	[0.022]	0.067***	[0.022]	0.056	[0.041]
Top applicant institution	0.088***	[0.026]	0.088***	[0.025]	0.094***	[0.025]	0.118**	[0.047]
Academic age	−0.000	[0.001]	−0.000	[0.001]	0.000	[0.001]	0.003	[0.002]
Female	0.002	[0.033]	0.002	[0.035]	−0.008	[0.036]	−0.001	[0.057]
European name	−0.006	[0.025]	−0.006	[0.028]	0.000	[0.026]	0.009	[0.043]
Asian/African name	−0.096**	[0.038]	−0.096**	[0.039]	−0.080*	[0.042]	−0.143**	[0.070]
Controls – Project								
Project duration	−0.004***	[0.001]	−0.004**	[0.002]	−0.003**	[0.001]	−0.002	[0.002]
Team size	0.007	[0.007]	0.007	[0.010]	0.000	[0.009]	0.003	[0.011]
Funds per head	0.001	[0.001]	0.001	[0.001]	−0.000	[0.001]	−0.002*	[0.001]
Industry partner	−0.009	[0.025]	−0.009	[0.034]	−0.004	[0.031]	−0.022	[0.045]
Team diversity (shannon)	−0.049**	[0.025]	−0.049	[0.032]	−0.038	[0.029]	−0.030	[0.043]
CI top institution	0.126	[0.079]	0.126	[0.093]	0.063	[0.094]	−0.008	[0.131]
Subject FE	YES		YES		YES		YES	
Observations	1906		1906		1906		777	
ll	−1111.638		−1111.638		−1073.939		−521.364	
chi2	80.64		136.15		465.25		34.20	

Average marginal effects are reported. Robust standard errors in parentheses. Standard errors in Models 2 and 3 clustered by panel = 48. Teams with zero publications have a shannon diversity value of 0. Results are robust to excluding these observations. Results are robust when using PI diversity rather than team diversity.
* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

ethnic background and in fact is much stronger, with an up to 14 % lower likelihood to receive funding compared to their white peers. Per capita funding enters weakly negative, suggesting that 'value for money' is considered at the margin. Other factors are insignificant.

4.2. Main results

The baseline regression presented in Table 4 have shown that the panel is relevant and important when considering funding success. They also highlighted the funding margin as a critical point of decision-making and for enquiry. As Lamont (2009) suggests, considerations of funding distribution to different institutions may only come to bear at the margin rather than when considering the top ranked applications upon which all members are liable to agree. In our context, although ESPRC panel members are not aware of the final budget for funding, panellists do appear to concentrate their efforts in their deliberations on those projects in the middle of the distribution of quality, as this is where the sharpest discussions take place among panellists. It is thus also at the margin where we would expect panels to pay attention to institutional diversity. We therefore in Table 5 consider only applications at the margin, that is, an equal number of proposals on either side of the funding cut-off, ignoring the top one third of funded proposals. The results show that the likelihood of receiving funding is not reduced when there are other applications from the same institution in the evaluation pool (Model 1). However, if the home institution already received funding this significantly reduces the likelihood of funding for a focal application by 14.3 % (Model 2), increasing to 22.5 % if >10 % of the available funds have been received by the same institution already (Model 3). This provides support for attention to institutional diversity in panel decisions and that considerations for institutional diversity operates at the margin.[12]

4.3. Investigating potential mechanisms

To further understand whether the perception of distributive justice is shaping the funding allocation, we interact our independent variable with two measures that could help us explore this mechanism in greater detail. First, we can assume that panels are more likely to consider the variety of recipient institutions when making their ranking decisions, when the level of diversity of the funded pool is low. However, they will give less attention to this issue when the diversity of the funded pool is high. Empirically, we thus consider the share of institutions in the funding pool that have received funding as moderator, which we interact with our independent variable. Results are reported in Table 6, Model 1, and the marginal interaction effects are illustrated in Fig. 4, panel A. They show that the interaction is positive, with a significant upwards slope, thus weakening the preference for discretionary institutional diversity. This suggests that if there is already a high variety in the funded pool, the panel is less concerned with the need to appear to achieve distributive justice. All other results are unchanged.

Secondly, we expect that perceptions of distributive justice might play

[12] Appendix Table A2 reports results for the full sample, which shows a reduced likelihood of 18.6 % if the same institution was already ranked above in the evaluation pool. This marginal effects are similar in size to what we observe at the funding margin, which suggests that this is where diversity considerations operate. This is confirmed in robustness tests, which show the negative correlation only for the margin (Tables 7, 8) and not the full sample (Appendix Table A2).

Table 5
Relevance of institutional diversity in panel assessment at the funding margin.

DV: funding success	(1)		(2)		(3)	
	AME	SE	AME	SE	AME	SE
Other project from same institution	−0.060	[0.050]				
Funded project from same institution			−0.143***	[0.044]		
Budget share allocated to home institution >0, ≤10 %					−0.098*	[0.059]
Budget share allocated to home institution >10 %					−0.225***	[0.064]
Controls – Panel						
Number panel members	0.003	[0.010]	0.005	[0.010]	0.005	[0.010]
Panel workload	−0.001	[0.001]	−0.001	[0.001]	−0.001	[0.001]
Panel competition	−0.003	[0.010]	−0.008	[0.009]	−0.005	[0.009]
Panel member from home institution	0.017	[0.046]	0.016	[0.047]	0.010	[0.048]
Panel diversity (shannon)	0.003	[0.010]	0.005	[0.010]	0.005	[0.010]
Controls – PI						
Past funding success	0.001	[0.005]	0.001	[0.005]	−0.000	[0.005]
Other UKRI funding	−0.049	[0.059]	−0.056	[0.058]	−0.058	[0.058]
Number of publications	0.009	[0.027]	0.009	[0.026]	0.007	[0.026]
Average citations	0.007	[0.024]	0.012	[0.023]	0.015	[0.024]
Average research orientation	0.040**	[0.020]	0.035*	[0.019]	0.036*	[0.019]
College member	0.062*	[0.037]	0.063*	[0.038]	0.069*	[0.037]
Top applicant institution	0.129***	[0.042]	0.160***	[0.042]	0.167***	[0.042]
Academic age	0.003	[0.002]	0.003	[0.002]	0.003	[0.002]
Female	0.001	[0.065]	0.002	[0.066]	−0.000	[0.066]
European name	0.009	[0.048]	0.009	[0.048]	0.014	[0.048]
Asian/African name	−0.141***	[0.052]	−0.138***	[0.051]	−0.133***	[0.050]
Controls – Project						
Project duration	−0.002	[0.002]	−0.002	[0.002]	−0.002	[0.002]
Team size	−0.000	[0.016]	−0.001	[0.016]	−0.001	[0.016]
Funds per head	−0.002*	[0.001]	−0.002*	[0.001]	−0.002*	[0.001]
Industry partner	−0.024	[0.058]	−0.021	[0.057]	−0.020	[0.057]
Team diversity (shannon)	−0.025	[0.048]	−0.021	[0.048]	−0.020	[0.047]
CI top institution	−0.023	[0.130]	−0.017	[0.128]	−0.004	[0.126]
Subject FE	YES		YES		YES	
Observations	777		777		777	
ll	−518.420		−513.965		−512.383	
chi2	47.832		76.240		106.019	

Average marginal effects are reported. Robust, clustered standard errors in parentheses. Standard errors in Models 2–4 clustered by panel = 48.
* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

out differently for different status institutions or applicants. High status institutions and applicants – those representing the leading international research universities - may be granted leniency by panels, enabling them to be less affected by diversity considerations (Sauder et al., 2012). At the same time, panels may be reluctant to be seen as too overly generous in their distribution of funding to high status institutions and applicants, as this goes against their desires for institutional diversity and might heighten concerns by externals about unequal distribution. To explore these status considerations, we interact our main independent variable with the PI's institutional status. The results are reported in Table 6, Model 2, and the marginal interaction effects illustrated in Fig. 4, panel B. They show that the interaction term is insignificant, suggesting that the preference for institutional diversity is not stronger for PIs at elite institutions, thus providing no support for the proposed mechanism. Thus, it appears it is the panel considerations of institutional diversity related to the breadth of institutions rather than the type of institutions.

4.4. Implications of panel discretion

The implications of panel discretion on the future of science can be wide-reaching, as shown by Ginther and Heggeness (2020). To give an indication of the potential welfare impact of the relatively lower success rate of second proposals by the same institution, we compare future funding success and future publication performance among funded and rejected EPSRC proposals as follows: applications that had another project from the same institution ranked above and were rejected in the funding margin (Group A) are compared with other projects rejected at the margin that did not have another application from the same institution ranked above (Group B), rejected projects outside the funding margin that had another application from the same institution ranked above (Group C), and funded projects at the margin that did not have another application from the same institution ranked above (Group D). The results of mean sample comparisons are reported in Table 7.

We find that the PIs on second (or later) institution projects that ranked in the funding margin but were rejected (A), outperform PIs that were similarly rejected at the margin but did not have a project from the same institution ranked above (B). In particular, they receive more citations per publication and more EPSRC grants in a 5-year post-grant period than those without an overlapping institutional application. This suggests that it was not purely project quality that led to their project being rejected, as clearly these PIs were able to perform better than those without the institutional overlap. In addition, they outperform, in terms of future funding success, rejected PIs that had an application from the same institution ranked above but who were outside the funding margin (C). Finally, they also do not perform worse than PIs who were successful at the funding margin and were the first ranked from their institution (D). While they show slightly less funding success in a 5 year window, this difference disappears in the longer run, with no difference in a 10 year window. Again, this suggests that at the funding margin the quality of second proposal from the same institution

Panel Name: Materials Prioritisation Panel Meeting (May)
Date of Panel:
Panel Contact:
Panel Rank Ordered List: Responsive Mode

Rank	Grant Reference	Value	Funding status	
1	EP/F0#####/1	212,607	Funded	
2	EP/F0#####/1	274,354	Funded	
3	EP/F0#####/1	335,335	Funded	Applications at margin
4	EP/F0#####/1	231,926	Funded	
5	EP/F0#####/1	44,503	Funded	
6	EP/F0#####/1	237,014	Funded	
7	EP/F0#####/1	192,958	Not Funded	Cut-off
8	EP/F0#####/1	222,682	Not Funded	
9	EP/F0#####/1	264,451	Not Funded	
10	EP/F0#####/1	257,451	Not Funded	
11	EP/F0#####/1	101,011	Not Funded	
12	EP/F0#####/1	99,476	Not Funded	
13	EP/F0#####/1	438,241	Not Funded	
14	EP/F0#####/1	364,357	Not Funded	

Fig. 3. EPSRC panel ranking with margin.

which was rejected is consistent with the first project that was funded.

In sum, these comparisons suggest that the implications of a loss of funding as a potential result of discretion does not have long-running implications for the PIs. Unlike in the case of early career funding observed by Ginther and Heggeness (2020), there is little discouragement effect and PIs are successful in future funding rounds. We also do not observe that the loss of funding leads to a weaker publication profile. This corresponds to previous studies that find rather weak and limited effects of funding on publications, possibly because strong but rejected PIs are able to secure other funding sources (Arora et al., 1998; Ayoubi et al., 2019; Jacob and Lefgren, 2011b). These results suggest that PIs who may have been exposed to panels' preference for institutional diversity were not significantly impaired in their future scientific efforts, and therefore the social welfare loss associated with this practice may be modest, although it may generate additional costs and challenges for the individuals concerned.

4.5. Robustness tests

The main results presented above may suffer from biases, the most relevant being the simultaneity of decision making on the panels, which would suggest that both our dependent and independent variable are jointly determined. To address this issue, we develop an instrument that seeks to capture proclivity of some institutions to bid more aggressively for funding but should not reflect the quality of the application itself. Among UK universities there are different degrees of support for funding applications, such as different levels of administrative resources to help prepare bids, different incentives with respect to pay, promotion and employment for funding, and different levels of internal management with respect to research grant development.[13] To reflect these institutional differences, we use the size of the potential application pool from the same institution over the proceeding period as an instrument, with the expectation that it should not affect funding success in a single round, but rather reflects the proclivity of some institutions to more frequently bid for external research funding than other institutions. Specifically, we use a measure of the share of projects submitted to the EPSRC by the focal institution over all projects in the preceding three years as an instrument (mean = 2.57 %). The instrument is significant in the first stage equation and its statistical appropriateness is confirmed in auxiliary regressions, which confirms that it is not significant in the funding success equations. Table 8, Model 1, presents the results of this estimation. We find that after instrumenting, the coefficient remains negative and significant. Instead, for the full sample no effect is observed (Appendix Table A2). Thus, at the funding margin and when endogenizing the propensity of the institution to bid for external funds, we observe that panels consider institutional diversity.

Second, we assess if the preference for institutional diversity can also be observed for the CI institution (where this differs from the PI institution). It may be that the desire to ensure institutional diversity can be met with reference to diversity of the CI institution(s) rather than just the PI's institution. To test this possibility, we create three additional variables of PI and CI institution combinations: (a) an application with a CI from the same institution as the PI was already funded, (b) an application with a PI from the same institution as the CI was already funded and (c) an application with a CI from the same institution as the CI was already funded. The results are reported in Model 2 of Table 8 and show that in addition to the PI-PI combination that was our focus so far, an application with a CI from the same institution as an already funded project (variable b) is less likely to be successful. This suggests that concerns about institutional diversity can extend to the CI as well as the PI from the same institution. We need to note, however, the very small proportion of projects to which this applies (<5 %) as in most projects, the PI and CI share the same institutional affiliation. Again, all our controls remain consistent with results reported in Table 5.

[13] Indeed, after the period of our study, the ESPRC introduced 'demand management' to restrict the number of bids to the funding council by specific PIs.

Table 6
Exploration of mechanism of distributive justice.

DV: funding success	(1b) Funding margin		(2b) Funding margin	
	Coef	SE	Coef	SE
Funded project from same institution (**A**)	−1.080***	[0.182]	−0.279**	[0.135]
Institutional diversity of funded pool (mean = 0.182) (**B**)	−1.356***	[0.432]		
A * B	2.996***	[0.733]		
Top applicant institution (**C**)	0.436***	[0.114]	0.648***	[0.221]
A * C			−0.450	[0.299]
Controls – Panel				
Number panel members	0.031	[0.027]	0.011	[0.027]
Panel workload	−0.000	[0.001]	−0.001	[0.002]
Panel competition	−0.039	[0.027]	−0.026	[0.025]
Panel member from home institution	0.018	[0.123]	0.033	[0.125]
Controls – PI				
Past funding success	0.003	[0.014]	0.001	[0.015]
Other UKRI funding	−0.149	[0.154]	−0.146	[0.158]
Number of publications	0.015	[0.068]	0.026	[0.069]
Average citations	0.018	[0.062]	0.026	[0.060]
Average research orientation	0.090*	[0.052]	0.096*	[0.051]
College member	0.197*	[0.104]	0.181*	[0.097]
Academic age	0.008	[0.006]	0.008	[0.006]
Female	0.001	[0.174]	−0.004	[0.177]
European name	0.043	[0.126]	0.015	[0.128]
Asian/African name	−0.317**	[0.140]	−0.368***	[0.142]
Controls – Project				
Project duration	−0.006	[0.005]	−0.005	[0.005]
Team size	−0.005	[0.042]	−0.004	[0.042]
Funds per head	−0.006*	[0.003]	−0.007**	[0.003]
Industry partner	−0.039	[0.152]	−0.052	[0.153]
Team diversity (shannon)	−0.043	[0.128]	−0.056	[0.129]
CI top institution	−0.027	[0.354]	−0.030	[0.344]
Constant	−0.140	[0.440]	−0.273	[0.451]
Subject FE	YES		YES	
Observations	777		777	
ll	−508.953		−512.427	
chi2	114.482		67.249	

Coefficients are reported. Robust, clustered standard errors in parentheses. Clustered by panel = 48.
* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

As a final robustness test to understand if we are truly measuring the preference for institutional diversity, we consider two tests that are akin to placebo tests. First, we estimate the effect that funding received by an application from a random university has on the likelihood of being successful. Second, we estimate the effect of funding received by the institution next in alphabet (based on all 100 institutions in the 2007 funding pool). The results are reported in Table 8. Models 3 and 4, and show that the placebo variables are insignificant. Instead, when considering all applications (Appendix Table A2, Model 3), the effect remains negative and significant. This suggests that the preference for institutional diversity is primarily observable at the margin, which is consistent with the idea that panels consider institutional diversity when allocating funding to projects with similar levels of quality.

5. Discussion

In this paper, we have sought to explore whether scientific panels may give some emphasis to institutional diversity in their decision-making. Overall, we found consistent associational evidence that high quality applications from institutions that have already been allocated funding are less likely to also receive funding in the same funding round. These effects were economically meaningful, as the second high quality

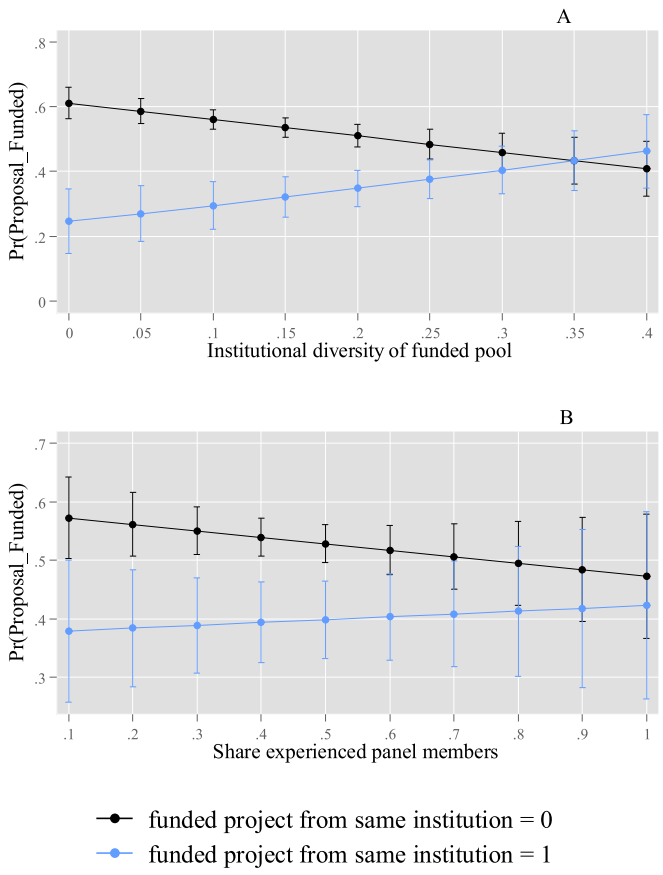

Fig. 4. Mechanisms.
Predictive margins with 95 % confidence intervals. Panel A shows results for institutional diversity of funded pool (mean = 0.182). Panel B shows results for institutional prestige. The interaction effect is significant and positive in Panel A, and insignificant in Panel B.

Table 7
Welfare analysis: Future performance comparison (*t*-tests).

	Group A: 2nd rejected in margin	Group B: 1st rejected in margin		Group C: 2nd rejected below margin		Group D: 1st funded in margin	
Publication number post 5 years	48.16	45.723		51.604		51.479	
Average citations post 5 years	12.176	10.267	**	12.874		11.391	
EPSRC grant post 5 years	1.427	0.996	***	1.116	*	1.796	**
EPSRC grant post 10 years	2.252	1.599	***	1.789	**	2.634	
N	131	267		303		284	

* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

application from an institution that already had a funded project was up to 22.5 % less likely to receive funding. As a result, it appears that a high-quality application from the same institution in a funding round had a greater chance of rejection due to presence of a similar high-quality application from the same institution, a factor that has nothing directly to do with the focal application's inherent quality. We found this effect

Table 8
Robustness tests.

DV: funding success	(1) IV		(2) CI test		(3) Placebo I		(4) Placebo 2	
	Coef	SE	AME	SE	AME	SE	AME	SE
Funded project from same institution (PI-PI)	−1.717**	[0.718]	−0.131***	[0.048]				
a) CI on funded project from same institution as PI (mean = 0.022)			0.030	[0.074]				
b) PI on funded project from same institution as CI (mean = 0.046)			−0.260***	[0.085]				
c) CI on funded project from same institution as CI (mean = 0.082)			−0.151	[0.152]				
Funded project from random other institution (mean = 0.086)					−0.050	[0.068]		
Funded project from institution next in alphabet (mean = 0.104)							−0.076	[0.061]
Controls – Panel								
Number panel members	0.041	[0.028]	0.005	[0.010]	0.002	[0.015]	0.001	[0.015]
Panel workload	0.004	[0.003]	−0.000	[0.001]	−0.001	[0.001]	−0.001	[0.001]
Panel competition	−0.059**	[0.024]	−0.008	[0.010]	−0.005	[0.014]	−0.005	[0.014]
Panel member from home institution	0.086	[0.127]	0.013	[0.046]	0.011	[0.042]	0.005	[0.052]
Controls – PI								
Past funding success	−0.006	[0.016]	0.002	[0.006]	0.001	[0.006]	0.001	[0.006]
Other UKRI funding	−0.206	[0.141]	−0.051	[0.058]	−0.046	[0.059]	−0.046	[0.065]
Number of publications	0.018	[0.061]	0.010	[0.026]	0.010	[0.027]	0.008	[0.030]
Average citations	0.078	[0.050]	0.013	[0.023]	0.005	[0.030]	0.007	[0.033]
Average research orientation	0.026	[0.064]	0.036*	[0.020]	0.041**	[0.019]	0.042*	[0.022]
College member	0.203*	[0.104]	0.062	[0.038]	0.057	[0.040]	0.059*	[0.036]
Top applicant institution	0.774***	[0.205]	0.155***	[0.043]	0.117***	[0.042]	0.108**	[0.054]
Academic age	0.003	[0.007]	0.002	[0.002]	0.003	[0.002]	0.003	[0.002]
Female	0.064	[0.157]	−0.002	[0.065]	−0.005	[0.062]	−0.004	[0.065]
European name	0.001	[0.113]	0.002	[0.046]	0.010	[0.051]	0.012	[0.052]
Asian/African name	−0.223	[0.174]	−0.134***	[0.049]	−0.144**	[0.066]	−0.145***	[0.055]
Controls – Project								
Project duration	−0.004	[0.004]	−0.002	[0.002]	−0.002	[0.003]	−0.002	[0.003]
Team size	−0.005	[0.031]	−0.000	[0.015]	−0.000	[0.018]	0.001	[0.016]
Funds per head	−0.005	[0.003]	−0.002*	[0.001]	−0.003	[0.002]	−0.002	[0.002]
Industry partner	−0.017	[0.123]	−0.021	[0.056]	−0.024	[0.062]	−0.027	[0.065]
Team diversity (shannon)	0.038	[0.134]	−0.023	[0.048]	−0.029	[0.051]	−0.030	[0.053]
CI top institution	−0.039	[0.298]	0.070	[0.164]	−0.014	[0.131]	−0.029	[0.162]
Constant	−0.244	[0.334]						
Subject FE	YES		YES		YES		YES	
Observations	777		777		777		777	
ll	−911.861		−509.058		−519.163		−518.640	
chi2	116.055		161.08		45.21		59.75	
Underidentification test (p-value)	0.0404							

Coefficients are reported for model 1; average marginal effects are reported for models 2–4. Robust, clustered standard errors in parentheses. Clustered by panel = 48. Bootstrapped (50 replications) standard errors in models 3–4.
* Corresponds to 10 % significance level.
** Corresponds to 5 % significance level.
*** Corresponds to 1 % significance level.

was present for applicants at the margins of panel decision-making, where the allocation is subject to the greatest degree of panel latitude. Indeed, the effect was stronger if the institution's prior project(s) received a higher share of the available budget. Thus, it appears that the affirmative decision to fund an application from an institution may be associated with a penalty on subsequent applications from that institution, and not the negative decision to reject a weaker application from that institution. In other words, institutions appear to be punished for having two strong projects, rather than benefitting from having two projects of mixed quality. Moreover, using a placebo test, we found no evidence that funding a project from a random, unrelated institution lowered the likelihood of funding for an application at the funding margin.

We suggested that this preference for institutional diversity in scientific funding could be driven by a desire to ensure the appearance of distributive justice in funding allocations. To probe this expectation, we examine the degree of institutional variety in the funded pool, we found that highly diverse allocations were less likely to be associated with a penalty for the second applications from the same institution. However, we found that this penalty was not more likely for second applications from an elite institution.

Interestingly, we did not find significant negative welfare effects from such panel preferences. PIs with unfunded applications in the funding margin with overlapping institutional applications generated similar levels of citations and future funding as funded PIs ranked above them from the same institution, and with funded PIs ranked near them in the funding margin without an overlapping institutional application. This not only suggests that the second applications from the same institution may be no worse than the first one, but that PIs are able to find alternative measures to conduct the research, often through reapplication.

Our analysis also extends prior work on the relationship between project characteristics and funding decisions. Using a quasi-replication of Banal-Estañol et al. (2019) we show that the apparent bias against interdisciplinary projects in funding decisions disappears once panel effects are fully integrated into the empirical model. This indicates the importance of giving greater attention to panel decision-making in seeking to understand scientific funding allocations.

Our findings should not be taken as a critique of peer review and/or panel decision-making. As Lamont (2009) suggests, it is important to see scientific evaluation as a social process, made by experts operating with incomplete information and subject to the same pressures and biases that other groups in society face when making difficult decisions. The attempt to develop and implement fair, robust procedures for scientific funding decision-making plays at least two important social functions: 1) to generate reasonable choices about which projects to fund, and 2) to

create legitimacy for these decisions among external audiences. This due process or procedural aspect to scientific panel decision-making is an essential aspect of the process itself. However, we found suggestive evidence that the desire to ensure distributive justice in panel decision-making might be associated with the tendency for panels to disfavour projects from institutions already ranked highly. In a sense, our results may reflect attempts by panels to demonstrate that not only is the process fair, but that the outcomes of the process appear 'fair' as well.

Our findings raise an interesting question about the balance between competition and equity in scientific funding. Typically, research funding is primarily allocated based on scientific merit, with clear instructions given to panels to not consider factors other than published criteria in their evaluations. But, in the real world of panel decision-making, decision-makers may be aware of the need to ensure that the allocation is perceived as being distributed in a fair way. Such considerations reflect the desire of funding councils and panel members to ensure that resources are shared among the scientific community, allowing different groups to have access to scarce resources they need to develop and extend their research. They may also reflect panel members' awareness of structural imbalances in the science system itself to favour some researchers and institutions over others, leading these scientists to engage in what Lamont calls "institutional affirmative action" to help correct these imbalances. Such efforts at diversity may also be undertaken by funding agency staff, as Ginther and Heggeness (2020) find. Our study provides further indication that these preferences are present when funding decisions are made at the 'sharp end' of the distribution, where the difference between projects of medium quality are liable to be modest. Perhaps this is the point at with the discretion for panels - given the uncertainty and closeness of the assessment - is at its greatest. In this vein, Bol et al. (2022) found that panels took corrective actions to create greater gender balance in funding allocations, overcoming the tendency of reviewers to offer higher evaluations of men.

One option for research councils to consider would be to create different programmes and calls that target underrepresented groups or institutions. An example of this approach is the ERA Chairs from EU's Horizon 2020 that set aside funding for research institutions in low-performing EU member states to retain or attract outstanding academics, or the NSF Established Program to Stimulate Competitive Research (EPSCoR) which similarly set aside funding for researchers in lower performing US states (Wu, 2010). This approach is also reflected in Canada's Research Chair programme, which has funded over 2000 chairs based on an institution's prior research income and alignment to its strategic plan. Such programmes create space for more diverse allocations of scientific funding by partially institutionalizing diversity in allocation decisions. Research councils can also allow fundable projects that fall just below the funding line to be given the possibility to reapply for funding, as did the EPSRC during the period of our study.

To deal with the specific challenges of panels engaging in institutional diversity, there are several proactive measures research councils/funders could take. First, research council administrators – as EPSRC panel coordinators do - could constantly and consistently remind panellists that prior funding decisions to allocate funding to one institution should have little or no place in the evaluations of individual projects from the same institution. This advisory warning can be made during new panel inductions, but also by sending signals to the panel members during the proceedings that they need not worry about the need for distributive justice in their final allocation.

Second, research councils could introduce institutional blinding to limit the ability of panels to try to ensure 'balance' in their funding decisions. Blinding is increasingly seen a means to overcome bias in research funding decision-making, but it has notable limitations due to the public character of science (Goldin and Rouse, 2000; Tomkins et al., 2017). Moreover, there is mixed evidence about whether blinding may overcome in-built advantages that some groups have over others due to the access to language, resources, and networks (Dahlander et al., 2023; Kolev et al., 2019; Lee and Huang, 2018).

Third, one factor in shaping the preference for institutional diversity in funding allocations is that panel members are liable to be aware that only the list of funded applications are publicly reported. It may be that the lack of information on the number and type of applications received and adjugated upon raises concerns about the distribution of funding, and whether it is truly reflective of the quality and distribution of the application pool. A low-cost solution would be for research councils/funders to publish greater information on the wider application pool, including information about all applications considered for funding. A more radical option could be for research councils/funders to build on the open science movement and adopt an open selection process, pledging to make all applications, peer and panel reviews, and proceedings of the panels open to the public. Such an approach might increase the perceived procedural and informational justice associated with the process. It might help to assuage the fears of panellists that the final distribution will be subject to challenge. Such a shift in approach might be challenging for the current norm of panel confidentiality with respect to their deliberations, but it might raise applicants' knowledge of the decision-making process and stimulate more care and attention among panellists for each project considered. In this context, many of the United States' Food and Drug Administration's Advisory Committees have been webcast since 2016, providing audiences insights into the deliberations of these scientific bodies during the COVID pandemic when such webcasts were prominently highlighted by media outlets and had much higher viewing numbers.

Fourth, to restrict the potential of the preference for institutional diversity by panels, research councils could limit the number of applications from institutions to single application per funding round. Of course, this approach might be difficult when there are response mode or open calls. In this case, funding councils can place projects – especially those receiving favourable review comments - from the same institution into different decision-making windows, ensuring that they do not appear together in the same panel deliberation. The single application approach has been used by many universities as part of their response to the UK research councils' 'demand management' procedures to limit the number of applicants to be considered by peer review. Of course, this shifts a critical part of the scientific decision-making to the university itself, taking part of the decision-making away from the panel and peer review process. It is not clear whether panels within universities can provide review processes commensurate with research councils/funders. It may be that such internal panels also suffer from similar preferences for diversity among local departments or people.[14] Moreover, our data shows that there are often two strong applications in a funding round from the same university, so selecting only one to go forward for funding consideration locally is sub-optimal as this project may be equally good or better than the best project from another institution. Alternatively, universities could pre-empt the preference for institutional diversity by delaying applications from different parts of the institution to ensure they are considered in different funding rounds.

An additional option for research councils/agencies would be to implement randomization for funding decisions at the margin or for those applications above a particular quality threshold (Ma et al., 2015). These types of approaches have been taken by the Swiss National Science Foundation, The British Academy, and the New Zealand health research council in recent years (Heyard et al., 2022). These approaches might help to increase the distributive justice of funding allocations by expanding the number and type of institutions and projects that are funded (Fang and Casadevall, 2016).

6. Limitations and future research

This paper has several important limitations, which could also

[14] Indeed, the authors' own experience of funding allocations within universities would suggest that the tendency of rotate funding across units and departments to help ensure diversity is present here as well.

provide departure points for future research. First, due to legal restrictions in the UK, we were unable access to peer reviewer scores. This means we were unable to determine whether the preference for institutional diversity by panels was shaped by these scores. It could be that peer review scores play a critical role in influencing the panel to place one project from the same institution below another in a ranking if another from the same institution was above it. Future research should probe how panels interpret and assess raw reviewer scores in light of concerns about institutional diversity of funding. A recent study on panel decisions in the Netherlands finds that panels "rectify" gender inequalities emerging from peer review (Bol et al., 2022), confirming that panels exercise significant discretion. Similarly, Ginther and Heggeness (2020) found considerable discretion at play at the NIH's National Research Service Award (NRSA).

Second, our study focuses on applicants, panels, and outcomes, but we are not able to fully observe the entire funding chain from: funding call > application pool > peer review > panel deliberations > funding council decisions > outcomes. It may be the selection at each of these stages (and within each stage) shapes the funding choices and outcomes. It remains very challenging to obtain data on each of these stages, as a result researchers, like us, have tended to focus on just a sub-subject of the chain. In doing so, however, the danger is that important aspects of the process are left observed., as our quasi-replication of Banal-Estañol et al. (2019) attests. Future researchers should work with funding agencies to capture information on the entire funding chain to assess how potential biases in one part of the system are counteracted or reinforced by other parts of the funding system.

Third, we focused on the case of the EPSRC and a single year due to data availability, which acts as significant limitation on our study's generalizability. However, there is little reason to suspect that the case of the EPSRC differs from other research councils, operating with similar procedures. Moreover, the EPSRC is a diverse council, funding research in a wide range of scientific fields. Its panels draw from a wide range of institutions and are continuously reconstituted. It also has a clear set of rules and procedures, rigorously upheld by panel coordinators. Still, future research should examine whether similar patterns emerge in other funding agencies, further documenting Lamont's observations of the tendency of panels to engage in "institutional affirmative action". As it stands, securing access to research councils' deliberations, panels, review scores and other information remains difficult for researchers, as it was for this project. Moreover, the number of scientific panels in use at any one time by funding agencies is often modest. For example, in 2020, the ERC operated 82 panels to allocate over two billion Euros of research funding (European Commission, 2021). Building up data infrastructure and increasing researcher accessibility to information about funding decisions could provide research funders with important opportunities to improve and reshape their practices. As Lamont (2012) suggests, awareness and understanding of the social processes around scientific funding allocations can help to enrich the process and generate new insights about ways to improve it.

Fourth, our study is associational and therefore merely suggestive of the preference for institutional diversity by panels. Although we have attempted to conduct a wide range of empirical tests to buttress our conjectures, we lack the appropriate identification strategy to make causals claims about panel preferences. To do so would require conducting field and/or lab experiments with randomly exposed information about applications' institutional affiliations to some panels and panellists, and/or accessing a natural experiment where institutional affiliation information of applicants was exposed to one set of panels and not others.

Fifth, we are unable to fully quantify the welfare effect of the preference for institutional diversity by panels, although we do find second applications rejected at the margin from the same institution are more likely to be funded in subsequent rounds than very similarly ranked but rejected applications with no overlapping affiliations. It is possible that strong projects are rejected that could have been funded, though we do not see that this leads to a discouragement effect, as these rejected proposals are as successful in subsequent rounds as funded projects of similar quality. However, in other settings, this could lead to a discouragement effect (Bol et al., 2018) as seen in the case of early career funding at the NIH (Ginther and Heggeness, 2020). Applying for grants itself may also encourage knowledge generation (Ayoubi et al., 2019) and feedback from reviewers and panel members could also improve projects in the future. Moreover, it is unclear where discretion – either by panels or funding officials – may play an important role in shaping research selection for good or ill. Greater attention needs to be given to unmasking these choices, so that the full lifecycle of scientific funding decisions is available for investigation (Ginther and Heggeness, 2020).

Sixth, our research builds on prior qualitative research on the experience of science panel decision-making, but our analysis relies on quantitative information. This means we lack understanding of the motivations and attitudes of those people involved in the decision-making, and future research could explore the factors that lead panels to engage in institutional diversity. Such patterns are not easy to observe. Indeed, Lamont (2009) described that although in panel meetings institutional diversity was frequently discussed, panellist often denied they gave any consideration to institutional diversity during subsequent interviews about the panel meeting. This suggests that there are many potential fruitful ways to bring together qualitative research on panels, including ethnographic research of actual panel deliberations, with quantitative approaches, stimulating a richer understanding of the mechanisms that give rise to scientific allocations (see Derrick, 2018 for a notable example exploring impact assessment).

Despite these limitations, this paper provides new and exploratory evidence that scientific panels may disfavour applications from the same institution in the same funding round, suggesting that panel funding may be shaped by a tendency towards promoting institutional diversity.

CRediT authorship contribution statement

This paper is built on joint work and close collaboration between co-authors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Acknowledgements

The authors benefitted from extensive comments from the four reviewers, Ben Martin, Stefano Baruffaldi, Panos Desyllas, Dimo Dimov, Virgilio Failla, Christos Kolympiris, Orietta Marsili, and Rossella Salandra. They wish to acknowledge the contributions of Stefano Baruffaldi, Stefano Benigni, Christina Cohrs, Van Phan, Rossella Salandra, and Felicia Seitz in the creation and cleaning of the data. Cornelia Lawson received support from the University of Bath School of Management through a Research seed corn fund.

Appendix A

Appendix Table A1
Correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) funded project	1											
(2) other project from same institution	0.007	1										
(3) funded project from same instit,	−0.136	0.495	1									
(4) past funding success	0.085	0.068	0.039	1								
(5) other UKRI funding	0	0.004	0.021	0.031	1							
(6) number of publications	0.077	0.047	0.038	0.356	0.034	1						
(7) average citations	0.043	0.089	0.1	0.043	0.056	0.088	1					
(8) college member	0.108	0.074	0.034	0.369	0.021	0.256	0.039	1				
(9) academic age	0.035	0.052	0.016	0.203	0.068	0.178	0.041	0.227	1			
(10) female	0.003	0.034	0.07	−0.048	0.028	−0.033	0.062	−0.004	−0.133	1		
(11) British name	0.041	0.064	0.035	0.178	0.071	0.054	0.083	0.139	0.248	−0.073	1	
(12) European name	−0.012	−0.079	−0.046	−0.165	−0.049	−0.075	−0.051	−0.138	−0.222	0.068	−0.847	1
(13) Asian/African name	−0.057	0.018	0.014	−0.045	−0.047	0.029	−0.066	−0.019	−0.076	0.018	−0.388	−0.161
(14) top applicant institution	0.094	0.192	0.233	0.068	0.049	0.084	0.188	0.063	0.068	0.082	0.014	−0.018
(15) project duration	−0.06	0.039	−0.022	0.023	−0.005	0.087	0.111	0.092	0.052	0.02	0.064	−0.047
(16) team size	0.026	−0.102	−0.033	0.102	0.063	0.296	−0.029	0.03	0.059	0.023	0.092	−0.103
(17) fund per head	0.002	−0.01	−0.095	0.018	−0.007	−0.01	0.078	0.055	0.06	−0.022	−0.017	0.027
(18) industry partner	−0.022	−0.057	−0.066	0.044	−0.021	−0.004	−0.129	0.055	0.012	−0.037	−0.009	−0.031
(19) team diversity(shannon)	−0.012	0.042	0.051	0.152	0.083	0.243	0.069	0.109	0.12	0.026	0.062	−0.065
(20) CI top institution	0.059	−0.031	0	0.057	−0.007	0.17	0.009	0.063	0.038	0.016	0.022	−0.012
(21) number panel members	0.032	0.202	0.208	0.01	−0.026	−0.04	0.064	0.048	0.043	−0.036	0.021	−0.012
(22) panel workload	−0.074	0.3	0.295	0.001	0.015	−0.047	0.085	0	0.023	0.004	0.02	−0.015
(23) panel competition	−0.205	0.097	−0.005	−0.029	0.001	−0.054	0.036	−0.065	0.013	−0.027	−0.02	−0.006
(24) panel member from same instit.	0.019	0.13	0.105	0.014	−0.008	−0.003	0.076	0.028	0.006	0.023	0.025	−0.017
(25) panel diversity(shannon)	−0.038	0.013	0.014	−0.064	0.002	−0.163	−0.221	−0.118	−0.115	−0.034	−0.128	0.105
(26) Chemistry/material	−0.011	0.1	0.068	0.115	0.001	0.128	0.183	0.151	0.115	−0.012	0.1	−0.071
(27) Engineering/ICT	−0.011	−0.069	−0.088	−0.111	0.001	−0.136	−0.189	−0.134	−0.159	−0.036	−0.102	0.068
(28) Health/translation	0.016	0.016	0.085	0.053	0.015	0.059	0.023	0.032	0.042	0.074	0.062	−0.06
(29) Physics/maths	0.011	−0.056	−0.084	−0.065	−0.026	−0.05	0.015	−0.045	0.035	−0.038	−0.074	0.086

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
1																
0.005	1															
−0.036	0.058	1														
0.007	−0.019	0.073	1													
−0.016	0.067	0.461	−0.169	1												
0.069	−0.036	0.067	0.117	0.055	1											
−0.001	0.046	0.044	0.182	−0.001	0.058	1										
−0.019	0.012	0.013	0.321	−0.025	0.031	0.07	1									
−0.018	−0.004	−0.169	−0.269	−0.251	−0.193	−0.105	−0.054	1								
−0.01	0.016	−0.123	−0.103	−0.239	−0.136	0.035	−0.065	0.477	1							
0.047	0.014	0.106	−0.076	−0.013	0.092	0.068	−0.113	−0.185	0.246	1						
−0.015	0.106	0.035	−0.07	−0.044	−0.048	−0.077	−0.04	0.178	0.022	−0.054	1					
0.057	−0.088	−0.478	−0.157	−0.321	0.039	−0.034	−0.1	0.202	0.188	0.113	−0.058	1				
−0.062	0.052	0.14	−0.117	0.023	−0.049	0.072	−0.043	0.045	−0.001	0.078	0.038	−0.402	1			
0.071	−0.063	−0.077	−0.05	0.044	0.142	−0.087	−0.055	−0.151	−0.011	0.013	−0.056	0.391	−0.444	1		
−0.011	0.01	−0.06	0.231	−0.1	−0.027	0.134	0.116	0.069	0.197	0.019	0.003	−0.023	−0.35	−0.507	1	
−0.011	0.015	0.019	−0.106	0.049	−0.128	−0.17	−0.026	0.084	−0.292	−0.169	0.034	−0.035	−0.172	−0.249	−0.197	1

Appendix Table A2
Relevance of institutional diversity in panel assessment - full sample regression.

	(1) Base		(2) IV		(3) Placebo I	
	AME	SE	Coef	SE	AME	SE
Funded project from same institution	−0.186***	[0.026]	−0.227	[0.405]		
Funded project from random other institution					−0.097***	[0.036]
Controls – Panel						
Number panel members	0.004	[0.004]	0.008	[0.015]	0.002	[0.007]
Panel workload	−0.000	[0.000]	−0.002	[0.002]	−0.001	[0.001]
Panel competition	−0.059***	[0.006]	−0.179***	[0.023]	−0.056***	[0.008]
Panel member from home institution	0.004	[0.029]	−0.009	[0.087]	−0.004	[0.027]
Controls – PI						
Past funding success	0.004	[0.003]	0.013	[0.009]	0.004*	[0.002]
Other UKRI funding	−0.030	[0.032]	−0.097	[0.106]	−0.026	[0.043]
Number of publications	0.010	[0.014]	0.028	[0.046]	0.009	[0.016]
Average citations	0.051***	[0.011]	0.158***	[0.038]	0.048***	[0.013]
Average research orientation	0.019*	[0.010]	0.066*	[0.034]	0.022*	[0.013]
College member	0.067***	[0.023]	0.218***	[0.070]	0.068***	[0.023]
Top applicant institution	0.139***	[0.029]	0.351**	[0.136]	0.094***	[0.027]
Academic age	0.000	[0.001]	0.001	[0.004]	0.000	[0.001]
Female	0.000	[0.037]	−0.023	[0.119]	−0.013	[0.037]
European name	−0.006	[0.026]	−0.008	[0.081]	−0.002	[0.026]
Asian/African name	−0.075*	[0.041]	−0.264*	[0.148]	−0.078	[0.057]
Controls – Project						
Project duration	−0.002**	[0.001]	−0.008**	[0.004]	−0.003	[0.002]
Team size	−0.001	[0.009]	−0.000	[0.029]	−0.000	[0.009]
Funds per head	−0.000	[0.001]	−0.000	[0.002]	−0.000	[0.001]
Industry partner	−0.004	[0.031]	−0.013	[0.100]	−0.002	[0.029]
Team diversity (shannon)	−0.032	[0.029]	−0.111	[0.090]	−0.038	[0.032]
CI top institution	0.068	[0.094]	0.206	[0.302]	0.069	[0.118]
Constant			−0.327	[0.279]		
Subject FE	YES		YES		YES	
Observations	1906		1906		1906	
ll	−1045.154		−2025.384		−1070.748	
chi2	410.359		404.984		676.19	
Underidentification test (*p*-value)			0.0008			

Average marginal effects are reported. Robust, clustered standard errors in parentheses. Clustered by panel = 48. Bootstrapped (50 replications) standard errors in model 3.

* Corresponds to 10 % significance level.

** Corresponds to 5 % significance level.

*** Corresponds to 1 % significance level.

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