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Do Funding Agencies Select and Enable Risky Research: Evidence from ERC Using Novelty as a Proxy of Risk Taking

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ABSTRACT

Concern exists that public funding of science is increasingly risk averse. Funders have addressed this concern by soliciting the submission of high-risk research to either regular or specially designed programs. Little evidence, however, has been gathered to examine the extent to which such programs and initiatives accomplish their stated goal. This paper sets out to study this using data from the European Research Council (ERC), a program within the EC, established in 2007 to support high-risk/high-gain research. We examine whether the ERC selected researchers with a track record of conducting risky research. We proxy high-risk by a measure of novelty in the publication records of applicants both before and after the application, recognizing that it is but one dimension of risk. We control and interact the risk measure with high-gain by tracking whether the applicant has one or more top 1% highly cited papers in their field. We find that applicants with a history of risky research are less likely to be selected for funding than those without such a history, especially early career applicants. This selection penalty for high-risk also holds among those applicants with a history of high-gain publications. To test whether receiving a long and generous prestigious ERC grant promotes risk taking, we employ a diff-in-diff approach. We find no evidence of a significant positive risk treatment effect for advanced grantees. Only for early career grantees do we find that recipients are more likely to engage in risky research, but only compared to applicants who are unsuccessful at the second stage. This positive treatment effect is in part due to unsuccessful applicants cutting back on risky research. We cautiously interpret this as a "lesson learned" that risk is not rewarded.

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1. Introduction

A major rationale for public funding of research is to promote risk taking in basic research. (Arrow, 1962; Nelson, 1959). Yet concerns exist that public funding of research is increasingly risk averse despite the fact that the science needed for breakthroughs is generally characterized as requiring risk-taking and a tolerance for failure, particularly in its early phases (Alberts, Kirschner, Tilghman, & Varmus, 2014; Petsko, 2012). Risk aversion on the part of science funders may thus slow advancements in the knowledge frontier, impeding or delaying breakthroughs[1].

Concerns not only relate to a risk bias in the selection of grants by funding agencies, but also that grants do not provide sufficient protective space for researchers to conduct risky research. In particular, grants of short duration can discourage risk taking, as a short time window is insufficient to allow the researcher to recover if the initial research encounters problems
(Azoulay, Graff Zivin, & Manso, 2011; Heinze, Shapira, Rogers, & Senker, 2009; Hollingsworth, 2004).

Funders have countered these criticisms by soliciting submissions of *high-risk* research to either regular or specially-designed programs and, in some cases, creating grants of a longer duration than most. The NIH, for example, created the High-Risk, High-Reward Research program[2], the Engineering and Physical Sciences Research Council of the UK created the IDEAS Factory, the NSF created the EAGER program to encourage early stage potentially transformative research that could be considered high-risk/high-payoff.[3] The European Union chose the moto, "high risk/high gain" when it established its signature science funding organization, the European Research Council (ERC), in 2007. Among philanthropic funders, the Wellcome Trust launched the Leap Fund in 2018 to support high-risk research projects in the health and life sciences.[4] The Howard Hughes Medical Institute (HHMI) funds grantees for a period of seven years, thereby allowing more risk taking. It also discounts the importance of preliminary data, which can discourage risk taking[5].

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[1] For an example of this for mRNA for vaccines, see Franzoni, Stephan & Veugelers (2021).
[2] https://commonfund.nih.gov/highrisk
[3] https://www.nsf.gov/nsb/publications/2018/nsb201915.pdf. The EAGER program replaced the SGER program.
[4] (https://wellcome.ac.uk/press-release/wellcome-launches-£250m-leap-fund-place-big-bets-bold-research) It is led by a CEO who decides which ideas to fund, which level of ambition and risk to allow, and who can reallocate funds as he/she sees appropriate. Copied verbatim from https://www.embopress.org/doi/10.15252/embr.201949472
[5] Leslie Voshall, a highly productive mosquito researcher at Rockefeller University, for example, is on record saying that her application to HHMI, which was funded by the institute, involved doing something "bold and

Little systematic evidence, however, has been gathered to address the extent to which funding agencies in general penalize risk when awarding grants and whether grants encourage risk taking (Franzoni, Stephan, & Veugelers, 2021). Even less evidence exists for programs that have risky research as a stated goal or whose structure may encourage risk taking. Exceptions are the work of Azoulay et al. (2011) which finds, as noted above, that HHMI funded researchers produce more hits and more flops, compared with a matched sample of NIH-funded researchers. Several studies have investigated the first years of the ERC, by interviewing researchers and evaluators. While Laudel and Gläser (2014) concluded that the ERC constitutes an institutional innovation that enables excellent research, Luukkonen (2012)'s interviews with members and chairs of ERC panels suggested that "despite the ERC's aims, the peer review process in some ways constrains the promotion of truly innovative research." (page 58).

The systematic study of risk taking by funding agencies faces multiple challenges. First, there is the issue of identifying *high-risk* research. While *high-gain* or excellence is commonly measured by highly cited papers or papers in prestigious journals, there are no such common measures for identifying *high-risk* research. Not only is there the file drawer problem of measuring failure associated with risk, but also the issue of how to create concrete measures of risk associated with text information. Second, there is the issue of identifying where risk aversion lies (Franzoni et al., 2021). Is it with the funder, reflected in its objectives and procedures for assessing proposals? Or is with the reviewers? Do panel members eschew funding risky research, irrespective of the mandate received by the agency they represent? Do they prefer well known conventional approaches? Are they too narrowly embedded in their discipline to appreciate risky research that crosses disciplinary boundaries? Or does risk aversion come from the applicants? Do they eschew risky research in building their research profile, perhaps anticipating risk aversion by science funders? Are those pursuing a research trajectory with considerable risk less likely to apply, fearing that their proposal will not be well received by reviewers? Third, are post-funding research outcomes a result of selection or treatment? Can a higher post-funding inclination for risky research, if observed, be associated with funding, or is it associated with the type of researcher selected for funding being prone or not to risky research, irrespective of the funding received? Do/can successful grantees use the funding to enable more risky research, or rather does it induce them to avoid risk to increase their project performance?

Here we take on some of these challenges by examining the role of risk in ERC funding decisions. ERC organizes a pan-EU EC funded competition for bottom-up proposals across all scientific disciplines. At its start in 2007, the ERC heralded *high-risk/high-gain* research as its core mission. Its organizational design tries to encourage risk by (i) giving full autonomy to panel expert members in terms of how and whom to select and explicitly

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new" and was supported with no preliminary data. As of February 2022, she is Vice President and Chief Scientific Officer of HHMI.

instructing panel members to not eschew risk and (ii) providing grants of above average size and duration to give researchers the freedom and protective space to work on their bottom-up proposed ideas.

In line with the mission of the ERC, we investigate econometrically whether researchers with a history of risky research are more likely to be selected for funding by ERC panels, controlling for other possible confounding selection factors, most notably scientific excellence (*high gain*). We also investigate, with a difference-in-differences approach, whether grantees pursue more risky research post selection compared with applicants who are not selected. We proxy risk using a measure of the novelty of scientific publications developed by Wang et al. (2017), who have shown in sufficiently large samples that novel research has a higher variance of citations with a higher probability of becoming a highly cited paper—characteristics associated with risky research. They also found that novel research is less likely to be highly cited in the short run, less likely to be published in high impact journals and less likely to be cited by research in its own field. These findings may correlate with how selection takes place, shaping risk biases in funding decisions, such as the use of field-specific panels and the use of short-term bibliometric indicators to assess the quality of applications. When assessing possible selection biases against risky research and risk treatment effects at ERC, we distinguish between early-career researchers and established researchers, as well as between the two stages of selection used by the ERC.

We find a significantly negative selection effect for applicants with highly novel publications in their track record prior to application. The risk bias against novelty holds for non-top cited researchers. Yet, top-cited researchers also pay a substantial selection penalty when they have a highly novel track record compared to other top-cited applicants without highly novel papers. When split by career stage we find that the negative selection against novelty is larger and more significant for early career applicants than for advanced applicants, suggesting that panel members are less willing to tolerate risk for early career applicants than for established researchers. For the treatment analysis, the difference-in-differences analysis finds no significant treatment effects for advanced career recipients, only positive treatment effects for early career grantees when compared to unsuccessful second stage applicants. This positive treatment effect for risky research is however in part due to unsuccessful second stage applicants cutting back on risky research. We cautiously interpret this as a strategy on the part of the failed junior applicants to prepare for resubmission of their proposal to a research funding system that appears to be biased against risky research.

2. Assessing risk biases at science funding agencies

Despite concern among science policy researchers that funders are overly risk averse (Franzoni, Stephan, Veugelers, 2021; Laudel, 2017; Mazzucato, 2015; Viner, Powell, & Green, 2004), the evidence, until recently, was largely anecdotal. However, recently, a handful of empirical studies have begun to address the topic. Before we review this evidence, it is important to note that risk remains an ill-defined and difficult to measure concept. Here we follow Franzoni and Stephan (2021) and use the term *risk* in its *speculative* meaning, in the sense that risk refers to research with the potential of generating exceptional "hits" as well

as generating "flops" (Azoulay, Graff Zivin, and Manso 2011) and thus has a higher variance in performance than non-risky research. The literature often looks at research that is novel and research that crosses disciplinary boundaries as indicators of risky research.

The work that exists suggests that peer review of proposals is conservative and biased against risky research. Luukkonen (2012) summarized the early body of work, saying that "the majority of the research on peer review concludes that it is inherently conservative and unable to select truly innovative research proposals." (p50). Commonly used consensus meetings, in which multiple views are confronted and disagreement among reviewers resolved with discussion, is prone to groupthink (Cooke 1991; Lamont 2009). Furthermore, the requirement of consensus may arguably induce a bias against risky research. To the extent that risky proposals lead to outcomes in the tails of the distribution, it is plausible that the related opinions would also be polarized. If this is the case, aggregation or deliberation that require consensus may be systematically biased against risk-taking (Linton 2016), Franzoni & Stephan (2021)).

In an experiment conducted at the Harvard Medical School, Boudreau, Guinan, Lakhani, and Riedl (2016) found that more novel research proposals, as measured by the percent of keyword-pairs that did not previously exist in the published scientific literature, receive more negative evaluations during peer-review than do less novel ones. The result is driven by proposals with particularly high levels of novelty. The authors explain these observations by the bounded rationality of evaluators, "experts extrapolating beyond the knowledge frontier to comprehend novel proposals are prone to systematic errors, misconstruing novel work." (Boudreau et al., 2016, p. 2779).

In their comparison between internal block grants and competitive project grants in Japan, Wang, Lee, and Walsh (2018) measure novelty of research, following the Uzzi et al (2013) approach, by the relative rareness in commonness of pairs of references of publications associated with the funded projects. They find that competitive project grants are more likely to be selecting novel ideas from seniors and men then from juniors and women. Banal-Estañol, Macho-Stadler, and Pérez-Castrillo (2019) studied the success rate of teams of co-investigators who sought funding at the UK Engineering and Physical Sciences Research Council. They showed that teams that are most likely to conduct novel research, e.g., new and diverse teams, and teams including members with high mobility, are less likely to be funded. They also showed that team-members with interdisciplinary backgrounds (i.e., who had balanced shares of publications in different fields) were less likely to be selected. Bromham, Dinnage, and Hua (2016) studied more than 18 thousand proposals submitted to the Australian Research Council Discovery Program and found that the probability of receiving funding decreased as the degree of interdisciplinarity of the proposal increased.[6]

[6] The study uses the interdisciplinary distance, a measure that takes into account the fields indicated as pertinent to the proposal by the principal investigator and the distance between the fields, based on the relative frequency with which the fields co-occur throughout the entire sample.

Less evidence exists on programs that have risky research in their stated goals. Azoulay et al. (2011) compared the research output of HHMI funded researchers with that of a matched sample of NIH-funded researchers. They found that HHMI investigators use more novel keywords and produce more hits and more flops, compared with the NIH investigators. It is not clear, as they are quick to point out, whether the results depend on the criteria for selection or other factors, such as the longer duration of grants and the practice of HHMI to not demand early results. Wagner and Alexander (2013) evaluated the US NSF SGER program designed to support high risk, high reward research. Funding decisions were made entirely by program officers; proposals were not sent out for review. The authors found that program directors routinely used but a small percent of available funds , suggesting that officers were averse to funding risky research, despite the number of funded proposals that had transformative results. Carayol and Lanoë (2018) studied the French ANR funding programs directed towards new areas and found that although individuals with a history of novel research are more likely to apply, they are not more likely to get funding. They use the pairwise combinations of author keywords to identify novel publications. Similarly, Ayoubi, Pezzoni, and Visentin (2021) investigated the Swiss National Science Foundation's SINERGIA program that promotes interdisciplinary, collaborative and breakthrough research and found that scientists inclined towards novel research are more likely to apply but less likely to be funded. They adopted the novelty measured developed by Wang et al. (2017).

Several studies have also investigated the early years of ERC (e.g., Luukkonen (2012), Pina et al (2019)). The ERC itself regularly performs an assessment of research outcomes of a random sample of finished projects by a panel of experts[7]. ERC grantees are found to produce excellent science. It is unclear whether these results are due to selection of excellent profiles for funding or due to ERC funding effects. Whether the ERC favors *high risk* research has not yet been examined comprehensively.

The evidence discussed above suggests that risky research is disfavored in the competition for funding. This seems to be the case not only with standard funding schemes, but even when a deliberate goal of the funding agency is to support *high-risk* research. Yet, the literature to date is thin and preliminary. Challenges include the identification and analysis of the *high-risk* research, the origin of any risk bias (i.e., whether it lies in the funding agency, evaluators, or the applicants), and the identification of any risk bias in the selection versus the treatment of the funding. We take on some of these challenges in examining the role of risk in ERC funding decisions. Before setting out our research framework in section 4, we first introduce the ERC setting as a high-risk science funding program.

[7] For the latest report, see https://erc.europa.eu/sites/default/files/document/file/2021-qualitative-evaluation-projects.pdf

3. ERC as a high-risk funding program

We analyze the ERC grants, a program within the European Commission (EC) funding for basic research, set up in 2007 as its instrument for supporting excellence in science. The time period of analysis covers the initial period during FP7 (2007-2013)[8]. The total budget available to the ERC during this period was about 7,7 billion euros. A total of about 43,000 applications were received, and about 4,400 funded, leaving an overall success rate somewhat higher than 10%.

The ERC was explicitly designed to support *high-risk/high-gain* research. Its mission statement at birth read "Scientific excellence is the sole selection criterion. In particular, *high risk/high gain* pioneering proposals which go beyond the state of the art, address new and emerging fields of research, introduce unconventional, innovative approaches are encouraged".[9]

The scientific governance of the ERC is done by an independent *Scientific Council*, composed of eminent scientists drawn across all fields, which have full authority over the design of its programs and the allocation of its budget to projects.

ERC organizes pan-European competitions for bottom-up individual proposals, in all fields of science and the humanities. ERC applicants, when successful, can work on a research topic proposed by them, with a team of their choice. Grants awarded are relatively long-term (5 years) and large (on average 2 million euro, with top-ups for equipment of up to max 0.5 million euro). The main schemes operated by ERC are its *Advanced Grants*, *Consolidator Grants*, and *Starting Grants*. *Advanced Grants* are designed to support established scientists (with an excellent scientific track record of at least 10 years). This scheme provides funding of up to EUR 2.5 million. *Starting Grants* are designed to support researchers at the early career stage (2-12 years of post-doctoral research experience) by enabling them to develop an independent research career and to establish their own research team and programme in Europe. The scheme provides funds of up to EUR 1.5 million for a period of up to 5 years. To address the large disparities in research experience among the applicants for the initial *Starting Grants* scheme, as well as the increasing problem of oversubscription, in 2013 the

[8] Accordingly, our description of the ERC's processes in this paper also focuses on this time period during FP7. While much of the processes remain the same, there are some changes after this period, for example the number of panels changed from 25 to 27 in 2021. Also, we only focus on individual grants (i.e., *Starting*, *Consolidator*, and *Advanced Grants*) but not the *Synergy Grant*, which targets at two to four PIs crossing different fields working together. We also do not study the *Proof of Concept Grants*, which targets at PIs of ERC *Starting*, *Consolidator*, *Advanced*, and *Synergy Grants* to establish proof of concept of an idea resulting from an ERC grant.

[9] While the mandate of ERC has not been changed, its current mission statement as stated on its website has shifted away from the *high-risk* ambition, focusing on scientific excellence as the sole criterium. It still includes "By challenging Europe's brightest minds, the ERC expects that its grants will help to bring about new and unpredictable scientific and technological discoveries - the kind that can form the basis of new industries, markets, and broader social innovations of the future". (https://erc.europa.eu/about-erc/mission) (accessed 9/2021)

ERC split the initial *Starting Grants* scheme into two parts, creating a third *Consolidator Grants* scheme designed to support researchers in the stage of consolidating their independent careers in Europe and to help them strengthen their recently created research teams or programmes (7-12 years of post-doctoral research experience). The *Consolidator Grants* scheme provides funds of up to EUR 2 million.[10]

The evaluation of ERC grant applications is conducted by panels composed of top scientists and scholars selected worldwide by the ERC Scientific Council. A total of 25 panels[11] are used: 9 in Life Sciences, 10 in Physical Sciences and Engineering, and 6 in Social Sciences and Humanities. For every call, each panel consists of 1 panel chair and 12-16 panel members. There is a 2-year panel rotation and panel members have a maximum tenure of four rounds. Each year about a quarter of panel members are replaced. Budgets are allocated to panels more or less according to demand, with the goal of equalizing success rates across panels.

Panel members decide jointly in face-to-face meetings who to fund. Evaluation is done in two steps. In stage one, a shortened proposal, with CV, is scored exclusively by members of the panel. The panel then meets to decide which proposals advance to the next stage. On average, the success rate to pass to stage 2 is somewhat higher than 20%. Between 100 to 200 applications are evaluated by each panel in the first stage. In view of the large number of proposals involved, it can be expected that the panel might rely on easy-to-process information for evaluating the applicant's track record, such as the Impact Factor of the journals in which the applicant has published and the number of citations received. It should be noted that, although the ERC's application guidelines do not ask for citations or journal impact factors, it is quite common for applicants to list these to signal their excellence and for panel members to "google" for such information.

Conditional on passing stage one, proposals proceed in their full format to stage two where the panel, with input from external reviewers, decides who gets funded or not. These external reviewers (a minimum of 3, and typically 5 to 8) are selected by panel members on the basis of their expertise for the proposal. The panel members then meet and consider the full proposal in light of the external reviews as well as their own evaluation. In contrast to the first stage, the second stage procedure places more emphasis on the full project proposal relative to the track record of the applicant. For *Starting* and *Consolidator Grants*, selection of the final grantees is made by the panel after interviews with the stage two applicants. For *Advanced Grants*, the final selection is done without interviews, at least during the time period of our sample. The success rate in stage two is typically about 50%.

[10] The average age of starting grantees is 35 years at the time of application, 40 years for consolidator grantees, and 52 years for advanced grantees.

[11] The number of panels changed from 25 to 27 in 2021.

Panel members and reviewers are asked by the Scientific Council to evaluate proposals on their ground-breaking nature and their level of ambition to go beyond the state of the art and push the frontier. Panel members are reminded at an introductory meeting with the Scientific Council, that the ERC's mission is *high-risk/high-gain*. Yet, panels are fully autonomous to decide who to fund and the process by which they choose. The risk appetite by ERC panel members is thus crucial for implementing the ERC's *high-risk/high-gain* mission. A quote from a panel member (PE4 2014-2020) illustrates the issue: "Don't be fooled by the ERC adage 'high risk, high gain'. Of course, research must be innovative with a high potential impact, but do not forget the feasibility aspects."[12] In terms of how they choose, common practice is to strive for consensus, with disagreements resolved by discussion (see also Luukkonen (2012)). Given, as noted above, that risky proposals are more likely to spark disagreement, moving from multiple opinions to a single aggregated opinion may induce a bias against risk. Consensus may be exposed to groupthink and may lead to aligning on median positions, herding away from risky research with tail outcomes (Franzoni et al , 2021).

4. Assessing risk bias at science funding agencies: the case of ERC

We investigate whether the design and implementation of the ERC program with its explicit mission of supporting *high risk/high gain* research is unbiased against risk when selecting grantees and whether its large and long grants enable grantees to conduct risky research. We face several challenges in this investigation.

4.1. Identifying risky research: novel research

A first challenge is to identify a proxy for risky research. Unfortunately, we cannot assess the risk-profile of the submitted research proposal, as we do not have access to the proposal text. Neither do we have access to either the panel or reviewer's scores and comments. Instead, we use the available information on publications of the applicants to measure their *high-risk* profile. We assume that the publication profile of a researcher may be indicative of his/her taste for risk in general and in turn the characteristics of the proposed research. Furthermore, analyzing publication records is relevant and informative as the track record of the applicant's publications is likely to carry an important weight in the evaluation for funding.

To assess the risk profile of the publications of the applicants, we use a measure for novelty of research. We take a combinatorial knowledge perspective and view novelty as the recombination of pre-existing knowledge components in an unprecedented fashion (Mednick, 1962; Nelson & Winter, 1982; Schumpeter, 1939; Simonton, 2003). More specifically, we adopt the metric proposed by Wang et al. (2017) that measures the novelty of an individual publication by whether the article makes first-time-ever combinations of scientific knowledge components as proxied by referenced journals, taking into account the difficulty of making

[12] Quote from an interview in FNRS.news n°121, Feb 2021. www.frs-fnrs.be

such new combinations in terms of the intellectual distance between newly paired journals. Several characteristics of novel papers stand out when assessed on large samples. First, they are rare. Second, novel papers display a higher mean and higher variance in citation performance. Third, novel papers, and especially highly novel ones, have a higher probability of becoming highly cited, but at the same time also a higher probability to be among the least cited one (Wang et al. (2017). As such, novel papers, and especially highly novel papers, display patterns associated with risky research. We therefore adopt this measure as a proxy for risky research, recognizing that novelty is but one dimension of risky research.

Several other characteristics of novel research suggest that panel practices may be biased against researchers who have a history of doing novel research. First, Wang et al. (2017) find strong evidence that novel research takes more time to establish high impact and is published in journals having a lower Impact Factor, suggesting not only a general barrier among scientists to appreciate novel research, but also a potential cause for risk bias when panels use bibliometric indicators based on short term citation windows. Another characteristic leading to a possible bias is that citations to novel papers are more likely to come from a broader set of disciplines and from disciplines that are more distant from the home field of the novel researcher, suggesting that novel research has a tendency to be best appreciated well beyond disciplinary boundaries. Given that most ERC panels and consulted experts are discipline-based, this decreases the likelihood that risky, novel research will be fully appreciated when evaluated for ERC funding.

4.2. Selection and treatment of risky research

We assess the ERC's mission with respect to risky research in two dimensions, disentangling a *selection* effect from a *treatment* effect.

We first examine ERC's risk appetite or risk bias in *selection*, that is, the extent to which the ERC selects researchers with a track record of conducting risky research, as measured by having produced highly novel papers prior to their application. Given the stated goal of the ERC to promote risky research, one would expect the selection process to favor applicants with a track record of novel papers, or, at a minimum, to not be biased against those who have followed a risky research agenda.

Next, taking into account *selection*, we examine the *treatment* effect, that is, the extent to which the long and sizeable ERC grants enable risk taking by funded recipients. It is important when assessing the *treatment effect*, to take into account differences between funded and unfunded researchers due to *selection* by comparing grantees with unsuccessful applicants who are otherwise very similar to the grantees.

We expect ERC grant treatment to promote risk taking because of its features conductive to risky research: a large sum of research funds, a high level of freedom in conducting the research and assembling a team, and a relatively long duration of funding (Azoulay et al., 2011; Heinze et al., 2009; Hollingsworth, 2004). Stated differently, ERC grants should provide recipients a *protective space* for risk taking. Furthermore, successful selection as an

ERC grantee may also involve a certification treatment: signaling to the research community the quality of the recipient, further securing his protective space. Getting ERC grant certification can boost the likelihood for early career researchers of getting a tenured position or promotion. It can also aid in getting resources from other funding agencies or their employing organizations[13]. Non-successful applicants also receive a message, which may make them work harder to strengthen their track record to improve their chances of obtaining future funding. They may also cut back on risky research and engage in less risky research that is more likely to deliver, if they perceive funding agencies as being risk-averse.

Given that the mission of the ERC is *high-risk/high-gain,* within an overall mission for *excellence*, it is important to not only assess any risk bias but also connect it to an analysis of excellence. First, when we analyze the risk bias in *selection* and *treatment*, we control for research excellence, which we proxy, as is standard in the literature, by the applicant having top cited publications. And secondly, we examine whether there are any interaction effects between risk and excellence in *selection:* is *high-risk* favored or less biased against when combined with *high-gain* than if not? One would expect that the risk bias in selection would be mitigated for applicants with an excellence track record.

4.3. Risk bias in the review process: Stage 1 vs. stage 2

The two-stage review process of the ERC allows us to examine whether the risk bias is stronger in the first stage or the second stage. Our prior is that the first stage is more prone to *selection* bias against risk. The panel has less information about the proposed project and, in view of the large volume of proposals to be reviewed, relies more on a quick screening of the applicant's track record. This likely involves assessing the applicant's bibliometric profile, using standard bibliometric indicators such as journal impact factors, which are biased against risk taking (Wang et al 2017). In comparison, the second stage evaluation of a smaller number of proposals is more thorough, with less weight on the CV and more on the full proposal, possibly leaving less selection bias against risky research. Yet, the importance expert external reviewers play in the second stage may bias the decisions against risky research when external experts are selected within the field while risky research is more likely to be highly cited outside of its own field (Wang et al, 2017). This within-field hypothesis is consistent with the finding of Boudreau et al. (2016) that reviewers specialized in areas that are closer to the applicant provide lower evaluation scores for novel research.

We expect *treatment* effects to be present for fully successful applicants, who stand to benefit from the "protective space" offered by the ERC funding for conducting risky research and the signal of quality that accompanies an ERC grant. Advancement to stage two—without being selected for funding—also can send a positive message on applicants' quality to their hosting

[13] Prior study has found that winning prestigious early career funding considerably increases the chance of future funding success, not directly due to achievements enabled by the initial grant (Bol, de Vaan, & van de Rijt, 2018).

institution or other funders, and thus provide those who fail at stage 2 some protective space. Yet, as stage 2 failures may be more likely to reapply for funding at ERC or other funding agencies, buoyed by their stage 1 success, they may choose to engage in less risky research, if they perceive a selection bias against risk at funding agencies. We may thus have different treatment effects for stage 2 failures than for stage 2 successes (i.e., grantees).

4.4. Early vs. advanced career researchers

We examine possible *selection* and *treatment* differences between early- and advanced-career applicants. Is the review process more or less biased against risk for early career researchers than established researchers? Do early career recipients pursue more risky research following ERC funding than do advanced career recipients?

With regard to *selection*, we expect a larger selection bias against risk for early than advanced career applicants for two reasons. First, early career applicants have a shorter career history than established career scientists. Thus their risky work is less likely to have been recognized as successful at the time of application, as novel research takes time to establish impact (Wang et al., 2017). Second, prior studies have found that reviewers are more likely to tolerate unorthodox ideas from established applicants with higher status while less likely to give the benefit of the doubt to applicants with low status (Chubin & Hackett, 1990; Wang et al., 2018; Whitley & Gläser, 2007).

Differences in panel selection procedures between early- and advanced-career grant applications may also play a role. The second stage selection for early career (i.e., *Starting* and *Consolidator Grants*) applicants involves interviews with panel members. No interviews are conducted in the second stage for advanced career applicants at the time of our sample. Therefore, differences in the second stage selection outcomes reflect both career stage differences and panel procedure differences. We have no clear priors concerning the role that interviews may play in fostering risk aversion.

With regard to the *treatment* effect, we expect a larger positive treatment for early career recipients than for advanced career recipients. First, early career researchers may benefit more from the *protective space* offered by an ERC grant, while advanced career researchers are already in secured positions and have more access to alternative resources irrespective of obtaining an ERC grant. Second, the information value from ERC *certification* may be higher for early career researchers than for advanced career researchers who have a shorter career history and accordingly fewer accomplishments to publicly signal their research talent.

Given any panel procedure differences, we might expect the difference between the first and second stage treatment effect to be stronger for early stage researchers than for advanced researchers, as the incentive for second-stage non-successful applicants to modify their behavior for re-application, is likely stronger for early stage career faculty, for whom obtaining the benefits from ERC “treatment” is more critical than it is for senior, established, profiles.

5. Data and methodology

5.1. Data

Our sample includes 10,036 applications across all 25 panels and call years from 2007 to 2013. For call years from 2007 to 2011, we have all funded applications (2,556), a random sample of applications who failed stage 2 (1,252), and a random sample of applications who failed stage 1 (1,304). For call years from 2012 to 2013, we have all funded applications (1,789), all applications who failed stage two (1,601), and a random sample of applications who failed stage one (1,534). In the statistical analysis we incorporate sampling weights.

Individuals may have applied multiple times and accordingly appear multiple times in our sample.[14] In case one applicant has multiple applications, we keep the applications up to the first successful one but exclude later applications after the first success, as the before period for these later applications is under the influence of ERC funding. This data restriction drops 85 applications[15]. For analyzing the *treatment* effect, we impose an additional restriction, by further excluding 340 failed applications which have a successful application within five years after the failed application, as the after period for these failed applications is at least partially supported by ERC funding, which will bias our estimate of the *treatment* effect.

For the sampled applicants, we know the call year, the panel to which they applied, reflecting the main scientific field they are active in, whether they are successful or not in any of the two stages, as well as some background information such as gender, nationality, career stage and hosting institution. About 39% of our applicants are from Life Sciences disciplines, 47% from Physical Sciences and Engineering. Only 14% are from Social Sciences and Humanities. About 80% of applicants are male, leaving females underrepresented in the pool of applicants; 60% are early career (<12 years since PhD).

Because the available sample is restricted to researchers who apply, we can only examine the *selection* and *treatment* effects among applicants. We cannot model self-selection into applying, for example, how attitude towards risk may affect selection into applying for an ERC grant. Yet, comparing publications of our sampled applicants with all publications in the world shows that there is no significant difference on more risky, novel research for applicants compared to world-averages, suggesting that there is no particular risk bias or risk love on the part of the applicants compared with the overall population of researchers[16]. In

[14] 1031 individuals applied twice in our sample, 56 individuals 3 times, and 5 individuals 4 times.
[15] It would be interesting to study whether the selection is different for individuals who already had an ERC grant. However, our sample only has a random sample of failed applications and therefore does not have all applications after a successful application. For the 85 observations for which we have second applications in our sample, these are all successes, suggesting an incumbency advantage for selection.
[16] Within our sample of all publications during the five years before the application, 1.01% are among the top 1% novel. This rate is the same as the expected 1% for the world field average.

contrast, publications of applicants are significantly above the world-average in terms of highly cited publications, signaling a pre-selection on research quality into applying[17].

We have all applicants' life-time publications in the Web of Science (WoS) up to 2017. To study the risk bias in selection, we use pre-application publication information for the five-year period before the call year. For the treatment analysis, we use post-publication information for five years after the call years.[18] We are cognizant of the fact that five years after call year may be too short a time window to fully account for the treatment effect from the grant, particularly for those areas with long publication lags associated with starting a new line of research.

In total, we have 362,032 unique journal articles authored by the applicants in this 10-year window around the call year. We only consider original research in the form of articles; we exclude other document types such as reviews, letters, or editorial material. Researchers who do not have publications in the 5-year period before the call year are excluded, leaving 8,717 applications for analysis. The remaining applicants in our sample have on average 18 publications in the five years preceding their application.

High risk. We measure risk taking in the profiles of researchers, ex ante and ex post application, by measuring the novelty of their publications before and after the call year.

In terms of operationalization, we use the novelty measure developed by Wang et al. (2017), More specifically, we measure novelty by the presence of *new* journal pairs in the references and assess the difficulty of making the new pair. We calculate the novelty score for each new journal pair as 1 – cosine similarity between their journal co-citation vectors in the preceding three years. We flag the publications with a novelty score in the top 1% within each field and publication year in the whole WoS database. As discussed supra, we focus on top novel publications because in large samples they display the clearest patterns of *high-risk* research, with the highest mean and variance in performance (Wang et al, 2017).

At the individual applicant level, we construct the *I*(*Top Novel*) dummy: 1 if a researcher has at least one paper that is top 1% novel in a field, and 0 otherwise. Because the top 1% novel publications are rare, we do not include the number or share of such publications. For each sampled researcher, we construct two *I*(*Top Novel*) dummies, one based on publications in the five-year period before the call year, and the other based on publications in the five-year period after the call year.

[17] Within the corpus of scientific articles authored by our sampled researchers in the 5-year period before the call year, 3.73% are among the top 1% highly cited (based on citations before the call year), i.e., almost four times the expected 1% for their world field average, indicating that applicants are considerably more successful in terms of publishing highly impactful research than an average researcher.

[18] For example, for applicants who applied to the call year of 2007, we construct before statistics for the years 2002-2006, and after statistics for 2008-2012. For call year 2013, the after period only has four years: 2014-2017.

Excellence/High Gain. Because the ERC's mission for risk taking is associated with its mission for excellence, we also look at the excellence profile in the publication records both before and after application, tracking the occurrence of highly cited papers.

At the publication level, we identify the top 1% highly cited publications in each field and publication year within the whole WoS database. We employ two different citation time windows for analyzing selection and treatment effects. For analyzing selection effects, we count citations before the call year, that is, before the evaluation takes place. For analyzing treatment effects, we count citations up to 2021[19].

At the individual applicant level, we construct the *I*(*Top Cited*) dummy which takes the value of 1 if a researcher has at least one paper that is top 1% highly cited, and 0 otherwise [20].

In the five-year period before the call year, 14.32% of all applicants in our pool have at least one top 1% novel publication, and 26.73% applicants have at least one top 1% highly cited publication (using citations before the call year). About 5.45% of the observations score both on top 1% novelty and top 1% cited. This higher than the expected co-occurrence of *high-risk* and *high-gain*, suggests a positive correlation between both dimensions. Stated differently, top novel profiles in our sample are more likely to be top cited compared with non-novel profiles and vice versa. This confirms that we need to control for the top-cited profile when analyzing the impact of a high-risk profile and suggests exploring the differences among the high-risk profiles between those that are top-cited versus those which are not.

5.2. Empirical strategy for assessing the selection effect

For assessing whether the ERC selects researchers with a *high-risk profile*, we examine the effect of a highly novel publication track record on applicants' funding success at three levels:

- Overall selection
- Stage 1 selection
- Stage 2 selection, conditional on being successful in stage 1

The dependent variables are: *Overall Success* (1 if funded and 0 if not funded), *Stage 1 Success* (1 if passing stage 1, and 0 if failing stage 1), and *Stage 2 Success* (1 if passing stage

[19] Call year fixed effect control for the different citation time windows in the sample. We also tried fixed citation time windows of 3 years for robustness checks and obtained consistent results. See supplementary material Table S6A&B.

[20] For each sampled researcher, we construct three *I*(*Top Cited*) dummies: (1) based on publications in the five-year period before the call year and using citations before the call year, which is used for analyzing selection effects, (2) based on publications in the five-year period before the call year and using citations up to 2021, and (3) based on publications in the five-year period after the call year and using citations up to 2021. Dummies (2) and (3) are used in the difference-in-differences analysis of treatment effect.

2 (i.e., funded), and 0 if having passed stage 1 failed at stage 2. Since the outcome variables are binary, we use *probit* models for our selection analysis.

The focal explanatory variable is *I*(*Top Novel*), whether the applicant had top 1% novel publications. To control for excellence, we also include *I*(*Top Cited*), whether the applicant had a top 1% highly cited publication (using citations before the call year). We also investigate possible interaction effects between *Top Novel* and *Top Cited,* to check whether any possible bias in selection against novelty is sensitive to the excellence profile of the applicant. To this end we construct 4 exclusive categories of applicants:

1. *TOP NOVEL/no TOP CITED*
2. *TOP NOVEL/TOP CITED*
3. *No TOP NOVEL/TOP CITED*
4. *No TOP NOVEL/no TOP CITED*

With the last category, i.e., applicants who have neither *Top Novel* nor *Top Cited* papers, being the baseline in the econometric specification, the coefficient for the first category shows whether there is any bias in selection against *Top Novel* profiles without *Top Cited* papers, compared to this baseline. Our hypothesis is that this coefficient is negative. The coefficient for the second category shows any bias in selection against the high-risk/high-gain profiles. We hypothesis that the coefficient is less negative than that on the first category, implying that a novelty bias is partly mitigated if the applicant also has a *Top Cited* profile. The coefficient on the third variable is hypothesized to be positive, following ERC's excellence mission, indicating that top-cited individuals without a risk profile are more likely to be funded than the benchmark. Comparing the second and third coefficient allows one to check the penalty for novelty that highly cited researchers pay. We expect this to be lower than the penalty for novelty paid by the non-highly cited researchers (i.e. the first coefficient), perhaps even to be non-significant, if excellence would perfectly mitigate the risk bias.

We also control for other potential confounders regarding the applicant's profile affecting selection. Included is the logarithm of the number of publications in the 5-year period before the call year, which might affect chances of success. It also controls for the higher likelihood of having at least one top cited or top novel paper in one's track record that a larger portfolio of publications bestows. We also control for the applicant's gender[21] and career stage (early stage versus advanced)[22]. To further examine career stage contingency effects, we split the sample into early stage and advanced stage applicants. We also include controls for country [23], field and ERC panel specific effects (25 panels), and time trends with call year dummies.

[21] Unfortunately, the low number of female applicants (20%) hinders a proper analysis by gender (see section 7.1).

[22] Early career applicants include both starting and consolidator grant applicants, i.e., with a window of 2 to 12 years since PhD. The division between starting grants (2 to 7 years) and consolidator grants (7 to 12 years) was only introduced in 2013, the last call year of our sample.

[23] Country is that of the host institution. We use dummies for individual countries. We merge countries with fewer than 50 observations in our sample into one group. If we instead use the full set of individual country

Call year dummies also allow us to control for the differences in time window for calculating *I*(*Top Cited*) (cf supra).

5.3. Empirical strategy for assessing the treatment effect

We employ a Difference-In-Differences (DID) approach to estimate the *treatment* effect of ERC funding on risk taking. DID allows one to single out the treatment effect controlling for the selection effect. DID first constructs the differences in the outcome variable (e.g., risk taking) between the treatment (e.g., funded) and control (e.g., unfunded) groups *before* the treatment (e.g., funding). This first pre-treatment difference represents the *selection* effect discussed supra. The second difference construct is the difference between the treatment and control groups *after* the treatment. The difference between these two differences (i.e., the post- and pre-treatment differences) is estimated and tested, which can be interpreted as the *treatment* effect.[24]

In the DID methodology, a key identification assumption is that both the treatment group, if it were not to have been treated, and the control group would have evolved with a common trend over time (i.e., the parallel trend assumption), such that the difference in differences can be attributed solely to the treatment. If this assumption is violated (e.g., because reviewers select researchers who innately have a higher potential for increasing their scientific output in the future), the difference-in-differences would still include a selection effect. Inspecting the time trend of our focal dependent variables does not suggest that the parallel trend assumption is violated (Supplementary Materials Figure S1).

For a DID estimation, the unit of analysis is an individual-time. In our setting, each individual has two observations, one for the 5-year period before the call year and one for the 5-year period after. To operationalize DID the following independent variables are used:

- A dummy indicating whether the applicant is in the treatment or control group (i.e., *Overall Success*, or *Stage 2 Success*)
- A dummy indicating whether the observation is pre- or post-treatment (i.e., *After*, 1 for after the call year, and 0 for before the call year)
- The interaction between the two dummies.

The interaction between the two dummies estimates the difference in differences, i.e., the *treatment* effect. Note that when splitting by stages, we only report the *Overall Success* and *Stage 2 Success*, as only these involve actual **funding** treatment.[25]

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dummies, some small countries will be automatically dropped in regression analysis due to lack of variance, but results are consistent with what we report here.

[24] See Imbens and Wooldridge (2009) for more on DID for program evaluation.

[25] Stage 1 success, comparing those who moved on to stage 2 with those who did not pass stage 1, does not involve a "ERC funding" treatment and therefore is not reported. The stage 1 treated include both applicants

The focal dependent variable is *I*(*Top Novel*), i.e. whether or not the ERC funding treatment leads recipients to produce high-risk research, as witnessed by the probability to have a highly novel publication in their publication stock in the 5-year period after the call year compared to before and compared to non-treated applicants. We include the same set of controls as used for assessing the *selection* effect.

We also split the DID *Top Novel* treatment analysis by *I*(*Top Cited*), using citations up to 2021. This allows us to check whether ERC grants provide a different treatment into high-risk depending on the excellence profile of the researcher. Although not our main focus, we also look at *I*(*Top Cited*) as dependent variable, allowing us to assess whether we observe treatment effects on the excellence mission of the ERC.

6. Results

6.1. Descriptive statistics

Before presenting the main econometric results, which control for confounding factors, we first present some descriptive statistics regarding *selection* and *treatment*.

who receive ERC funding as well as those who did not, having failed the second stage selection. Thus, the only identifiable treatment is a certification of passing the first selection stage. In some countries, this passing of first selection is honored by providing runner's up funding and could actually involve some "funding" treatment. The results for a first stage certification treatment are available in the SM Table S2.

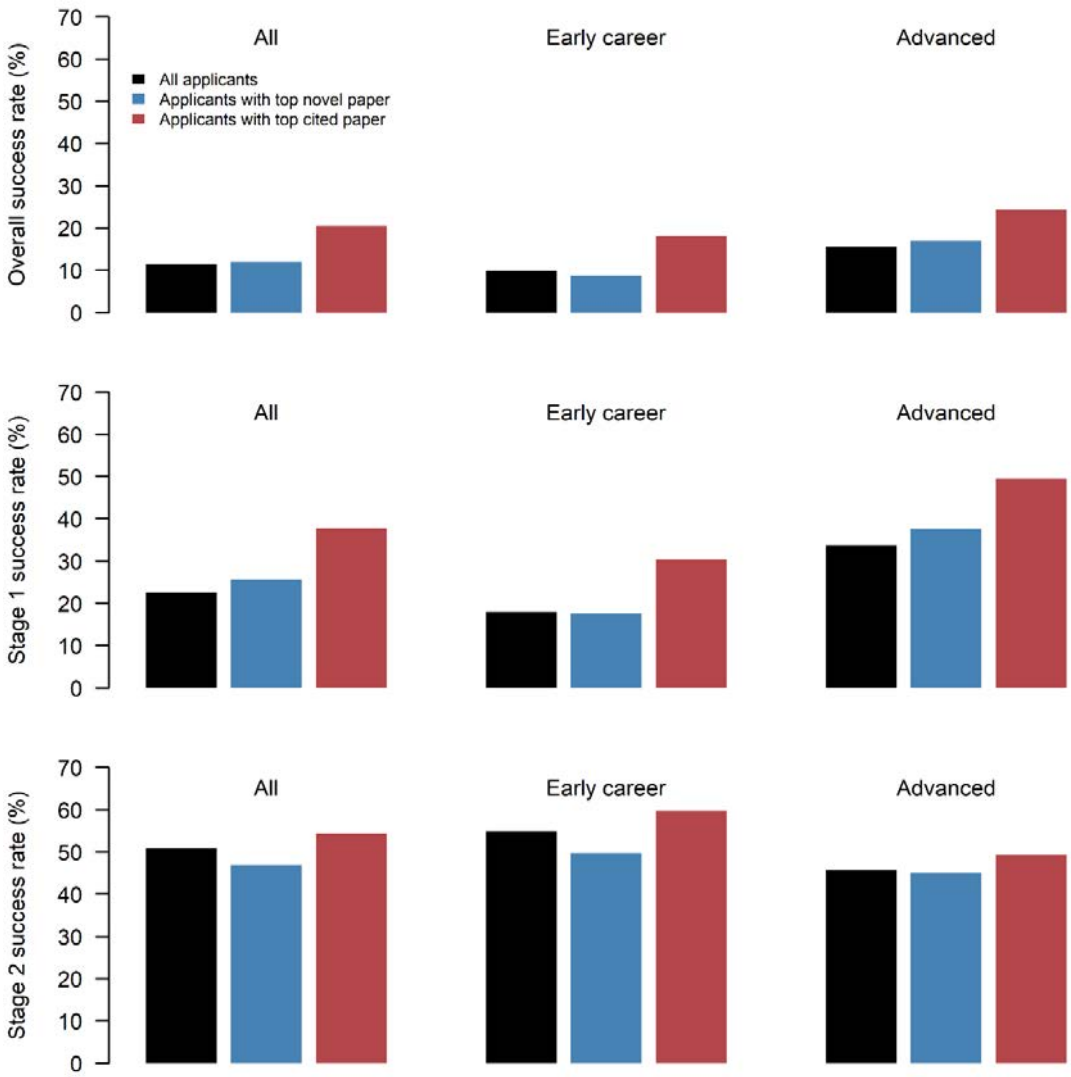

Figure 1. Descriptive statistics on *selection*.

Figure 1 reports the success rate of passing different selection stages by whether the applicant has a *high-risk* or *high-gain* profile. The descriptive statistics show no strong overall selection bias against applicants with top novel publications. Only in the second stage, the success rate for applicants with top 1% novel publications is somewhat lower than the average rate for all applicants. This holds for early career applicants, while for advanced career applicants, no negative selection is found. In contrast, Figure 1 shows a clear positive selection on excellence as measured by whether the applicant has one or more top 1% highly cited publications at the time of selection. Applicants with top cited publications have an overall success rate which is double the average success rate for all applicants. The positive selection on highly cited profiles holds both in the first stage and the second stage, and for both early and advanced career applicants. This strong selection on excellence needs to be controlled for when assessing any selection bias against *Top Novel* profiles, as will be done in our econometric analysis in section 6.2.

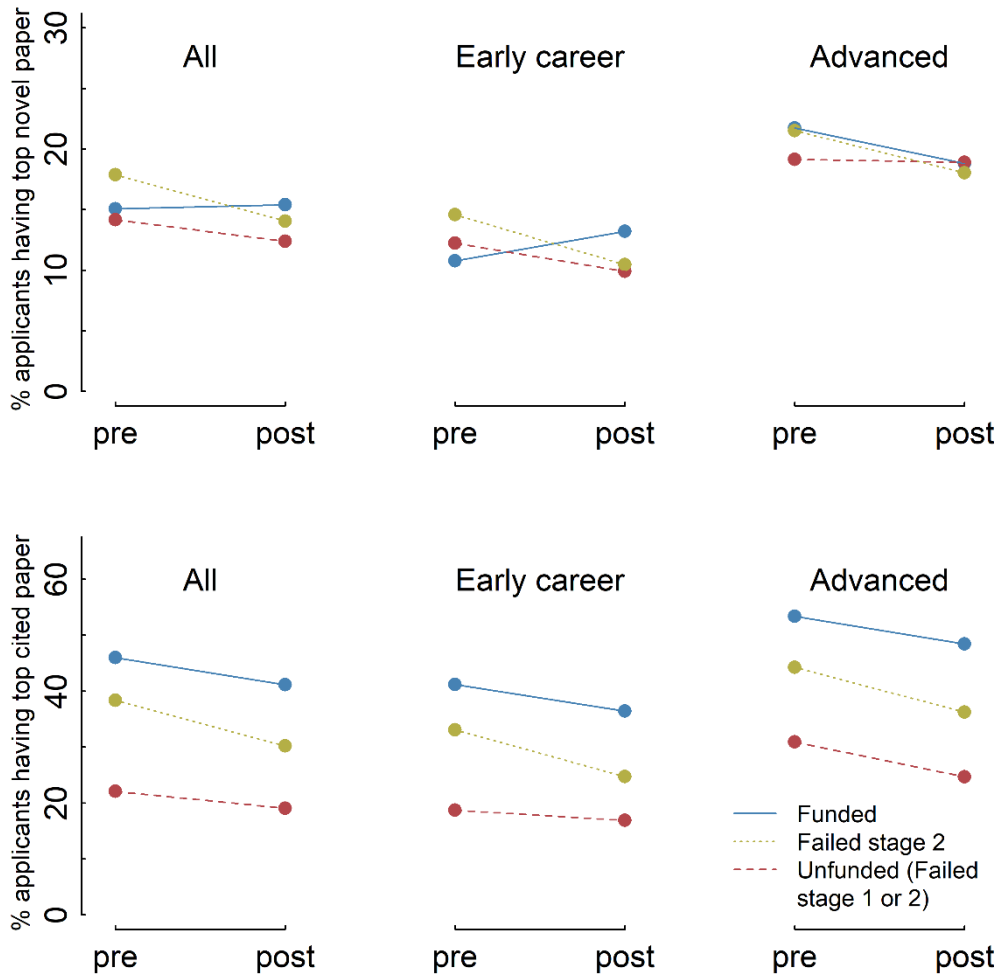

Figure 2: Descriptive statistics on *treatment*

The top panel of Figure 2 reports the share of applicants engaging in *Top Novel* research by whether they receive funding or not comparing before and after the call year. The descriptive statistics suggest overall a positive treatment effect on producing top novel publications. While funded applicants display a slight increase in their likelihood to have top novel publication after receiving the grant, there is a downward trend for unsuccessful applicants after applying, especially those who failed stage 2. If there is any positive treatment effect on *Top Novel* research for grantees, it comes mostly from successful applicants not cutting back on *Top Novel* research compared to non-grantees. These effects are most clear for the early careers. For advanced careers, both grantees as well as unsuccessful applicants face a downward trend in top novel publications. The DID analysis will control for this common trend.

The bottom panel of Figure 2 looks at any treatment effect from ERC funding on highly-cited publications. While successful applicants continue to be more likely to produce top cited publications than unsuccessful ones after receiving the grant, the descriptive statistics do not suggest a positive *treatment* from funding on producing more highly cited publications than before. In fact, the post-treatment period shows a smaller likelihood of producing highly cited

publications compared with the pre-treatment period, which holds for both successful and unsuccessful applicants. This may reflect the difficulty of continuing to produce big hits over time and the amount of time it may require to translate funding into new lines of research. The DID analysis will control for this common trend.

6.2. Econometric results

6.2.1. Selection

The econometric analysis relates the likelihood of applicants with an ex-ante *Top Novel* profile of being selected for funding, controlling for other factors that potentially influence the selection outcome and could correlate with the *Top Novel* profile of the applicant, thus confounding its effect. These include first and foremost their *Top Cited* profile, and also their number of publications, country, field, year, and gender. Results are presented for the entire sample, the early career sample and the advanced career sample.

Table 1: Econometric (probit) results on funding selection effects

	Overall Success Probit	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All							
I(Top Novel)	-0.194***	-0.190***	-0.155**	-0.122*			
	(0.044)	(0.046)	(0.057)	(0.050)			
I(Top Cited)		0.454***	0.479***	0.210***			
		(0.036)	(0.045)	(0.043)			
Top Novel Yes Top Cited No					-0.180**	-0.098	-0.231**
					(0.054)	(0.063)	(0.072)
Top Novel Yes Top Cited Yes					0.257***	0.271**	0.145*
					(0.070)	(0.092)	(0.070)
Top Novel No Top Cited Yes					0.457***	0.501***	0.177***
					(0.038)	(0.049)	(0.047)
N	8688	8688	8688	6369	8688	8688	6369
Pseudo R2	0.086	0.104	0.135	0.024	0.104	0.135	0.025
Wald chi2	764***	901***	655***	175***	901***	655***	181***
Early career							
I(Top Novel)	-0.232***	-0.213***	-0.166*	-0.200*			
	(0.055)	(0.056)	(0.065)	(0.078)			
I(Top Cited)		0.474***	0.475***	0.231***			
		(0.043)	(0.052)	(0.061)			
Top Novel Yes Top Cited No					-0.255***	-0.183*	-0.296**
					(0.068)	(0.075)	(0.101)
Top Novel Yes Top Cited Yes					0.306**	0.333**	0.111
					(0.090)	(0.112)	(0.115)
Top Novel No Top Cited Yes					0.462***	0.469***	0.206**
					(0.046)	(0.056)	(0.066)
N	5290	5290	5290	3627	5290	5290	3627
Pseudo R2	0.093	0.111	0.121	0.030	0.111	0.121	0.030
Wald chi2	580***	680***	513***	107***	683***	515***	111***
Advanced							
I(Top Novel)	-0.165*	-0.172*	-0.153	-0.083			
	(0.069)	(0.071)	(0.095)	(0.065)			

I(Top Cited)		0.419***	0.472***	0.189**			
		(0.061)	(0.080)	(0.058)			
Top Novel Yes					-0.107	0.037	-0.209*
Top Cited No					(0.094)	(0.116)	(0.101)
Top Novel Yes					0.225*	0.229+	0.140
Top Cited Yes					(0.100)	(0.135)	(0.090)
Top Novel No					0.442***	0.555***	0.143*
Top Cited Yes					(0.068)	(0.092)	(0.065)
N	3398	3398	3398	2742	3398	3398	2742
Pseudo R2	0.073	0.088	0.115	0.023	0.088	0.117	0.023
Wald chi2	260***	311***	247***	79**	312***	256***	83**

Note: All specifications also include as controls, but not reported: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additionally controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

All

The econometric results (Table 1) confirm a significantly negative selection effect for applicants with a *high-risk* profile, measured by the presence of highly novel publications in their track record prior to application (Col 1). This negative selection effect continues to hold controlling for *Top Cited* publications (Col 2), i.e., the bias against *Top Novel* profiles holds irrespective of whether the applicant has a *Top Cited* profile or not. Col 2 confirms also the strong selection in favor of *Top Cited* profiles.

The negative selection for *Top Novel* profiles holds in both stages (Col 3 &4). Although we expected the bias to be stronger in Stage 1 than in Stage 2 when panels are most likely to rely on bibliometric analysis of applicants' publication records, the difference between both stages is only minor and not statistically significant. The positive selection for *Top Cited* is though significantly higher in stage 1 than in stage 2.

To further examine whether the bias against *Top Novel* is mitigated for *Top Cited* profiles, we look at the coefficients on the exclusive categories of applicants in Col 5: top-novel/top-cited; top-novel/no-top cited, no-top novel/ top-cited with the benchmark being applicants who have neither top novel nor top cited publications prior to applying. The results show, as expected, that the group least likely to be selected has a profile of top novel research without any accompanying top cited research. These applicants are the least likely to be selected, even less likely than the benchmark group of applicants without top novel and top cited publications, confirming a selection bias against novelty among non-top cited researchers. The group most likely to be selected for funding are those with a profile of top cited research and no accompanying top novel research. Those who have a track record combining top cited and top novel research (the *high-gain/high-risk* profiles) lie in between. Although this profile of applicants is more likely to be selected for funding compared to other applicants with top novel papers, but without top cited papers, as well as compared to benchmark applicants, they are nevertheless less likely to be selected for funding compared to top cited applicants who do

not have a top novel track record. The results thus show that a bias against novelty holds, not only among the non-top-cited applicants, but also among the top cited applicants[26] : even for the top cited profiles, those with a history of high novelty, are significantly less likely to be selected for funding than top-cited without such a history of top novelty. We can thus conclude that excellence may mitigate, but certainly does not eliminate, the bias against novelty.[27]

Col 6&7 show that the bias against top novelty among the top cited profiles only holds significantly in stage 1, but is no longer significant in stage 2 when the full proposal is evaluated: in stage 2, both top novel and non-top novel highly cited profiles are as likely to be selected for funding. In contrast, the bias against top novelty among the non-top cited profiles only holds significantly in stage 2, while there is no significant risk bias in stage 1: both top novel and non-top novel non-top cited profiles, are as unlikely to be selected to proceed to stage 2.

We note that the number of publications is a significant control variable for selection, especially in stage 1.[28] Also the call years are significant, reflecting a.o the impact of changes in the overall budget available for funding over time. Country controls are significant, with especially Switzerland and Israel as outliers in success rates, all else equal, reflecting these countries strong science system. Panel/field fixed effects are not significant, reflecting the strategy of ERC to allocate budgets to panels according to demand, to equalize success rates across panels. Also, gender does not significantly impact selection, confirming that the low female grantee problem at ERC is one of low application rates, rather than significantly lower success rates.

By career stage

When split by career stage of the applicants we find that the negative selection against novelty is larger and more significant for early career applicants than for advanced applicants, suggesting that panel members are less willing to tolerate risk for early career applicants than for advanced careers (Col 2). Among *early career* applicants, the selection penalty against top novelty holds in both stages (Col 3 & 4). In contrast, the positive selection for excellence, especially in stage 1, holds regardless of career stage.

Col 5-7 show that the bias against top novelty among the non-highly cited is only significant for the early career applicants, and holds most prominently in stage 2. It is much weaker to

[26] Running the selection analysis while splitting the sample by I(*Top Cited*), see Table S3A in the supplementary material, confirms that the bias against top novelty holds within both subsamples: top cited profiles and non-top cited profiles, It also confirms the bias among the highly cited profiles to hold significantly only in Stage 1.
[27] The difference in coefficients for *Top Novelty*, given *Top Cited* (0.457-0.257) is somewhat higher than the difference in coefficients for *Top Novelty*, given no *Top Cited* (-0.180), but this difference in difference is not significant
[28] Full regression results for all control variables are available in the supplementary material Table S1.

non-significant for advanced career applicants. The bias against top novelty among top cited applicants, mostly in stage 1, holds in both samples, albeit less robustly for advanced careers.

Overall, the results, although supporting on average a bias against risk when selecting grantees, suggest that a proper assessment of risk bias needs to take into account other factors, such as the highly cited profile of the applicants, their career stage and the selection process, impacting risk bias in selection for funding.

6.2.2. Treatment

To assess treatment effects, we examine the Difference-in-Differences estimates, focusing on the *Success* * *After* coefficient, controlling for selection (*Success*) and trends (*After*). The overall results (Col 1) compare those who were funded with all other applicants. The stage 2 results compare those who were funded to those who made it to stage 2 but did not succeed in getting a grant.

Table 2. Econometric (DID) results on funding treatment effects

	I(Top Novel) Probit		**I(Top Cited) Probit**	
	Overall	Stage 2	Overall	Stage 2
	(1)	(2)	(3)	(4)
All				
Success	-0.246***	-0.153**	0.485***	0.211***
	(0.047)	(0.049)	(0.041)	(0.041)
After	-0.060	-0.106+	-0.066	-0.150**
	(0.055)	(0.059)	(0.050)	(0.051)
Success * After	0.093	0.140*	-0.038	0.046
	(0.067)	(0.069)	(0.059)	(0.059)
N	16616	12056	16616	12087
Pseudo R2	0.186	0.169	0.233	0.183
Wald chi2	849***	1142***	1601***	2085***
Early career				
Success	-0.299***	-0.228**	0.569***	0.236***
	(0.061)	(0.072)	(0.051)	(0.059)
After	-0.139*	-0.169+	-0.054	-0.193*
	(0.070)	(0.090)	(0.061)	(0.077)
Success * After	0.231**	0.283**	-0.102	0.042
	(0.087)	(0.103)	(0.074)	(0.086)
N	10208	6953	10182	6953
Pseudo R2	0.173	0.166	0.203	0.161
Wald chi2	499***	587***	942***	1038***
Advanced				
Success	-0.162*	-0.089	0.374***	0.165**
	(0.073)	(0.064)	(0.067)	(0.058)
After	0.100	-0.047	-0.078	-0.100
	(0.084)	(0.075)	(0.078)	(0.066)
Success * After	-0.140	-0.008	0.074	0.075
	(0.102)	(0.093)	(0.094)	(0.082)
N	6408	5103	6408	5116
Pseudo R2	0.205	0.168	0.294	0.204
Wald chi2	454***	572***	1104***	1063***

Note: All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Results show no significant treatment effect overall on *Top Novel* when comparing funded with unfunded applicants (Col 1). There is thus no evidence that the long duration and large amount of ERC funding provides a *protective space* for researchers to engage in more risky novel research, nor is *certification* from the ERC powerful enough to make a difference in risk-taking for grantees compared to non-grantees.

The stage 2 results show however that there is a positive treatment effect on the probability of producing top novel publications when comparing funded applicants with those who successfully passed stage 1 but failed stage 2 (Col 2). This stage 2 result comes from the sample of *early career* applicants. For *advanced career* applicants there are no significant treatment effect for *Top Novel* in any model specifications.

Figure 3 shows that while we observe a slight upward trend in terms of having top novel publications for grantees post funding, the significant treatment effect for *Top Novelty* comes from the steep downward trend in top novel publications for applicants who failed stage 2. We cautiously interpret this downward trend for failed stage 2 early career applicants as a "lesson learned" that risk taking is not rewarded in the selection process. This lesson is particularly relevant for the applicants failing in stage 2, as these are more likely to try again and reapply to the ERC[29] or to other funding agencies which may be even more risk averse than the ERC. The successful early career ERC grantees, benefiting from the *protective space* or *certification* offered by the ERC, or the sense of accomplishment it awards, seem less exposed to these pressures.

[29] About 37% failed starting grant applicants reapply, and the success rate for these reapplying applicants is 43% for starting grants.

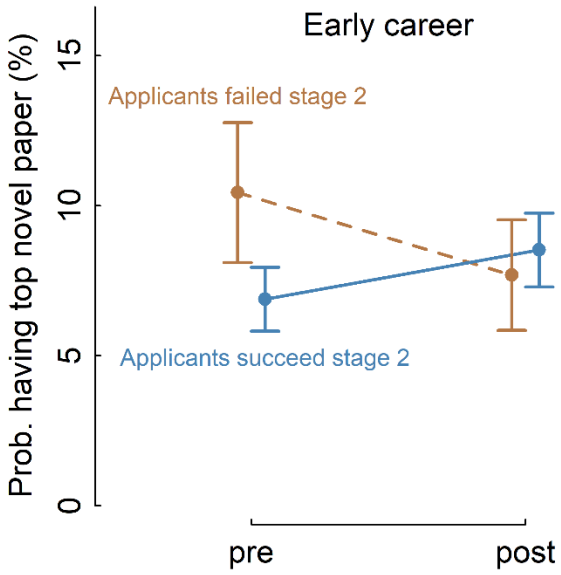

Figure 3: ERC grant has a positive treatment effect on risk-taking for early career applicants. Estimated probability of having top novel publications for early career grantees (i.e., applicants successful in stage 2) and early career applicants who failed in stage 2, all else being equal (all other variables set to the population mean). Estimates are based on regression results in Table 2 Column 2 Section Early Career.

Splitting the sample into applicants with and without top cited publications in the pre-application period (see Table S3B in the Supplementary Material) shows that the only significant treatment effect, namely the stage 2 treatment effect for *early careers*, holds both among top-cited early career applicants as well as among non-top-cited applicants.

Finally, Col 3 & 4 in Table 2, show, in line with the descriptive statistics, no significant treatment effect from receiving an ERC grant on the probability of producing top cited publications in any model specification. This finding suggests that the observed and often claimed association between ERC funding and researchers' excellence performance (see e.g., ERC (2021)) is mainly a selection effect, rather than a treatment effect.

7. Additional results and robustness analysis

In this section, we look at whether the main risk bias results vary by gender (section 7.1) or scientific field (section 7.2) of the applicants. We also look at the robustness of the results to using two different measures for risk: less extreme form of novelty (section 7.3) and atypicality (section 7.4).

7.1. Gender

Beyond controlling for any selection bias against females in general, which is insignificant (cf supra), in this section we check for any differences in a risk bias in selection and treatment

between female and male applicants. Our prior is that, being underrepresented, female applicants face a higher risk bias than men. To examine this, we split the sample by applicant's gender and repeat all analyses for female and male subsamples separately (Table S4A&B). As noted earlier, because only 20% of the applicants are female, the number of female observations is low, e.g., female advanced applicants in stage 2, leaving results with wide confidence intervals, sensitive to outliers.

As 80% of our observations are male, it is no surprise that our main results continue to hold in the male sample. For female applicants, we also find a *selection* bias against risk in general, somewhat larger on average than for males, although the difference between males and females is not significant in view of the wide confidence intervals for females. We don't find a stronger selection bias for early career female applicants compared to advanced female careers. On the contrary, while the selection penalty against novelty is only marginally significant for early stage female applicants, the selection penalty against novelty is significantly negative and large for advanced career female applicants. Again, this result is sensitive to outliers, with a large confidence interval. For *treatment* effects, both for males and females, we find on average no significant overall treatment effect for risk. The positive treatment effect for early career applicants in stage 2, which we find for males, does not hold significantly for females. In contrast, we find a positive risk treatment effect for advanced career female applicants at stage 2, again a result which, although significant, comes with a high confidence interval. Based on this split-sample analysis, we conclude that our reported findings are robust for male applicants, but that a larger sample of female applicants is required to infer gender differences with confidence.

7.2. Scientific field

We run separate analyses by scientific field of the applicants. Results are reported in Table S5A&B. As most of our observations come from the Life Sciences (39% of the full sample) and the Physical Sciences & Engineering (48%), we concentrate our discussions on the LS and PE fields.

The overall *selection* bias against risk holds both for LS and PE, but is somewhat smaller in PE than in LS. The result that the bias is stronger for *early career* applicants only holds for PE. Actually, in PE, there is no significant selection bias against risk for *advanced career* PE applicants.

The lack of a significant risk *treatment* effect holds for both LS and PE. Our main result that there is only a significant positive risk treatment effect in stage 2 for *early career* applicants, only holds for PE, but is not significant for LS.

7.3. Alternative threshold for top novelty

The main analysis uses as proxy for high-risk, top novelty, i.e., having one or more publications with a novelty score in the top 1% of a field and publication year. Our selection of this indicator is motivated by the finding that novel papers in the top 1% exhibit the riskiest

profile[30]. To test whether the bias against risk in funding decisions is less severe for those who have a history of having engaged in less extreme risky research, we use more moderate thresholds for identifying top novel publications. We would expect less bias against more moderately risky research compared to more extreme risky research. Using the threshold of top 5% novelty (i.e., having at least one publication with a novelty score that is among the top 5% of a field and publication year), rather than the 1%, results in far more applicants with a risk profile[31]

Using the 5% cutoff for novelty, we continue to find overall negative *selection* for novelty, like that found for top 1% novelty, although the risk bias is somewhat smaller. The negative selection bias for stage 2 is no longer significant. The result that the risk bias is somewhat stronger for *early career* scientists than for advanced careers, still holds for Top 5% novelty, but the difference is smaller. Both early stage and advanced careers witness no significant risk selection bias in stage 2 when using Top 5% novelty. Overall, we conclude that the bias against risk is less pronounced when a less strict identification of risk is used.

In terms of *treatment*, the more moderate threshold for novelty also fails to generate significant treatment effects, like for the Top 1% indicator. Of more interest, the significant positive treatment effect found for stage 2 early career awardees using the Top 1% novelty indicator disappears when using Top 5%. The reason why it disappears is because, while we found failed stage 2 applicants to reduce their Top 1% novel publications, there is no such decline using the more expansive definition of novelty. More generally, we find that grantees increase their production of both top 1% and top 5% novel publication in the post-grant period, while unsuccessful applicants cut back their top 1% publications but still increase their top 5% novel publications. This suggests that ERC applicants who fail stage 2 avoid highly risky research, but not moderately risky research, consistent with the lower risk bias against more moderately novel publication in ERC selection.

The results suggest that the bias in selection and the treatment effect associated with avoiding novelty for early career scientists hold mostly for the extreme end of novelty but less so for more moderate novelty.

7.4 An alternative measure for high-risk: Atypicality

As an alternative measure for *high-risk*, we use the atypicality measure proposed by Uzzi et al. (2013) and adapted by Lee, Walsh, and Wang (2015). Like our novelty measure, it is rooted in a combinatorial novelty perspective. It assesses atypicality, based on the

[30] Wang et al. (2017) find a higher dispersion in citation performance, delayed recognition and home-bias in citations, as well as difficulty in getting into high impact journals, are much more pronounced for highly novel papers than for moderately novel ones.
[31] Compared to 14% of applicants scoring with their pre-application track record on I(Top1% novelty), 43% of applicants score on I(Top5% novelty)

commonness of journal-pairs in the references of an article.[32] Our novelty measure is likely to pick up more of the risky characteristics of a publication, as it measures new, first time ever reference pairs, rather than uncommon ones in the Uzzi measure.

In line with our *I*(*Top 1% Novel*), we also construct *I*(*Top 1% Atypical*) as a dummy variable which takes 1 if the applicant has at least one publication that ranks among the top 1% in terms of the atypicality score within the same field and publication year. This ensures that we have the most extreme forms of atypicality, reflecting higher risk. There is a positive but moderate correlation between our novelty measure of *high-risk* (i.e., *I*(*Top 1% Novel*)) and the atypicality measure for high-risk *I*(*Top 1% Atypical*) , reflecting that both measures proxy related, albeit different research profiles.[33]

The selection results using *Top 1% Atypical* are largely consistent but, compared to the results for Top 1%-novelty, (Figure S.1) less striking. Overall, we find a significant negative selection bias, albeit smaller, than the bias when using Top 1% Novelty. This bias is no longer significant for stage 2 when using atypicality as risk measure. The stronger selection bias for early careers compared to advanced careers found when using Top 1% novelty as a risk measure, does not hold for top-atypicality. In terms of treatment effects, using top-atypicality as a measure for high-risk also generates no significant risk treatment effects, as when using novelty as indicator. The positive stage 2 treatment effects on risk-taking for early career applicants, observed when using top-novelty, are no longer significant when using top-atypicality as measure for high-risk. Figure S.2 shows that the reason for losing this effect is that the drop in high-risk research post-call for stage 2 failed applicants is much less notable for top-atypicality than when using top-novelty.

We interpret these results as indicating that top atypicality and top novelty, although related, signal different research profiles. Specifically, research that is top atypical remains less risky than top novel research. This difference results in a similar but less severe bias in terms of selection for atypicality. It also suggests that the implied strategy to cut back on risky research for early-career-failed applicants is more moderate in terms of atypicality than in terms of novelty, consistent with a less severe bias in terms of selection for atypicality, leaving less scope for a positive risk treatment effect with atypicality than with novelty.

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[32] Specifically, for each publication, we retrieve all its referenced journal pairs. For each journal pair, we define its "commonness" as the ratio between its observed number of co-occurrences in that year and its expected number of co-occurrences (i.e., the probability of the occurrence of journal 1 * the probability of the occurrence of journal 2, in that year). Subsequently, we record the 10th percentile of the series of journal-pair-level commonness scores as an indication for the typicality of the publication. We then take the natural logarithm of this score and add a minus sign, so the resulting atypicality measure for individual publications is roughly normally distributed and follows the same direction as novelty.

[33] The correlation between *I*(*Top 1% Novel*)) and *I*(*Top 1% Atypical*) is 0.20. 89% applicants who do not have any top novel publications also do not have any top atypical publications. However, there are many off-diagonal cases.

8.Conclusions

We examine whether the ERC with its explicit mission of supporting *high risk/high gain* research is biased against risk when selecting grantees and whether its large and long duration grants enable risky research. We use the novelty of papers written pre-selection and post selection as our primary measure of risk.

We find a bias against funding applicants with highly novel profiles, controlling for other possible confounding selection factors. The bias is particularly strong for early career applicants. It occurs at both the first stage of selection, when vetting is based on a short description of the proposed research and the applicant's CV, as well as at the second stage, albeit less so, when the full proposal, as well as reports solicited from experts, are reviewed by the panel and early-career candidates, who pass to this stage, are interviewed. The group of applicants most likely to be funded have top cited articles with no history of risk taking, as measured by top novelty. Although the bias against risk is partly mitigated for top novel applicants who also have published top cited work, they are nevertheless significantly less likely to be selected for funding than their top-cited peers without such a history of top novelty. We can thus conclude that research excellence may mitigate, but certainly does not eliminate, the bias against novelty.

We use a diff-in-diff approach to examine whether ERC grants enable risk taking by grantees. We find no evidence of a treatment effect for advanced career grantees. Only early career grantees are more likely to engage in risky research than are unsuccessful applicants who make it to stage two. This positive treatment effect is due to a slight increase in risky research among successful applications but also due to unsuccessful second stage applicants cutting back on risky research post selection. We cautiously interpret this as a strategy on the part of the failed applicant to prepare for resubmission to a program that appears to be biased against risky research.

Our results demonstrate that a bias against applicants with a novel profile can exist even when the agency's mission is *high-risk/high gain* as was that of the ERC at the time the applicants were reviewed. It is troublesome that applicants with a history of doing novel research are less likely to be selected in programs that have a goal of supporting high-risk research. But at the same time, our results show that early career researchers benefit from the positive funding treatment effect, as the protective space and certification offered by the ERC appears to enable their risk-taking. However, this positive treatment effect is partially due to the fact that early career applicants who failed to receive funding engage in less novel research afterwards, suggesting that they learned that novelty is not rewarded.

Our results are consistent with the research of Boudreau et al. (2016), in an experiment conducted at the Harvard Medical School, and Carayol and Lanoë (2018), for submissions to ANR. Both studies, using different measures of risk, come to similar conclusions regarding the role that risk plays in selection of awardees. Our results are also consistent with Ayoubi et al. (2021), who use the same risk measure that we do and find that applicants who engage in novel research are less likely to be funded by the Swiss National Science Foundation's

SINERGIA program. Yet, our results also indicate that biases against risk can be quite specific. A proper assessment of risk bias needs to take into account the excellence profile of the applicants, their career stage and the selection process.

Our work is not without problems. First, the short time window over which we can follow applicants subsequent to submission may affect the treatment results given the lengthy period of time it takes to do research, get it published and then read by the scientific community. The problem is challenging to address given that grants run for five years after the call and considerable time is needed subsequently to see long term effects. We leave this challenge to future research. Second, lacking access to the proposal, we are unable to measure its riskiness. We are only able to measure characteristics of the applicant's profile of research publications. We also lack access to reviewers' comments and ratings and therefore cannot directly observe whether reviewers singled out the risky nature of the researcher's profile—and proposal-- as a reason for not funding the applicant. Third, although our measure of risk has the properties of higher variance associated with risky research, we are aware that it measures but one aspect of risk. Clearly there is a need for better and broader measures of risk.

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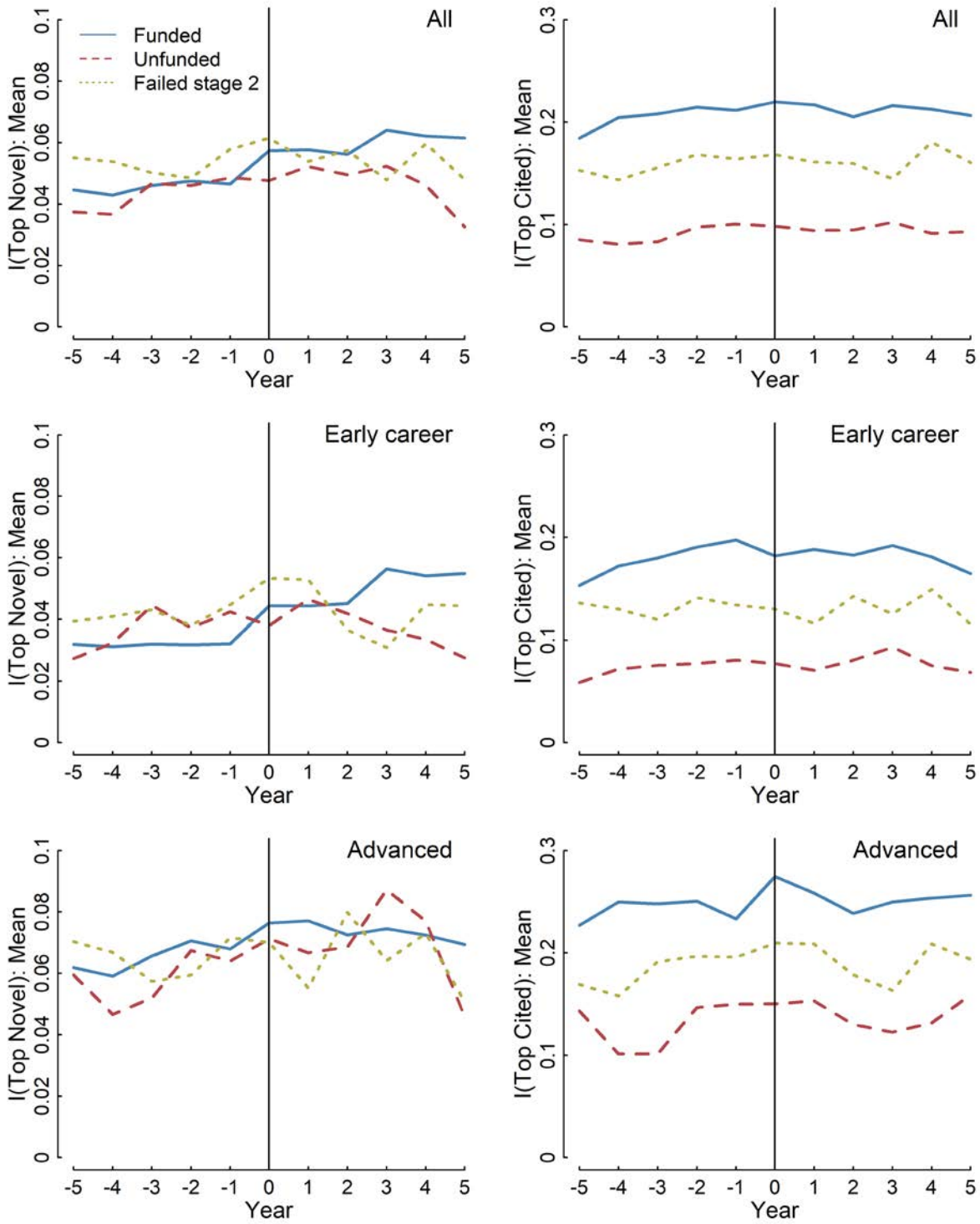


Figure S1: Time trend

Table S1: Full regression results for Table 1 Selection

	Overall Success	Overall Success	Stage 1 Success	Stage 2 Success	Overall Success	Stage 1 Success	Stage 2 Success
	Probit	Probit	Probit	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
All							
I(Top Novel)	-0.194***	-0.190***	-0.155**	-0.122*			
	(0.044)	(0.046)	(0.057)	(0.050)			
I(Top Cited)		0.454***	0.479***	0.210***			
		(0.036)	(0.045)	(0.043)			
Top Novel No Top Cited Yes					0.457***	0.501***	0.177***
					(0.038)	(0.049)	(0.047)
Top Novel Yes Top Cited No					-0.180**	-0.098	-0.231**
					(0.054)	(0.063)	(0.072)
Top Novel Yes Top Cited Yes					0.257***	0.271**	0.145*
					(0.070)	(0.092)	(0.070)
ln(pubs)	0.245***	0.154***	0.187***	0.028	0.154***	0.187***	0.029
	(0.019)	(0.020)	(0.024)	(0.025)	(0.020)	(0.024)	(0.025)
Female	-0.007	-0.001	-0.049	0.080	0.000	-0.046	0.080
	(0.036)	(0.036)	(0.043)	(0.049)	(0.036)	(0.043)	(0.049)
Advanced	-0.036	-0.041	0.144**	-0.269***	-0.041	0.146**	-0.269***
	(0.036)	(0.037)	(0.044)	(0.040)	(0.037)	(0.044)	(0.040)
PANEL							
LS02	-0.031	-0.133	-0.118	-0.052	-0.133	-0.115	-0.051
	(0.102)	(0.101)	(0.124)	(0.130)	(0.101)	(0.124)	(0.130)
LS03	0.020	-0.042	-0.018	-0.043	-0.042	-0.021	-0.039
	(0.112)	(0.113)	(0.140)	(0.130)	(0.113)	(0.140)	(0.130)
LS04	0.017	-0.007	0.012	-0.045	-0.007	0.012	-0.044
	(0.107)	(0.102)	(0.127)	(0.132)	(0.102)	(0.127)	(0.132)
LS05	-0.049	-0.095	-0.132	0.038	-0.095	-0.132	0.043
	(0.098)	(0.095)	(0.116)	(0.133)	(0.095)	(0.116)	(0.132)
LS06	-0.072	-0.124	-0.080	-0.118	-0.124	-0.081	-0.117
	(0.104)	(0.100)	(0.123)	(0.129)	(0.100)	(0.123)	(0.129)
LS07	0.030	0.012	-0.030	0.097	0.011	-0.031	0.098
	(0.103)	(0.101)	(0.122)	(0.120)	(0.101)	(0.122)	(0.119)
LS08	-0.052	-0.065	-0.024	-0.070	-0.065	-0.023	-0.070
	(0.112)	(0.114)	(0.142)	(0.128)	(0.114)	(0.141)	(0.128)
LS09	0.117	0.122	0.277+	-0.113	0.122	0.277+	-0.112
	(0.113)	(0.113)	(0.143)	(0.139)	(0.113)	(0.143)	(0.138)
PE01	0.215*	0.241*	0.273*	0.123	0.241*	0.274*	0.128
	(0.100)	(0.097)	(0.119)	(0.123)	(0.097)	(0.118)	(0.123)
PE02	-0.104	-0.160	-0.174	-0.028	-0.159	-0.168	-0.031
	(0.100)	(0.098)	(0.118)	(0.123)	(0.098)	(0.118)	(0.122)
PE03	-0.206*	-0.209*	-0.203+	-0.088	-0.209*	-0.201+	-0.084
	(0.101)	(0.098)	(0.119)	(0.123)	(0.098)	(0.119)	(0.123)
PE04	-0.161	-0.164	-0.022	-0.219+	-0.164	-0.024	-0.220+
	(0.109)	(0.109)	(0.139)	(0.127)	(0.109)	(0.140)	(0.127)

PE05	-0.145	-0.150	-0.214+	0.048	-0.150	-0.214+	0.048
	(0.099)	(0.097)	(0.117)	(0.124)	(0.097)	(0.117)	(0.124)
PE06	0.081	0.074	0.112	0.028	0.074	0.114	0.029
	(0.103)	(0.102)	(0.123)	(0.124)	(0.102)	(0.123)	(0.123)
PE07	0.053	0.040	0.133	-0.110	0.040	0.132	-0.114
	(0.109)	(0.107)	(0.127)	(0.130)	(0.107)	(0.128)	(0.130)
PE08	0.100	0.134	0.170	0.064	0.133	0.168	0.075
	(0.107)	(0.105)	(0.128)	(0.126)	(0.105)	(0.128)	(0.127)
PE09	-0.228*	-0.213*	-0.238+	-0.017	-0.213*	-0.239+	-0.017
	(0.108)	(0.106)	(0.130)	(0.137)	(0.106)	(0.130)	(0.137)
PE10	-0.048	-0.045	0.016	-0.101	-0.045	0.019	-0.096
	(0.107)	(0.105)	(0.129)	(0.126)	(0.105)	(0.129)	(0.125)
SH01	0.328**	0.332**	0.368**	0.181	0.333**	0.375**	0.177
	(0.113)	(0.110)	(0.133)	(0.141)	(0.110)	(0.133)	(0.141)
SH02	0.250*	0.235*	0.350*	-0.003	0.236*	0.353*	-0.007
	(0.116)	(0.112)	(0.137)	(0.139)	(0.112)	(0.137)	(0.139)
SH03	0.215	0.239+	0.330*	0.023	0.239+	0.329*	0.029
	(0.141)	(0.135)	(0.165)	(0.170)	(0.135)	(0.165)	(0.170)
SH04	0.049	0.047	0.067	0.047	0.046	0.064	0.052
	(0.102)	(0.100)	(0.120)	(0.127)	(0.101)	(0.121)	(0.127)
SH05	-0.057	-0.218	0.307	-0.709+	-0.218	0.308	-0.717+
	(0.291)	(0.311)	(0.341)	(0.383)	(0.312)	(0.343)	(0.383)
SH06	0.498**	0.472**	0.453*	0.327+	0.472**	0.456*	0.322+
	(0.176)	(0.175)	(0.224)	(0.190)	(0.176)	(0.225)	(0.190)
CALL_YEAR							
2008	0.610***	0.635***	0.789***	-0.010	0.635***	0.789***	-0.011
	(0.089)	(0.090)	(0.118)	(0.149)	(0.090)	(0.119)	(0.149)
2009	0.503***	0.500***	0.592***	-0.009	0.500***	0.592***	-0.012
	(0.066)	(0.069)	(0.089)	(0.143)	(0.069)	(0.089)	(0.142)
2010	0.665***	0.684***	0.813***	0.029	0.684***	0.816***	0.030
	(0.064)	(0.066)	(0.087)	(0.137)	(0.066)	(0.088)	(0.137)
2011	0.530***	0.546***	0.670***	-0.037	0.547***	0.673***	-0.037
	(0.061)	(0.062)	(0.082)	(0.136)	(0.063)	(0.082)	(0.136)
2012	0.553***	0.566***	0.585***	0.141	0.567***	0.587***	0.142
	(0.057)	(0.059)	(0.075)	(0.134)	(0.059)	(0.076)	(0.134)
2013	0.315***	0.323***	0.386***	-0.045	0.323***	0.387***	-0.043
	(0.056)	(0.058)	(0.075)	(0.134)	(0.058)	(0.075)	(0.133)
COUNTRY							
AT	0.822***	0.756***	0.596***	0.636**	0.755***	0.594***	0.640**
	(0.124)	(0.125)	(0.144)	(0.204)	(0.125)	(0.145)	(0.204)
BE	0.647***	0.626***	0.629***	0.253	0.626***	0.626***	0.256
	(0.114)	(0.115)	(0.146)	(0.192)	(0.115)	(0.146)	(0.192)
CH	1.190***	1.115***	1.172***	0.494**	1.115***	1.171***	0.500**
	(0.110)	(0.110)	(0.142)	(0.178)	(0.110)	(0.142)	(0.178)
DE	0.901***	0.860***	0.815***	0.438*	0.860***	0.815***	0.441*
	(0.094)	(0.094)	(0.117)	(0.171)	(0.094)	(0.117)	(0.171)

DK	0.627***	0.577***	0.589***	0.189	0.577***	0.587***	0.192
	(0.124)	(0.123)	(0.143)	(0.199)	(0.123)	(0.143)	(0.199)
EL	0.230+	0.203	0.128	0.124	0.203	0.128	0.127
	(0.139)	(0.140)	(0.167)	(0.246)	(0.140)	(0.167)	(0.246)
ES	0.554***	0.522***	0.514***	0.211	0.522***	0.512***	0.216
	(0.098)	(0.098)	(0.118)	(0.178)	(0.098)	(0.118)	(0.178)
FI	0.530***	0.514***	0.592***	0.106	0.513***	0.590***	0.110
	(0.119)	(0.120)	(0.138)	(0.199)	(0.120)	(0.138)	(0.198)
FR	0.888***	0.846***	0.788***	0.448**	0.846***	0.787***	0.452**
	(0.095)	(0.095)	(0.119)	(0.172)	(0.095)	(0.119)	(0.172)
HU	0.681***	0.724***	0.755**	0.162	0.724***	0.755**	0.161
	(0.176)	(0.173)	(0.226)	(0.290)	(0.173)	(0.226)	(0.289)
IE	0.196	0.179	0.040	0.265	0.179	0.034	0.279
	(0.147)	(0.146)	(0.172)	(0.246)	(0.146)	(0.173)	(0.246)
IL	1.029***	0.994***	0.976***	0.431*	0.994***	0.978***	0.434*
	(0.121)	(0.123)	(0.158)	(0.182)	(0.123)	(0.158)	(0.182)
IT	0.289**	0.271**	0.239*	0.110	0.271**	0.236*	0.115
	(0.093)	(0.094)	(0.115)	(0.181)	(0.094)	(0.115)	(0.181)
NL	0.881***	0.822***	0.888***	0.299+	0.822***	0.887***	0.299+
	(0.099)	(0.100)	(0.126)	(0.175)	(0.100)	(0.126)	(0.175)
NO	0.492**	0.456**	0.548**	0.094	0.456**	0.544**	0.093
	(0.143)	(0.147)	(0.175)	(0.231)	(0.147)	(0.175)	(0.231)
PL	0.058	0.068	-0.036	0.195	0.069	-0.031	0.196
	(0.177)	(0.175)	(0.183)	(0.316)	(0.175)	(0.183)	(0.317)
PT	0.342*	0.332*	0.154	0.420	0.332*	0.154	0.431
	(0.151)	(0.152)	(0.169)	(0.265)	(0.152)	(0.169)	(0.264)
SE	0.731***	0.704***	0.675***	0.379*	0.704***	0.674***	0.382*
	(0.107)	(0.107)	(0.129)	(0.184)	(0.107)	(0.129)	(0.184)
UK	0.801***	0.756***	0.738***	0.361*	0.756***	0.738***	0.362*
	(0.090)	(0.090)	(0.111)	(0.167)	(0.090)	(0.111)	(0.167)
Intercept	-2.938***	-2.821***	-2.560***	-0.372	-2.822***	-2.570***	-0.364
	(0.126)	(0.124)	(0.162)	(0.229)	(0.124)	(0.163)	(0.229)
N	8688	8688	8688	6369	8688	8688	6369
Pseudo R2	0.086	0.104	0.135	0.024	0.104	0.135	0.025
Wald chi2	764***	901***	655***	175***	901***	655***	181***
Early career							
I(Top Novel)	-0.232***	-0.213***	-0.166*	-0.200*			
	(0.055)	(0.056)	(0.065)	(0.078)			
I(Top Cited)		0.474***	0.475***	0.231***			
		(0.043)	(0.052)	(0.061)			
Top Novel No Top Cited Yes					0.462***	0.469***	0.206**
					(0.046)	(0.056)	(0.066)
Top Novel Yes Top Cited No					-0.255***	-0.183*	-0.296**
					(0.068)	(0.075)	(0.101)
Top Novel Yes Top Cited Yes					0.306**	0.333**	0.111
					(0.090)	(0.112)	(0.115)

ln(pubs)	0.243***	0.154***	0.185***	0.002	0.154***	0.185***	0.002
	(0.024)	(0.025)	(0.030)	(0.037)	(0.025)	(0.030)	(0.037)
Female	-0.022	-0.014	-0.064	0.091	-0.016	-0.065	0.090
	(0.041)	(0.042)	(0.048)	(0.062)	(0.042)	(0.048)	(0.062)
PANEL							
LS02	-0.124	-0.192	-0.191	-0.041	-0.192	-0.191	-0.038
	(0.116)	(0.120)	(0.138)	(0.194)	(0.120)	(0.138)	(0.194)
LS03	-0.035	-0.070	-0.054	-0.064	-0.069	-0.054	-0.059
	(0.121)	(0.122)	(0.140)	(0.190)	(0.122)	(0.139)	(0.190)
LS04	0.026	0.011	0.021	0.031	0.013	0.021	0.031
	(0.121)	(0.123)	(0.145)	(0.195)	(0.123)	(0.145)	(0.195)
LS05	-0.117	-0.157	-0.188	0.059	-0.159	-0.188	0.062
	(0.113)	(0.116)	(0.135)	(0.206)	(0.116)	(0.135)	(0.205)
LS06	-0.119	-0.147	-0.083	-0.140	-0.147	-0.083	-0.138
	(0.118)	(0.121)	(0.141)	(0.193)	(0.121)	(0.141)	(0.193)
LS07	0.049	0.053	0.029	0.153	0.054	0.030	0.158
	(0.117)	(0.120)	(0.132)	(0.179)	(0.120)	(0.132)	(0.179)
LS08	-0.079	-0.041	-0.036	-0.034	-0.039	-0.036	-0.030
	(0.119)	(0.122)	(0.138)	(0.194)	(0.122)	(0.138)	(0.193)
LS09	0.120	0.169	0.323*	-0.065	0.169	0.323*	-0.064
	(0.132)	(0.135)	(0.161)	(0.201)	(0.135)	(0.161)	(0.200)
PE01	0.108	0.163	0.194	0.133	0.163	0.194	0.142
	(0.115)	(0.117)	(0.133)	(0.183)	(0.117)	(0.133)	(0.183)
PE02	-0.195+	-0.233*	-0.277*	0.024	-0.238*	-0.279*	0.023
	(0.114)	(0.118)	(0.131)	(0.187)	(0.118)	(0.131)	(0.186)
PE03	-0.269*	-0.250*	-0.254+	-0.034	-0.250*	-0.254+	-0.030
	(0.114)	(0.118)	(0.133)	(0.182)	(0.118)	(0.133)	(0.182)
PE04	-0.182	-0.159	-0.011	-0.205	-0.160	-0.011	-0.205
	(0.119)	(0.121)	(0.148)	(0.187)	(0.121)	(0.148)	(0.187)
PE05	-0.193+	-0.188	-0.240+	0.115	-0.187	-0.240+	0.117
	(0.115)	(0.119)	(0.134)	(0.186)	(0.119)	(0.134)	(0.185)
PE06	0.009	0.037	0.056	0.073	0.037	0.055	0.073
	(0.114)	(0.117)	(0.132)	(0.178)	(0.117)	(0.132)	(0.178)
PE07	-0.007	0.026	0.129	-0.126	0.026	0.129	-0.128
	(0.130)	(0.131)	(0.144)	(0.188)	(0.131)	(0.144)	(0.187)
PE08	0.089	0.122	0.157	0.113	0.124	0.158	0.122
	(0.120)	(0.125)	(0.144)	(0.189)	(0.126)	(0.144)	(0.189)
PE09	-0.288*	-0.271*	-0.292+	0.012	-0.271*	-0.292+	0.011
	(0.125)	(0.129)	(0.150)	(0.210)	(0.129)	(0.150)	(0.210)
PE10	-0.056	-0.008	0.026	-0.021	-0.009	0.025	-0.011
	(0.121)	(0.123)	(0.141)	(0.187)	(0.124)	(0.141)	(0.186)
SH01	0.260+	0.285*	0.261+	0.316	0.282*	0.260+	0.317
	(0.134)	(0.134)	(0.152)	(0.214)	(0.134)	(0.152)	(0.214)
SH02	0.219	0.236+	0.274+	0.095	0.234+	0.273+	0.091
	(0.134)	(0.135)	(0.154)	(0.192)	(0.135)	(0.154)	(0.192)
SH03	0.127	0.160	0.236	0.056	0.159	0.236	0.054
	(0.173)	(0.172)	(0.192)	(0.231)	(0.172)	(0.192)	(0.231)

SH04	0.003	0.015	0.030	0.080	0.016	0.030	0.083
	(0.116)	(0.119)	(0.133)	(0.180)	(0.118)	(0.133)	(0.180)
SH05	0.019	-0.121	0.340	-0.588	-0.121	0.340	-0.594
	(0.363)	(0.402)	(0.442)	(0.526)	(0.400)	(0.441)	(0.525)
SH06	0.519*	0.557*	0.682*	0.151	0.553*	0.680*	0.146
	(0.244)	(0.235)	(0.305)	(0.267)	(0.235)	(0.305)	(0.267)
CALL_YEAR							
2009	0.449***	0.446***	0.537***	-0.056	0.445***	0.537***	-0.059
	(0.074)	(0.078)	(0.095)	(0.159)	(0.077)	(0.095)	(0.158)
2010	0.742***	0.759***	0.857***	0.094	0.758***	0.857***	0.095
	(0.067)	(0.069)	(0.087)	(0.142)	(0.069)	(0.087)	(0.142)
2011	0.548***	0.566***	0.705***	-0.046	0.564***	0.705***	-0.046
	(0.065)	(0.066)	(0.084)	(0.141)	(0.066)	(0.084)	(0.141)
2012	0.538***	0.550***	0.579***	0.140	0.548***	0.579***	0.140
	(0.061)	(0.063)	(0.078)	(0.137)	(0.063)	(0.078)	(0.137)
2013	0.280***	0.287***	0.366***	-0.085	0.286***	0.366***	-0.084
	(0.060)	(0.062)	(0.077)	(0.136)	(0.062)	(0.077)	(0.136)
COUNTRY							
AT	0.858***	0.775***	0.533**	0.784**	0.780***	0.535**	0.787**
	(0.154)	(0.157)	(0.185)	(0.278)	(0.157)	(0.185)	(0.278)
BE	0.779***	0.751***	0.671***	0.407	0.753***	0.671***	0.413
	(0.140)	(0.143)	(0.185)	(0.260)	(0.143)	(0.185)	(0.261)
CH	1.183***	1.114***	1.058***	0.563*	1.117***	1.059***	0.570*
	(0.140)	(0.140)	(0.180)	(0.249)	(0.140)	(0.180)	(0.249)
DE	0.988***	0.945***	0.876***	0.463*	0.947***	0.877***	0.466*
	(0.119)	(0.121)	(0.156)	(0.235)	(0.121)	(0.156)	(0.235)
DK	0.642***	0.576***	0.557**	0.142	0.580***	0.559**	0.147
	(0.157)	(0.158)	(0.186)	(0.271)	(0.158)	(0.186)	(0.271)
EL	0.390*	0.354*	0.207	0.255	0.356*	0.208	0.262
	(0.175)	(0.179)	(0.218)	(0.355)	(0.179)	(0.218)	(0.355)
ES	0.609***	0.576***	0.502**	0.268	0.578***	0.503**	0.275
	(0.123)	(0.125)	(0.157)	(0.242)	(0.125)	(0.157)	(0.242)
FI	0.525***	0.532***	0.453*	0.287	0.536***	0.455**	0.295
	(0.148)	(0.150)	(0.175)	(0.274)	(0.150)	(0.175)	(0.274)
FR	1.024***	0.981***	0.832***	0.618*	0.985***	0.834***	0.622*
	(0.121)	(0.122)	(0.158)	(0.240)	(0.122)	(0.158)	(0.240)
HU	0.745**	0.776***	0.905**	-0.019	0.779***	0.906**	-0.017
	(0.215)	(0.212)	(0.273)	(0.362)	(0.212)	(0.273)	(0.360)
IE	0.404*	0.362+	0.137	0.568	0.362+	0.136	0.573
	(0.176)	(0.185)	(0.212)	(0.350)	(0.185)	(0.212)	(0.351)
IL	1.422***	1.390***	1.276***	0.732**	1.393***	1.277***	0.739**
	(0.151)	(0.152)	(0.192)	(0.257)	(0.152)	(0.192)	(0.257)
IT	0.316**	0.306*	0.218	0.131	0.309*	0.219	0.134
	(0.120)	(0.121)	(0.157)	(0.253)	(0.121)	(0.157)	(0.254)
NL	0.893***	0.835***	0.871***	0.269	0.838***	0.872***	0.272
	(0.124)	(0.126)	(0.163)	(0.239)	(0.126)	(0.162)	(0.239)

NO	0.431*	0.394*	0.627**	-0.178	0.401*	0.630**	-0.176
	(0.182)	(0.189)	(0.217)	(0.308)	(0.189)	(0.217)	(0.308)
PL	0.312	0.282	-0.052	0.852+	0.283	-0.052	0.868*
	(0.226)	(0.227)	(0.241)	(0.438)	(0.227)	(0.241)	(0.441)
PT	0.514**	0.518**	0.275	0.592+	0.521**	0.276	0.603+
	(0.178)	(0.180)	(0.205)	(0.340)	(0.181)	(0.205)	(0.339)
SE	0.758***	0.732***	0.630***	0.436+	0.736***	0.631***	0.441+
	(0.135)	(0.137)	(0.169)	(0.250)	(0.137)	(0.169)	(0.251)
UK	0.868***	0.834***	0.691***	0.533*	0.836***	0.692***	0.535*
	(0.115)	(0.116)	(0.149)	(0.231)	(0.116)	(0.149)	(0.232)
Intercept	-2.954***	-2.876***	-2.526***	-0.431	-2.872***	-2.523***	-0.428
	(0.151)	(0.153)	(0.199)	(0.297)	(0.153)	(0.199)	(0.297)
N	5290	5290	5290	3627	5290	5290	3627
Pseudo R2	0.093	0.111	0.121	0.030	0.111	0.121	0.030
Wald chi2	580***	680***	513***	107***	683***	515***	111***
Advanced							
I(Top Novel)	-0.165*	-0.172*	-0.153	-0.083			
	(0.069)	(0.071)	(0.095)	(0.065)			
I(Top Cited)		0.419***	0.472***	0.189**			
		(0.061)	(0.080)	(0.058)			
Top Novel No Top Cited Yes					0.442***	0.555***	0.143*
					(0.068)	(0.092)	(0.065)
Top Novel Yes Top Cited No					-0.107	0.037	-0.209*
					(0.094)	(0.116)	(0.101)
Top Novel Yes Top Cited Yes					0.225*	0.229+	0.140
					(0.100)	(0.135)	(0.090)
ln(pubs)	0.273***	0.181***	0.216***	0.055	0.180***	0.212***	0.058+
	(0.032)	(0.034)	(0.042)	(0.034)	(0.034)	(0.042)	(0.034)
Female	0.044	0.055	0.016	0.065	0.058	0.028	0.070
	(0.076)	(0.077)	(0.096)	(0.080)	(0.076)	(0.095)	(0.080)
PANEL							
LS02	0.057	-0.094	-0.047	-0.079	-0.091	-0.031	-0.079
	(0.179)	(0.178)	(0.236)	(0.174)	(0.177)	(0.235)	(0.174)
LS03	0.180	0.089	0.132	0.008	0.081	0.104	0.010
	(0.192)	(0.197)	(0.276)	(0.174)	(0.198)	(0.279)	(0.174)
LS04	-0.039	-0.075	-0.035	-0.110	-0.075	-0.032	-0.105
	(0.180)	(0.166)	(0.218)	(0.172)	(0.165)	(0.217)	(0.172)
LS05	0.034	-0.014	-0.048	0.015	-0.017	-0.061	0.028
	(0.162)	(0.154)	(0.197)	(0.166)	(0.154)	(0.196)	(0.166)
LS06	-0.040	-0.123	-0.120	-0.075	-0.127	-0.134	-0.073
	(0.171)	(0.163)	(0.210)	(0.169)	(0.163)	(0.210)	(0.169)
LS07	-0.036	-0.091	-0.145	0.039	-0.093	-0.157	0.036
	(0.170)	(0.166)	(0.214)	(0.163)	(0.166)	(0.214)	(0.163)
LS08	-0.020	-0.113	-0.003	-0.113	-0.112	0.002	-0.115
	(0.201)	(0.205)	(0.284)	(0.166)	(0.205)	(0.281)	(0.166)
LS09	0.061	0.002	0.163	-0.165	0.000	0.154	-0.160
	(0.192)	(0.192)	(0.254)	(0.192)	(0.191)	(0.251)	(0.192)

PE01	0.388*	0.375*	0.449*	0.132	0.373*	0.447*	0.135
	(0.169)	(0.162)	(0.214)	(0.160)	(0.162)	(0.214)	(0.160)
PE02	0.058	-0.031	0.014	-0.063	-0.029	0.023	-0.068
	(0.170)	(0.165)	(0.218)	(0.162)	(0.165)	(0.218)	(0.162)
PE03	-0.148	-0.185	-0.156	-0.126	-0.182	-0.146	-0.120
	(0.171)	(0.161)	(0.216)	(0.164)	(0.161)	(0.215)	(0.164)
PE04	-0.171	-0.207	-0.102	-0.192	-0.212	-0.121	-0.191
	(0.196)	(0.199)	(0.279)	(0.167)	(0.199)	(0.281)	(0.167)
PE05	-0.123	-0.148	-0.212	0.000	-0.149	-0.217	0.001
	(0.160)	(0.155)	(0.198)	(0.165)	(0.154)	(0.197)	(0.165)
PE06	0.219	0.153	0.213	0.012	0.154	0.216	0.015
	(0.181)	(0.177)	(0.237)	(0.175)	(0.177)	(0.236)	(0.175)
PE07	0.103	0.027	0.121	-0.093	0.026	0.110	-0.096
	(0.176)	(0.172)	(0.224)	(0.186)	(0.172)	(0.226)	(0.186)
PE08	0.098	0.126	0.168	0.013	0.123	0.161	0.029
	(0.175)	(0.170)	(0.227)	(0.170)	(0.169)	(0.225)	(0.171)
PE09	-0.157	-0.150	-0.188	-0.017	-0.155	-0.206	-0.016
	(0.184)	(0.180)	(0.229)	(0.180)	(0.180)	(0.230)	(0.180)
PE10	-0.041	-0.101	-0.020	-0.158	-0.100	-0.017	-0.156
	(0.181)	(0.178)	(0.237)	(0.168)	(0.178)	(0.237)	(0.168)
SH01	0.438*	0.410*	0.609*	0.085	0.418*	0.635**	0.073
	(0.189)	(0.185)	(0.238)	(0.190)	(0.185)	(0.238)	(0.190)
SH02	0.311	0.251	0.498+	-0.088	0.252	0.496+	-0.087
	(0.208)	(0.195)	(0.263)	(0.202)	(0.195)	(0.263)	(0.202)
SH03	0.258	0.280	0.412	0.086	0.276	0.395	0.104
	(0.250)	(0.236)	(0.320)	(0.255)	(0.235)	(0.315)	(0.256)
SH04	0.129	0.109	0.140	0.057	0.102	0.116	0.070
	(0.181)	(0.177)	(0.228)	(0.184)	(0.177)	(0.229)	(0.183)
SH05	-0.271	-0.483	0.227	-0.894	-0.485	0.225	-0.905
	(0.516)	(0.550)	(0.545)	(0.633)	(0.554)	(0.552)	(0.633)
SH06	0.498+	0.400	0.183	0.545*	0.400	0.179	0.541*
	(0.258)	(0.261)	(0.318)	(0.259)	(0.262)	(0.322)	(0.258)
CALL_YEAR							
2009	-0.051	-0.082	-0.141	0.006	-0.082	-0.142	0.004
	(0.101)	(0.102)	(0.137)	(0.094)	(0.102)	(0.137)	(0.094)
2010	-0.026	-0.029	-0.007	-0.070	-0.026	0.007	-0.072
	(0.103)	(0.102)	(0.143)	(0.091)	(0.101)	(0.143)	(0.091)
2011	-0.115	-0.123	-0.169	-0.020	-0.121	-0.162	-0.020
	(0.094)	(0.095)	(0.126)	(0.091)	(0.095)	(0.126)	(0.091)
2012	-0.040	-0.044	-0.202+	0.137	-0.044	-0.199+	0.136
	(0.084)	(0.084)	(0.107)	(0.085)	(0.084)	(0.108)	(0.085)
2013	-0.200*	-0.216*	-0.343**	0.004	-0.217*	-0.344**	0.005
	(0.086)	(0.086)	(0.108)	(0.088)	(0.086)	(0.109)	(0.088)
COUNTRY							
AT	0.814***	0.766***	0.770**	0.449	0.772***	0.791**	0.442
	(0.220)	(0.219)	(0.249)	(0.295)	(0.220)	(0.251)	(0.294)

BE	0.375+	0.363+	0.527*	-0.001	0.363+	0.521*	-0.009
	(0.210)	(0.202)	(0.242)	(0.275)	(0.203)	(0.245)	(0.274)
CH	1.208***	1.118***	1.429***	0.371	1.121***	1.444***	0.367
	(0.185)	(0.184)	(0.256)	(0.245)	(0.183)	(0.256)	(0.244)
DE	0.761***	0.718***	0.726***	0.391	0.721***	0.735***	0.388
	(0.160)	(0.156)	(0.172)	(0.238)	(0.157)	(0.173)	(0.238)
DK	0.655**	0.614**	0.722**	0.234	0.618**	0.731**	0.227
	(0.205)	(0.201)	(0.223)	(0.283)	(0.201)	(0.223)	(0.282)
EL	0.049	0.025	0.115	-0.032	0.030	0.137	-0.041
	(0.226)	(0.222)	(0.235)	(0.322)	(0.223)	(0.237)	(0.324)
ES	0.499**	0.461**	0.570**	0.143	0.463**	0.574**	0.137
	(0.172)	(0.169)	(0.180)	(0.254)	(0.169)	(0.181)	(0.253)
FI	0.616**	0.540*	0.980***	-0.128	0.546*	1.003***	-0.136
	(0.215)	(0.211)	(0.264)	(0.283)	(0.211)	(0.265)	(0.282)
FR	0.692***	0.646***	0.762***	0.220	0.652***	0.783***	0.216
	(0.158)	(0.155)	(0.173)	(0.238)	(0.155)	(0.172)	(0.237)
HU	0.566+	0.604+	0.448	0.611	0.613*	0.478	0.592
	(0.314)	(0.308)	(0.365)	(0.398)	(0.310)	(0.370)	(0.399)
IE	-0.118	-0.132	-0.063	-0.182	-0.139	-0.092	-0.157
	(0.247)	(0.242)	(0.270)	(0.359)	(0.243)	(0.273)	(0.358)
IL	0.530**	0.479*	0.686**	0.056	0.487*	0.714**	0.045
	(0.187)	(0.188)	(0.225)	(0.251)	(0.189)	(0.225)	(0.250)
IT	0.269+	0.224	0.303+	0.061	0.225	0.303+	0.060
	(0.158)	(0.154)	(0.163)	(0.246)	(0.155)	(0.164)	(0.245)
NL	0.936***	0.874***	0.991***	0.372	0.878***	1.004***	0.362
	(0.178)	(0.176)	(0.210)	(0.246)	(0.177)	(0.212)	(0.245)
NO	0.566*	0.515*	0.420	0.485	0.521*	0.436	0.472
	(0.258)	(0.258)	(0.290)	(0.326)	(0.258)	(0.291)	(0.325)
PL	-0.325	-0.286	0.014	-0.430	-0.271	0.058	-0.461
	(0.292)	(0.287)	(0.276)	(0.458)	(0.287)	(0.276)	(0.457)
PT	-0.060	-0.118	-0.117	0.107	-0.112	-0.094	0.108
	(0.291)	(0.289)	(0.297)	(0.434)	(0.289)	(0.297)	(0.435)
SE	0.739***	0.700***	0.812***	0.293	0.703***	0.825***	0.286
	(0.187)	(0.182)	(0.211)	(0.263)	(0.182)	(0.212)	(0.262)
UK	0.724***	0.654***	0.875***	0.138	0.658***	0.891***	0.129
	(0.151)	(0.147)	(0.160)	(0.232)	(0.148)	(0.161)	(0.232)
Intercept	-2.408***	-2.208***	-1.790***	-0.554+	-2.219***	-1.823***	-0.536+
	(0.204)	(0.197)	(0.234)	(0.283)	(0.197)	(0.234)	(0.283)
N	3398	3398	3398	2742	3398	3398	2742
Pseudo R2	0.073	0.088	0.115	0.023	0.088	0.117	0.023
Wald chi2	260***	311***	247***	79**	312***	256***	83**

Table S2: Full regression results for Table 2 Treatment

	I(Top Novel) Probit			I(Top Cited) Probit		
	Overall	Stage 1	Stage 2	Overall	Stage 1	Stage 2
	(1)	(2)	(3)	(4)	(5)	(6)
All						
Success	-0.246***	-0.196***	-0.153**	0.485***	0.447***	0.211***
	(0.047)	(0.051)	(0.049)	(0.041)	(0.045)	(0.041)
After	-0.060	-0.055	-0.106+	-0.066	-0.056	-0.150**
	(0.055)	(0.062)	(0.059)	(0.050)	(0.057)	(0.051)
Success *	0.093	0.027	0.140*	-0.038	-0.061	0.046
After	(0.067)	(0.070)	(0.069)	(0.059)	(0.064)	(0.059)
ln(pubs)	0.645***	0.649***	0.581***	0.752***	0.745***	0.672***
	(0.030)	(0.031)	(0.024)	(0.029)	(0.029)	(0.019)
Female	0.008	0.006	-0.042	-0.062	-0.057	-0.152***
	(0.061)	(0.060)	(0.045)	(0.054)	(0.054)	(0.036)
Advanced	-0.003	0.006	-0.037	-0.091*	-0.114**	-0.104**
	(0.049)	(0.049)	(0.038)	(0.042)	(0.043)	(0.031)
PANEL						
LS02	0.494**	0.493**	0.415**	0.461**	0.466**	0.568***
	(0.185)	(0.185)	(0.130)	(0.152)	(0.152)	(0.089)
LS03	0.132	0.129	0.053	0.178	0.176	0.285**
	(0.202)	(0.202)	(0.148)	(0.162)	(0.163)	(0.092)
LS04	-0.126	-0.123	0.217	0.260+	0.257+	0.513***
	(0.202)	(0.203)	(0.161)	(0.145)	(0.145)	(0.096)
LS05	0.082	0.078	0.202	0.377**	0.388**	0.211*
	(0.177)	(0.177)	(0.140)	(0.144)	(0.144)	(0.088)
LS06	0.000	0.001	-0.015	0.392**	0.389**	0.411***
	(0.193)	(0.193)	(0.149)	(0.148)	(0.148)	(0.093)
LS07	0.682***	0.682***	0.757***	0.082	0.082	-0.019
	(0.163)	(0.163)	(0.123)	(0.142)	(0.142)	(0.086)
LS08	0.620***	0.620***	0.694***	0.112	0.111	-0.040
	(0.178)	(0.178)	(0.128)	(0.148)	(0.149)	(0.090)
LS09	0.361+	0.373*	0.424**	-0.011	-0.041	-0.110
	(0.185)	(0.185)	(0.142)	(0.167)	(0.168)	(0.102)
PE01	0.631***	0.636***	0.937***	0.036	0.025	-0.107
	(0.176)	(0.177)	(0.125)	(0.164)	(0.164)	(0.091)
PE02	0.282	0.280	0.437***	0.351*	0.358*	0.219*
	(0.172)	(0.172)	(0.125)	(0.143)	(0.143)	(0.085)
PE03	-0.129	-0.131	-0.012	-0.118	-0.115	-0.157+
	(0.172)	(0.172)	(0.134)	(0.140)	(0.140)	(0.088)
PE04	0.179	0.183	0.393**	-0.209	-0.224	-0.313**
	(0.178)	(0.178)	(0.127)	(0.166)	(0.167)	(0.095)
PE05	0.366*	0.361*	0.404**	-0.365**	-0.355**	-0.399***
	(0.169)	(0.169)	(0.124)	(0.135)	(0.135)	(0.087)
PE06	0.535**	0.536**	0.780***	0.014	0.011	-0.017
	(0.184)	(0.184)	(0.133)	(0.148)	(0.149)	(0.093)
PE07	0.835***	0.838***	0.854***	0.004	-0.005	-0.273**
	(0.176)	(0.176)	(0.131)	(0.169)	(0.169)	(0.096)
PE08	0.840***	0.841***	1.112***	-0.018	-0.021	-0.347***
	(0.168)	(0.168)	(0.123)	(0.152)	(0.152)	(0.089)
PE09	0.116	0.111	0.584***	0.107	0.118	0.094
	(0.179)	(0.180)	(0.130)	(0.148)	(0.148)	(0.095)
PE10	0.228	0.235	0.488**	0.200	0.186	-0.047
	(0.169)	(0.170)	(0.144)	(0.148)	(0.149)	(0.092)
SH01	0.764***	0.773***	0.717***	0.253	0.232	0.173
	(0.204)	(0.204)	(0.166)	(0.184)	(0.184)	(0.118)
SH02	0.644**	0.650**	0.881***	0.108	0.098	0.124
	(0.203)	(0.204)	(0.170)	(0.177)	(0.177)	(0.113)

SH03	0.879***	0.878***	1.174***	-0.040	-0.050	0.087
	(0.202)	(0.203)	(0.150)	(0.207)	(0.207)	(0.141)
SH04	0.615***	0.616***	0.604***	0.049	0.041	-0.147
	(0.176)	(0.176)	(0.135)	(0.160)	(0.161)	(0.095)
SH05	1.240**	1.259**	0.000***	-0.644	-0.686	-0.336
	(0.401)	(0.401)	((empty))	(0.432)	(0.433)	(0.470)
SH06	-0.230	-0.221	0.587**	0.216	0.214	0.482**
	(0.232)	(0.235)	(0.216)	(0.204)	(0.202)	(0.139)
CALL_YEAR						
2008	-0.002	0.012	0.205	0.182	0.151	0.118
	(0.135)	(0.135)	(0.137)	(0.120)	(0.121)	(0.104)
2009	0.102	0.108	0.180	0.124	0.111	0.144
	(0.111)	(0.112)	(0.131)	(0.100)	(0.101)	(0.097)
2010	-0.015	-0.003	0.177	0.040	0.015	0.164+
	(0.107)	(0.108)	(0.126)	(0.093)	(0.093)	(0.092)
2011	0.039	0.052	0.157	0.022	-0.008	0.137
	(0.102)	(0.102)	(0.128)	(0.091)	(0.091)	(0.092)
2012	-0.022	-0.012	0.160	0.087	0.062	0.141
	(0.097)	(0.097)	(0.126)	(0.086)	(0.086)	(0.090)
2013	0.004	0.014	0.147	0.182*	0.159+	0.220*
	(0.099)	(0.099)	(0.127)	(0.087)	(0.088)	(0.090)
COUNTRY						
AT	-0.259	-0.248	-0.159	0.824***	0.806***	0.071
	(0.176)	(0.176)	(0.171)	(0.203)	(0.204)	(0.155)
BE	-0.232	-0.223	-0.125	0.418*	0.400*	-0.117
	(0.179)	(0.179)	(0.154)	(0.167)	(0.169)	(0.152)
CH	-0.208	-0.190	0.056	0.659***	0.621***	0.228+
	(0.152)	(0.153)	(0.144)	(0.139)	(0.141)	(0.138)
DE	-0.336*	-0.325*	-0.205	0.467***	0.438**	0.046
	(0.144)	(0.145)	(0.139)	(0.133)	(0.134)	(0.134)
DK	-0.309+	-0.302+	-0.201	0.386*	0.360*	0.186
	(0.175)	(0.175)	(0.165)	(0.161)	(0.162)	(0.156)
EL	-0.125	-0.126	0.118	0.298	0.301	-0.366+
	(0.187)	(0.187)	(0.204)	(0.255)	(0.256)	(0.198)
ES	-0.348*	-0.340*	-0.254+	0.434**	0.416**	0.060
	(0.151)	(0.152)	(0.152)	(0.143)	(0.144)	(0.141)
FI	-0.159	-0.141	-0.021	0.383*	0.347+	-0.058
	(0.195)	(0.194)	(0.168)	(0.175)	(0.178)	(0.159)
FR	-0.112	-0.103	-0.100	0.394**	0.374**	0.030
	(0.145)	(0.146)	(0.140)	(0.134)	(0.135)	(0.133)
HU	-0.100	-0.097	-0.411+	-0.109	-0.147	0.089
	(0.285)	(0.285)	(0.229)	(0.240)	(0.236)	(0.238)
IE	-0.640*	-0.648*	-0.024	0.863***	0.875***	0.113
	(0.257)	(0.256)	(0.207)	(0.200)	(0.201)	(0.197)
IL	-0.302+	-0.288+	-0.162	0.430**	0.403*	-0.043
	(0.161)	(0.161)	(0.150)	(0.158)	(0.160)	(0.140)
IT	-0.455**	-0.448**	-0.187	0.360**	0.346*	0.154
	(0.141)	(0.142)	(0.151)	(0.136)	(0.138)	(0.140)
NL	-0.346*	-0.329*	-0.093	0.480**	0.445**	0.050
	(0.150)	(0.151)	(0.147)	(0.139)	(0.140)	(0.137)
NO	-0.077	-0.063	-0.181	0.509**	0.481*	0.064
	(0.216)	(0.216)	(0.220)	(0.186)	(0.187)	(0.191)
PL	0.273	0.271	-0.251	0.150	0.154	-0.314
	(0.243)	(0.243)	(0.310)	(0.222)	(0.224)	(0.285)
PT	-0.451+	-0.451+	-0.327	0.358	0.359	-0.177
	(0.231)	(0.231)	(0.263)	(0.251)	(0.250)	(0.197)
SE	-0.158	-0.150	-0.211	0.643***	0.621***	-0.023
	(0.169)	(0.170)	(0.155)	(0.156)	(0.157)	(0.145)

UK	-0.166	-0.154	-0.126	0.599***	0.574***	0.158
	(0.135)	(0.135)	(0.136)	(0.127)	(0.129)	(0.131)
Intercept	-2.919***	-2.938***	-3.189***	-3.327***	-3.303***	-2.374***
	(0.214)	(0.216)	(0.223)	(0.189)	(0.190)	(0.173)
N	16616	16616	12056	16616	16616	12087
Pseudo R2	0.186	0.186	0.169	0.233	0.235	0.183
Wald chi2	849***	847***	1142***	1601***	1496***	2085***
Early career						
Success	-0.299***	-0.206**	-0.228**	0.569***	0.526***	0.236***
	(0.061)	(0.064)	(0.072)	(0.051)	(0.054)	(0.059)
After	-0.139*	-0.135+	-0.169+	-0.054	-0.039	-0.193*
	(0.070)	(0.076)	(0.090)	(0.061)	(0.068)	(0.077)
Success *	0.231**	0.110	0.283**	-0.102	-0.125	0.042
After	(0.087)	(0.090)	(0.103)	(0.074)	(0.079)	(0.086)
ln(pubs)	0.650***	0.653***	0.602***	0.706***	0.699***	0.645***
	(0.041)	(0.041)	(0.034)	(0.036)	(0.036)	(0.026)
Female	-0.035	-0.037	-0.031	-0.081	-0.075	-0.151**
	(0.072)	(0.072)	(0.055)	(0.063)	(0.064)	(0.044)
PANEL						
LS02	0.367	0.365	0.170	0.243	0.250	0.493***
	(0.237)	(0.237)	(0.181)	(0.187)	(0.188)	(0.118)
LS03	0.075	0.074	-0.066	-0.046	-0.050	0.335**
	(0.251)	(0.251)	(0.213)	(0.198)	(0.199)	(0.124)
LS04	-0.148	-0.143	0.163	0.096	0.086	0.438**
	(0.265)	(0.265)	(0.235)	(0.180)	(0.180)	(0.130)
LS05	-0.054	-0.059	0.085	0.323+	0.333+	0.237*
	(0.229)	(0.229)	(0.194)	(0.178)	(0.178)	(0.120)
LS06	-0.128	-0.127	-0.163	0.266	0.261	0.413**
	(0.266)	(0.266)	(0.232)	(0.185)	(0.185)	(0.128)
LS07	0.617**	0.618**	0.714***	-0.130	-0.136	-0.123
	(0.205)	(0.205)	(0.169)	(0.185)	(0.185)	(0.119)
LS08	0.487*	0.485*	0.321+	-0.194	-0.193	-0.019
	(0.225)	(0.225)	(0.181)	(0.187)	(0.187)	(0.123)
LS09	0.122	0.131	0.401*	-0.271	-0.307	-0.195
	(0.236)	(0.237)	(0.194)	(0.221)	(0.223)	(0.140)
PE01	0.442+	0.446+	0.760***	-0.187	-0.205	-0.171
	(0.232)	(0.232)	(0.173)	(0.221)	(0.223)	(0.127)
PE02	0.151	0.147	0.303+	0.172	0.180	0.272*
	(0.215)	(0.215)	(0.169)	(0.178)	(0.178)	(0.113)
PE03	-0.242	-0.242	-0.174	-0.274	-0.272	-0.229+
	(0.218)	(0.218)	(0.188)	(0.176)	(0.176)	(0.119)
PE04	0.120	0.123	0.269	-0.350+	-0.366+	-0.291*
	(0.217)	(0.217)	(0.169)	(0.203)	(0.204)	(0.129)
PE05	0.279	0.277	0.305+	-0.592***	-0.585**	-0.401**
	(0.222)	(0.222)	(0.171)	(0.170)	(0.170)	(0.118)
PE06	0.328	0.326	0.576**	-0.313+	-0.313+	-0.069
	(0.229)	(0.229)	(0.180)	(0.181)	(0.181)	(0.121)
PE07	0.722**	0.727**	0.770***	-0.114	-0.128	-0.326*
	(0.221)	(0.221)	(0.176)	(0.213)	(0.213)	(0.128)
PE08	0.765***	0.765***	0.954***	-0.047	-0.047	-0.370**
	(0.218)	(0.218)	(0.166)	(0.191)	(0.191)	(0.120)
PE09	-0.137	-0.140	0.499**	-0.101	-0.095	0.015
	(0.227)	(0.227)	(0.176)	(0.188)	(0.188)	(0.125)
PE10	0.199	0.204	0.432*	-0.011	-0.022	-0.180
	(0.213)	(0.213)	(0.217)	(0.191)	(0.192)	(0.131)
SH01	0.610*	0.616*	0.753**	0.187	0.169	0.259
	(0.269)	(0.269)	(0.233)	(0.231)	(0.231)	(0.164)
SH02	0.581*	0.585*	0.824***	-0.244	-0.261	-0.093
	(0.239)	(0.238)	(0.229)	(0.226)	(0.228)	(0.158)

SH03	0.742**	0.743**	1.001***	-0.217	-0.236	0.099
	(0.239)	(0.239)	(0.191)	(0.263)	(0.266)	(0.170)
SH04	0.472*	0.474*	0.254	-0.067	-0.077	-0.165
	(0.223)	(0.223)	(0.185)	(0.200)	(0.201)	(0.124)
SH05	1.013*	1.025*	0.000***	0.000***	0.000***	0.000***
	(0.502)	(0.502)	((empty))	((empty))	((empty))	((empty))
SH06	-0.285	-0.281	0.498+	-0.268	-0.281	0.413*
	(0.302)	(0.305)	(0.262)	(0.259)	(0.247)	(0.202)
CALL_YEAR						
2009	0.003	0.007	0.034	0.069	0.056	0.179+
	(0.125)	(0.126)	(0.143)	(0.111)	(0.112)	(0.107)
2010	0.007	0.014	0.232+	-0.022	-0.051	0.111
	(0.110)	(0.110)	(0.122)	(0.094)	(0.095)	(0.094)
2011	0.054	0.065	0.118	0.053	0.013	0.166+
	(0.107)	(0.107)	(0.129)	(0.093)	(0.094)	(0.094)
2012	-0.061	-0.054	0.180	0.110	0.085	0.132
	(0.102)	(0.102)	(0.124)	(0.087)	(0.087)	(0.089)
2013	-0.025	-0.017	0.206	0.165+	0.140	0.237**
	(0.104)	(0.104)	(0.125)	(0.089)	(0.089)	(0.090)
COUNTRY						
AT	-0.135	-0.130	0.285	0.874***	0.860***	0.125
	(0.228)	(0.228)	(0.233)	(0.244)	(0.244)	(0.208)
BE	-0.168	-0.164	0.009	0.226	0.206	-0.147
	(0.226)	(0.227)	(0.212)	(0.201)	(0.203)	(0.202)
CH	-0.113	-0.106	0.274	0.640***	0.610***	0.373*
	(0.207)	(0.207)	(0.205)	(0.173)	(0.174)	(0.188)
DE	-0.261	-0.252	-0.099	0.474**	0.435**	0.070
	(0.194)	(0.195)	(0.197)	(0.159)	(0.161)	(0.182)
DK	-0.621**	-0.617**	-0.179	0.490*	0.456*	0.198
	(0.233)	(0.233)	(0.237)	(0.196)	(0.197)	(0.211)
EL	0.085	0.085	0.428	0.425	0.419	-0.359
	(0.245)	(0.245)	(0.274)	(0.326)	(0.327)	(0.267)
ES	-0.234	-0.229	-0.157	0.442**	0.422*	0.181
	(0.198)	(0.199)	(0.215)	(0.170)	(0.171)	(0.189)
FI	0.047	0.052	0.306	0.409+	0.391+	-0.177
	(0.233)	(0.233)	(0.227)	(0.209)	(0.211)	(0.215)
FR	-0.143	-0.141	0.003	0.427**	0.412*	0.074
	(0.203)	(0.204)	(0.199)	(0.163)	(0.164)	(0.182)
HU	-0.042	-0.033	-0.402	-0.025	-0.091	0.206
	(0.339)	(0.341)	(0.311)	(0.312)	(0.309)	(0.310)
IE	-0.591*	-0.595*	0.130	0.613*	0.616*	-0.090
	(0.289)	(0.289)	(0.267)	(0.260)	(0.260)	(0.270)
IL	-0.087	-0.082	0.146	0.355+	0.329+	0.007
	(0.209)	(0.210)	(0.212)	(0.185)	(0.187)	(0.191)
IT	-0.379*	-0.375*	0.082	0.305+	0.290+	0.248
	(0.188)	(0.188)	(0.216)	(0.166)	(0.168)	(0.194)
NL	-0.207	-0.195	0.036	0.422*	0.379*	0.083
	(0.196)	(0.197)	(0.210)	(0.166)	(0.168)	(0.186)
NO	0.203	0.219	0.137	0.616**	0.565*	0.014
	(0.269)	(0.269)	(0.307)	(0.232)	(0.235)	(0.272)
PL	0.352	0.350	0.101	-0.114	-0.119	-0.048
	(0.352)	(0.353)	(0.391)	(0.275)	(0.278)	(0.370)
PT	-0.260	-0.260	0.140	0.392	0.387	-0.145
	(0.286)	(0.286)	(0.306)	(0.294)	(0.295)	(0.251)
SE	-0.077	-0.074	-0.059	0.702***	0.682***	0.042
	(0.223)	(0.224)	(0.219)	(0.186)	(0.187)	(0.196)
UK	-0.022	-0.018	0.096	0.541***	0.524**	0.191
	(0.179)	(0.180)	(0.194)	(0.155)	(0.156)	(0.179)

Intercept	-2.845***	-2.855***	-3.272***	-3.017***	-2.995***	-2.312***
	(0.264)	(0.265)	(0.285)	(0.221)	(0.222)	(0.220)
N	10208	10208	6953	10182	10182	6953
Pseudo R2	0.173	0.173	0.166	0.203	0.205	0.161
Wald chi2	499***	489***	587***	942***	866***	1038***
Advanced						
Success	-0.162*	-0.151+	-0.089	0.374***	0.352***	0.165**
	(0.073)	(0.083)	(0.064)	(0.067)	(0.077)	(0.058)
After	0.100	0.128	-0.047	-0.078	-0.081	-0.100
	(0.084)	(0.103)	(0.075)	(0.078)	(0.098)	(0.066)
Success *	-0.140	-0.155	-0.008	0.074	0.044	0.075
After	(0.102)	(0.113)	(0.093)	(0.094)	(0.107)	(0.082)
ln(pubs)	0.691***	0.698***	0.580***	0.883***	0.876***	0.724***
	(0.044)	(0.045)	(0.034)	(0.041)	(0.042)	(0.029)
Female	0.103	0.099	-0.103	-0.048	-0.047	-0.152*
	(0.103)	(0.103)	(0.080)	(0.094)	(0.094)	(0.065)
PANEL						
LS02	0.844***	0.837***	0.622**	0.919***	0.926***	0.669***
	(0.229)	(0.229)	(0.185)	(0.209)	(0.207)	(0.139)
LS03	0.305	0.302	0.166	0.558*	0.559*	0.214
	(0.246)	(0.249)	(0.203)	(0.244)	(0.244)	(0.134)
LS04	0.022	0.014	0.259	0.510*	0.522*	0.629***
	(0.247)	(0.246)	(0.199)	(0.205)	(0.203)	(0.138)
LS05	0.411+	0.403+	0.292	0.364*	0.376*	0.175
	(0.219)	(0.219)	(0.196)	(0.175)	(0.174)	(0.130)
LS06	0.320	0.312	0.126	0.557**	0.564**	0.414**
	(0.230)	(0.229)	(0.197)	(0.186)	(0.184)	(0.131)
LS07	0.897***	0.888***	0.766***	0.400*	0.412*	0.107
	(0.208)	(0.209)	(0.173)	(0.184)	(0.182)	(0.125)
LS08	0.911***	0.915***	0.978***	0.738***	0.730**	-0.060
	(0.228)	(0.228)	(0.180)	(0.209)	(0.210)	(0.131)
LS09	0.892***	0.910***	0.405*	0.517*	0.490*	-0.002
	(0.246)	(0.246)	(0.200)	(0.238)	(0.240)	(0.149)
PE01	1.123***	1.126***	1.123***	0.416*	0.415*	0.012
	(0.213)	(0.214)	(0.177)	(0.184)	(0.182)	(0.129)
PE02	0.596**	0.594**	0.548**	0.662**	0.669**	0.169
	(0.213)	(0.213)	(0.179)	(0.199)	(0.198)	(0.130)
PE03	0.124	0.116	0.122	0.089	0.098	-0.047
	(0.222)	(0.221)	(0.188)	(0.182)	(0.179)	(0.128)
PE04	0.368	0.371	0.506**	-0.054	-0.063	-0.339*
	(0.255)	(0.256)	(0.186)	(0.227)	(0.226)	(0.136)
PE05	0.629**	0.618**	0.484**	0.027	0.043	-0.424**
	(0.193)	(0.193)	(0.176)	(0.184)	(0.182)	(0.126)
PE06	1.088***	1.087***	1.029***	0.652**	0.648**	0.075
	(0.248)	(0.249)	(0.193)	(0.219)	(0.221)	(0.147)
PE07	1.205***	1.202***	0.909***	0.237	0.236	-0.216
	(0.230)	(0.230)	(0.190)	(0.240)	(0.239)	(0.146)
PE08	1.109***	1.110***	1.273***	0.006	0.001	-0.298*
	(0.205)	(0.204)	(0.179)	(0.182)	(0.181)	(0.133)
PE09	0.620**	0.603**	0.651**	0.458*	0.478*	0.212
	(0.230)	(0.230)	(0.189)	(0.196)	(0.194)	(0.149)
PE10	0.416+	0.423*	0.537**	0.546**	0.535**	0.112
	(0.213)	(0.215)	(0.186)	(0.192)	(0.191)	(0.130)
SH01	1.159***	1.173***	0.647**	0.315	0.285	0.086
	(0.261)	(0.262)	(0.219)	(0.203)	(0.201)	(0.160)
SH02	0.823*	0.818*	0.936***	0.729**	0.735**	0.528**
	(0.341)	(0.346)	(0.239)	(0.247)	(0.244)	(0.160)
SH03	1.219***	1.210***	1.343***	0.256	0.265	0.071
	(0.305)	(0.307)	(0.245)	(0.289)	(0.283)	(0.260)

SH04	0.952***	0.947***	0.984***	0.215	0.218	-0.096
	(0.221)	(0.222)	(0.193)	(0.202)	(0.202)	(0.152)
SH05	1.833**	1.871**	0.000***	0.194	0.133	-0.009
	(0.613)	(0.610)	((empty))	(0.516)	(0.522)	(0.553)
SH06	0.144	0.163	0.635*	0.875**	0.882**	0.605**
	(0.314)	(0.320)	(0.322)	(0.267)	(0.267)	(0.191)
CALL_YEAR						
2009	0.181	0.172	0.065	0.061	0.076	0.010
	(0.135)	(0.135)	(0.084)	(0.124)	(0.125)	(0.077)
2010	-0.050	-0.053	-0.085	-0.107	-0.103	0.111
	(0.139)	(0.138)	(0.082)	(0.121)	(0.122)	(0.075)
2011	-0.017	-0.022	0.004	-0.195+	-0.189	-0.008
	(0.121)	(0.122)	(0.081)	(0.114)	(0.115)	(0.074)
2012	0.019	0.014	-0.074	-0.105	-0.101	0.027
	(0.109)	(0.109)	(0.075)	(0.100)	(0.101)	(0.068)
2013	0.087	0.083	-0.150+	0.082	0.086	0.075
	(0.115)	(0.115)	(0.081)	(0.105)	(0.106)	(0.071)
COUNTRY						
AT	-0.567*	-0.541+	-0.626*	0.545+	0.513+	-0.005
	(0.280)	(0.278)	(0.250)	(0.300)	(0.306)	(0.236)
BE	-0.456	-0.435	-0.189	0.836**	0.820**	0.005
	(0.300)	(0.299)	(0.233)	(0.305)	(0.309)	(0.237)
CH	-0.431*	-0.390+	-0.151	0.697**	0.639*	0.113
	(0.213)	(0.216)	(0.207)	(0.244)	(0.248)	(0.206)
DE	-0.531**	-0.514*	-0.289	0.369	0.348	0.038
	(0.203)	(0.204)	(0.200)	(0.240)	(0.243)	(0.200)
DK	0.044	0.056	-0.186	0.234	0.217	0.244
	(0.261)	(0.262)	(0.239)	(0.277)	(0.278)	(0.239)
EL	-0.571*	-0.573*	-0.162	0.047	0.062	-0.350
	(0.265)	(0.264)	(0.306)	(0.337)	(0.340)	(0.302)
ES	-0.660**	-0.645**	-0.303	0.389	0.373	-0.137
	(0.209)	(0.210)	(0.219)	(0.260)	(0.264)	(0.216)
FI	-0.862***	-0.792**	-0.342	0.239	0.144	0.105
	(0.237)	(0.238)	(0.247)	(0.278)	(0.277)	(0.245)
FR	-0.143	-0.120	-0.185	0.266	0.236	0.009
	(0.197)	(0.198)	(0.202)	(0.237)	(0.240)	(0.201)
HU	-0.230	-0.241	-0.426	-0.175	-0.134	-0.071
	(0.482)	(0.481)	(0.358)	(0.288)	(0.290)	(0.302)
IE	-0.843*	-0.853*	-0.191	1.123**	1.146**	0.652+
	(0.398)	(0.396)	(0.353)	(0.336)	(0.338)	(0.343)
IL	-0.600*	-0.574*	-0.469*	0.491+	0.457+	-0.085
	(0.236)	(0.237)	(0.219)	(0.268)	(0.272)	(0.212)
IT	-0.648**	-0.631**	-0.443*	0.527*	0.511*	0.069
	(0.199)	(0.200)	(0.214)	(0.243)	(0.246)	(0.205)
NL	-0.674**	-0.650**	-0.173	0.548*	0.523*	0.049
	(0.214)	(0.216)	(0.210)	(0.260)	(0.263)	(0.206)
NO	-0.731*	-0.728*	-0.495+	0.288	0.293	0.177
	(0.311)	(0.311)	(0.282)	(0.295)	(0.297)	(0.270)
PL	0.048	0.047	-0.565	0.315	0.317	-0.616
	(0.307)	(0.307)	(0.439)	(0.360)	(0.362)	(0.412)
PT	-0.999*	-1.004*	-1.112**	0.140	0.152	-0.257
	(0.420)	(0.420)	(0.410)	(0.342)	(0.344)	(0.325)
SE	-0.347	-0.326	-0.339	0.466+	0.430	-0.093
	(0.225)	(0.226)	(0.227)	(0.264)	(0.267)	(0.219)
UK	-0.440*	-0.409*	-0.319	0.679**	0.638**	0.144
	(0.194)	(0.196)	(0.197)	(0.232)	(0.236)	(0.196)
Intercept	-3.269***	-3.282***	-2.990***	-3.970***	-3.988***	-2.557***
	(0.268)	(0.271)	(0.273)	(0.297)	(0.301)	(0.242)
N	6408	6408	5103	6408	6408	5116

Pseudo R2	0.205	0.206	0.168	0.294	0.296	0.204
Wald chi2	454***	449***	572***	1104***	1055***	1063***

Table S3A: Split sample by whether having top cited publications in the pre period, Selection

	Have top cited publications in the pre period			*No top cited publications in the pre period*		
	Overall Success Probit	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**
	(1)	(2)	(3)	(4)	(5)	(6)
All						
I(Top Novel)	-0.165*	-0.182+	-0.064	-0.209***	-0.134*	-0.203**
	(0.071)	(0.096)	(0.070)	(0.056)	(0.065)	(0.073)
N	3357	3343	2837	5331	5331	3532
Pseudo R2	0.061	0.088	0.033	0.085	0.114	0.024
Wald chi2	190***	155***	112***	518***	447***	101***
Early career						
I(Top Novel)	-0.180+	-0.198+	-0.119	-0.280***	-0.195*	-0.303**
	(0.094)	(0.119)	(0.116)	(0.070)	(0.077)	(0.105)
N	1766	1756	1429	3510	3510	2178
Pseudo R2	0.097	0.126	0.041	0.090	0.101	0.039
Wald chi2	183***	165***	61+	394***	323***	91***
Advanced						
I(Top Novel)	-0.187+	-0.203	-0.075	-0.165+	-0.082	-0.127
	(0.099)	(0.134)	(0.088)	(0.096)	(0.120)	(0.100)
N	1571	1573	1381	1821	1821	1354
Pseudo R2	0.050	0.066	0.034	0.082	0.117	0.024
Wald chi2	81**	71*	60	174***	167***	43

Note: This table splits the sample by whether the applicant has top cited publications and then replicates Table 1 for each subsample. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S3B: Split sample by whether having top cited publications in the pre period, Treatment

	I(Top Novel) Probit			
	Have top cited publications in the pre period		*No top cited publications in the pre period*	
	Overall	Stage 2	Overall	Stage 2
	(1)	(2)	(3)	(4)
All				
Success	-0.209**	-0.147*	-0.286***	-0.169*
	(0.073)	(0.071)	(0.063)	(0.068)
After	-0.143	-0.198*	-0.020	-0.034
	(0.091)	(0.086)	(0.067)	(0.079)
Success * After	0.113	0.172+	0.120	0.139
	(0.105)	(0.100)	(0.088)	(0.096)
N	6352	5349	10052	6606
Pseudo R2	0.191	0.159	0.174	0.172
Wald Chi2	466***	602***	496***	562***
Early career				
Success	-0.236*	-0.192+	-0.352***	-0.261**
	(0.101)	(0.114)	(0.079)	(0.092)
After	-0.251*	-0.261+	-0.102	-0.133
	(0.125)	(0.141)	(0.082)	(0.114)
Success * After	0.264+	0.299+	0.274*	0.326*
	(0.147)	(0.159)	(0.110)	(0.134)
N	3393	2767	6671	4125
Pseudo R2	0.208	0.175	0.160	0.170
Wald Chi2	323***	321***	335***	325***
Advanced				
Success	-0.192+	-0.141	-0.193+	-0.062
	(0.103)	(0.087)	(0.106)	(0.095)
After	-0.028	-0.162	0.212*	0.083
	(0.126)	(0.104)	(0.108)	(0.107)
Success * After	-0.053	0.075	-0.213	-0.091
	(0.147)	(0.126)	(0.144)	(0.138)
N	2957	2582	3374	2481
Pseudo R2	0.193	0.153	0.240	0.184
Wald Chi2	274***	304***	313***	279***

Note: This table splits the sample by whether the applicant has top cited publications and then replicates Table 2 for each subsample. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S4A: Split sample by gender, Selection

	Female			*Male*		
	Overall Success Probit	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**
	(1)	(2)	(3)	(4)	(5)	(6)
All						
I(Top Novel)	-0.344**	-0.317**	-0.165	-0.158**	-0.115+	-0.115*
	(0.113)	(0.122)	(0.129)	(0.050)	(0.063)	(0.055)
I(Top Cited)	0.456***	0.420***	0.235*	0.460***	0.498***	0.205***
	(0.080)	(0.094)	(0.104)	(0.040)	(0.051)	(0.046)
N	1741	1747	1186	6941	6931	5182
Pseudo R2	0.140	0.164	0.075	0.101	0.134	0.025
Wald chi2	285***	269***	100***	707***	576***	157***
Early career						
I(Top Novel)	-0.184	-0.242+	0.113	-0.217***	-0.134+	-0.270**
	(0.128)	(0.133)	(0.159)	(0.062)	(0.074)	(0.087)
I(Top Cited)	0.434***	0.413***	0.180	0.484***	0.489***	0.247***
	(0.091)	(0.104)	(0.128)	(0.049)	(0.060)	(0.068)
N	1324	1331	864	3957	3951	2760
Pseudo R2	0.128	0.136	0.088	0.114	0.125	0.034
Wald chi2	201***	172***	97***	524***	446***	102***
Advanced						
I(Top Novel)	-0.840**	-0.511+	-0.774**	-0.101	-0.102	-0.025
	(0.248)	(0.280)	(0.230)	(0.074)	(0.100)	(0.068)
I(Top Cited)	0.640***	0.461*	0.507**	0.406***	0.495***	0.156*
	(0.181)	(0.216)	(0.183)	(0.064)	(0.085)	(0.062)
N	402	373	317	2980	2980	2418
Pseudo R2	0.238	0.294	0.168	0.082	0.110	0.020
Wald chi2	116***	114***	65*	253***	209***	64+

Note: This table splits the sample by applicant's gender and then replicates Table 1 for each subsample. All specifications include as controls: log number of publications, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S4B: Split sample by gender, Treatment

	I(Top Novel) Probit			
	Female		*Male*	
	Overall	Stage 2	Overall	Stage 2
	(1)	(2)	(3)	(4)
All				
Success	-0.259*	-0.246*	-0.231***	-0.144**
	(0.116)	(0.112)	(0.052)	(0.054)
After	0.010	-0.237	-0.079	-0.085
	(0.117)	(0.145)	(0.061)	(0.064)
Success * After	0.086	0.344*	0.101	0.104
	(0.155)	(0.171)	(0.074)	(0.076)
N	3359	2242	13227	9781
Pseudo R2	0.277	0.173	0.176	0.169
Wald Chi2	390***	211***	647***	1003***
Early career				
Success	-0.100	-0.103	-0.332***	-0.276**
	(0.130)	(0.132)	(0.069)	(0.083)
After	-0.045	-0.091	-0.172*	-0.194+
	(0.134)	(0.172)	(0.081)	(0.103)
Success * After	0.084	0.167	0.283**	0.319**
	(0.178)	(0.204)	(0.100)	(0.117)
N	2576	1651	7610	5278
Pseudo R2	0.257	0.203	0.173	0.166
Wald Chi2	321***	178***	382***	489***
Advanced				
Success	-0.382	-0.701**	-0.102	-0.032
	(0.250)	(0.212)	(0.077)	(0.067)
After	0.273	-0.568*	0.082	0.002
	(0.229)	(0.248)	(0.090)	(0.078)
Success * After	-0.017	0.781*	-0.150	-0.086
	(0.323)	(0.307)	(0.108)	(0.098)
N	700	518	5617	4503
Pseudo R2	0.449	0.235	0.191	0.166
Wald Chi2	179***	91***	379***	540***

Note: This table splits the sample by applicant's gender and then replicates Table 2 for each subsample. All specifications include as controls: log number of publications, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S5A: Split sample by field, Selection

	Life Sciences			*Physical Sciences and Engineering*			*Social Sciences and Humanities*		
	Overall Success Probit	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All									
I(Top Novel)	-0.307***	-0.296**	-0.183*	-0.148*	-0.125	-0.072	-0.093	0.035	-0.202
	(0.077)	(0.097)	(0.089)	(0.062)	(0.076)	(0.067)	(0.137)	(0.181)	(0.160)
I(Top Cited)	0.527***	0.576***	0.183**	0.410***	0.431***	0.209**	0.396**	0.292*	0.420**
	(0.056)	(0.071)	(0.067)	(0.051)	(0.064)	(0.060)	(0.119)	(0.146)	(0.138)
N	3361	3361	2438	4131	4131	3033	1194	1196	894
Pseudo R2	0.124	0.163	0.032	0.116	0.146	0.029	0.079	0.102	0.066
Wald chi2	439***	384***	96***	476***	329***	103***	101***	102***	67***
Early career									
I(Top Novel)	-0.264**	-0.226*	-0.245+	-0.214**	-0.145+	-0.226*	-0.031	-0.013	-0.097
	(0.094)	(0.115)	(0.145)	(0.077)	(0.086)	(0.099)	(0.171)	(0.205)	(0.246)
I(Top Cited)	0.546***	0.594***	0.180+	0.427***	0.421***	0.237**	0.427**	0.269	0.534**
	(0.067)	(0.082)	(0.096)	(0.063)	(0.075)	(0.085)	(0.148)	(0.174)	(0.196)
N	2024	2024	1359	2517	2517	1728	749	749	537
Pseudo R2	0.143	0.156	0.046	0.120	0.127	0.037	0.084	0.104	0.078
Wald chi2	333***	278***	70***	339***	247***	65**	78***	81***	47*
Advanced									
I(Top Novel)	-0.331**	-0.347*	-0.157	-0.119	-0.147	0.010	-0.086	0.330	-0.369+
	(0.117)	(0.153)	(0.110)	(0.098)	(0.130)	(0.089)	(0.219)	(0.288)	(0.223)
I(Top Cited)	0.466***	0.513***	0.200*	0.353***	0.415***	0.151+	0.452*	0.465+	0.314
	(0.094)	(0.122)	(0.092)	(0.087)	(0.114)	(0.084)	(0.194)	(0.256)	(0.206)
N	1331	1337	1073	1614	1614	1305	435	426	352
Pseudo R2	0.102	0.156	0.027	0.119	0.141	0.035	0.108	0.149	0.085
Wald chi2	160***	156***	37	204***	165***	62**	61***	71***	37

Note: This table splits the sample by field and then replicates Table 1 for each subsample. All specifications include as controls: log number of publications, gender, country dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S5B: Split sample by field, Treatment

	I(Top Novel) Probit					
	Life Sciences		*Physical Sciences and Engineering*		*Social Sciences and Humanities*	
	Overall	Stage 2	Overall	Stage 2	Overall	Stage 2
	(1)	(2)	(3)	(4)	(5)	(6)
All						
Success	-0.329***	-0.148+	-0.199**	-0.146*	-0.157	-0.240+
	(0.078)	(0.083)	(0.065)	(0.066)	(0.149)	(0.144)
After	-0.154+	-0.094	-0.030	-0.088	0.157	-0.195
	(0.088)	(0.098)	(0.077)	(0.077)	(0.157)	(0.188)
Success * After	0.091	0.032	0.093	0.153+	0.013	0.321
	(0.112)	(0.118)	(0.093)	(0.091)	(0.196)	(0.218)
N	6418	4593	7855	5721	2300	1664
Pseudo R2	0.210	0.193	0.176	0.137	0.302	0.209
Wald Chi2	318***	435***	480***	598***	176***	160***
Early career						
Success	-0.361**	-0.207	-0.275**	-0.282**	-0.206	-0.106
	(0.104)	(0.128)	(0.083)	(0.095)	(0.197)	(0.208)
After	-0.245*	-0.222	-0.122	-0.212+	0.112	0.153
	(0.116)	(0.160)	(0.098)	(0.116)	(0.194)	(0.256)
Success * After	0.195	0.203	0.280*	0.385**	0.049	0.009
	(0.150)	(0.183)	(0.120)	(0.133)	(0.259)	(0.295)
N	3904	2595	4832	3305	1400	973
Pseudo R2	0.189	0.195	0.170	0.140	0.334	0.224
Wald Chi2	180***	204***	293***	324***	149***	108***
Advanced						
Success	-0.265*	-0.113	-0.113	-0.023	-0.019	-0.388+
	(0.116)	(0.104)	(0.104)	(0.088)	(0.228)	(0.205)
After	0.032	0.004	0.160	0.021	0.125	-0.730**
	(0.133)	(0.121)	(0.120)	(0.102)	(0.246)	(0.279)
Success * After	-0.127	-0.110	-0.215	-0.084	0.068	0.841*
	(0.167)	(0.155)	(0.145)	(0.127)	(0.312)	(0.332)
N	2500	1978	3003	2410	848	640
Pseudo R2	0.241	0.193	0.202	0.133	0.340	0.285
Wald Chi2	240***	238***	270***	288***	125***	125***

Note: This table splits the sample by field and then replicates Table 2 for each subsample. All specifications include as controls: log number of publications, gender, country dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S6A: Different citation time windows, Selection

	Citations up to 2021			*3-year citations*		
	Overall Success Probit	**Stage 1 Success Probit**	**Stage 2 Success Probit**	**Overall Success Probit**	**Stage 1 Success Probit**	**Stage 2 Success Probit**
	(1)	(2)	(3)	(4)	(5)	(6)
All						
I(Top Novel)	-0.204***	-0.175**	-0.125*	-0.199***	-0.167**	-0.124*
	(0.046)	(0.057)	(0.050)	(0.046)	(0.056)	(0.050)
I(Top Cited)	0.417***	0.452***	0.168***	0.446***	0.439***	0.245***
	(0.036)	(0.045)	(0.041)	(0.035)	(0.044)	(0.042)
N	8688	8688	6369	8688	8688	6369
Pseudo R2	0.101	0.133	0.023	0.103	0.133	0.025
Wald chi2	867***	638***	170***	895***	633***	183***
Early career						
I(Top Novel)	-0.246***	-0.202**	-0.206**	-0.233***	-0.189**	-0.198*
	(0.056)	(0.065)	(0.078)	(0.056)	(0.065)	(0.078)
I(Top Cited)	0.471***	0.515***	0.168**	0.481***	0.467***	0.248***
	(0.043)	(0.052)	(0.059)	(0.043)	(0.051)	(0.060)
N	5290	5290	3627	5290	5290	3627
Pseudo R2	0.111	0.124	0.028	0.112	0.121	0.031
Wald chi2	681***	537***	103***	686***	505***	108***
Advanced						
I(Top Novel)	-0.165*	-0.151	-0.084	-0.172*	-0.155+	-0.089
	(0.071)	(0.094)	(0.065)	(0.071)	(0.094)	(0.065)
I(Top Cited)	0.348***	0.362***	0.169**	0.400***	0.398***	0.245***
	(0.061)	(0.081)	(0.056)	(0.060)	(0.080)	(0.058)
N	3398	3398	2742	3398	3398	2742
Pseudo R2	0.084	0.108	0.022	0.087	0.111	0.025
Wald chi2	292***	225***	79*	313***	241***	88**

Note: This table replicates Table 1 but used different citation time windows for identifying the top 1% highly cited publications. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S6B: Different citation time windows, Treatment

	I(Top 1% Cited): 3 Year Probit	
	Overall	Stage 2
	(1)	(2)
All		
Success	0.502***	0.272***
	(0.041)	(0.043)
After	-0.113*	-0.119*
	(0.049)	(0.052)
Success * After	-0.058	-0.052
	(0.059)	(0.061)
N	16616	12056
Pseudo R2	0.239	0.211
Wald Chi2	1566***	2204***
Early career		
Success	0.541***	0.304***
	(0.051)	(0.061)
After	-0.102+	-0.141+
	(0.061)	(0.079)
Success * After	-0.098	-0.057
	(0.074)	(0.089)
N	10208	6953
Pseudo R2	0.214	0.194
Wald Chi2	901***	1240***
Advanced		
Success	0.437***	0.233***
	(0.067)	(0.060)
After	-0.122	-0.089
	(0.078)	(0.068)
Success * After	0.017	-0.034
	(0.094)	(0.084)
N	6392	5103
Pseudo R2	0.295	0.228
Wald Chi2	921***	1073***

Note: This table replicates Table 2 but used different citation time windows for identifying the top 1% highly cited publications. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S7A: Top 5% Novel, Selection

	Overall Success Probit	Stage 1 Success Probit	Stage 2 Success Probit
	(1)	(2)	(3)
All			
I(Top 5% Novel)	-0.162***	-0.192***	-0.022
	(0.033)	(0.041)	(0.043)
I(Top 1% Cited)	0.453***	0.479***	0.210***
	(0.035)	(0.045)	(0.043)
N	8688	8688	6369
Pseudo R2	0.104	0.137	0.023
Wald chi2	917***	686***	170***
Early career			
I(Top 5% Novel)	-0.176***	-0.178***	-0.077
	(0.040)	(0.047)	(0.060)
I(Top 1% Cited)	0.474***	0.475***	0.229***
	(0.043)	(0.052)	(0.061)
N	5290	5290	3627
Pseudo R2	0.112	0.122	0.029
Wald chi2	689***	534***	103***
Advanced			
I(Top 5% Novel)	-0.148*	-0.244**	0.056
	(0.059)	(0.077)	(0.059)
I(Top 1% Cited)	0.418***	0.474***	0.190**
	(0.060)	(0.080)	(0.058)
N	3398	3398	2742
Pseudo R2	0.088	0.118	0.022
Wald chi2	311***	255***	79**

Note: This table replicates Table 1 but uses whether the applicant has top 5% novel publications instead of top 1% novel publications. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S7B: Top 5% Novel, Treatment

	I(Top 5% Novel) Probit	
	Overall	Stage 2
	(1)	(2)
All		
Success	-0.197***	-0.054
	(0.039)	(0.042)
After	-0.061	0.008
	(0.044)	(0.050)
Success * After	0.025	-0.043
	(0.054)	(0.059)
N	16616	12087
Pseudo R2	0.195	0.225
Wald chi2	1160***	2531***
Early career		
Success	-0.225***	-0.095
	(0.048)	(0.060)
After	-0.071	0.044
	(0.054)	(0.073)
Success * After	0.092	-0.026
	(0.067)	(0.084)
N	10208	6971
Pseudo R2	0.168	0.203
Wald chi2	654***	1381***
Advanced		
Success	-0.182**	0.011
	(0.066)	(0.059)
After	-0.032	-0.035
	(0.075)	(0.068)
Success * After	-0.078	-0.083
	(0.090)	(0.084)
N	6408	5116
Pseudo R2	0.253	0.245
Wald chi2	666***	1134***

Note: This table replicates Table 2 but uses whether the applicant has top 5% novel publications instead of top 1% novel publications. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S8A: Atypicality, Selection

	Overall Success Probit	Stage 1 Success Probit	Stage 2 Success Probit	Overall Success Probit	Stage 1 Success Probit	Stage 2 Success Probit
	(1)	(2)	(3)	(4)	(5)	(6)
All						
I(Top 1% Atypical)	-0.157**	-0.171**	-0.060			
	(0.047)	(0.058)	(0.051)			
Atypicality Avg				0.021+	0.017	0.014
				(0.012)	(0.014)	(0.016)
I(Top 1% Cited)	0.457***	0.483***	0.211***	0.460***	0.485***	0.210***
	(0.035)	(0.045)	(0.043)	(0.035)	(0.045)	(0.043)
N	8688	8688	6369	8688	8688	6369
Pseudo R2	0.103	0.135	0.023	0.102	0.134	0.023
Wald Chi2	889***	668***	172***	876***	646***	172***
Early career						
I(Top 1% Atypical)	-0.152*	-0.121+	-0.116			
	(0.059)	(0.065)	(0.079)			
Atypicality Avg				0.023+	0.018	0.015
				(0.014)	(0.016)	(0.021)
I(Top 1% Cited)	0.477***	0.479***	0.231***	0.484***	0.485***	0.229***
	(0.043)	(0.052)	(0.061)	(0.043)	(0.052)	(0.061)
N	5290	5290	3627	5290	5290	3627
Pseudo R2	0.110	0.120	0.029	0.110	0.120	0.028
Wald Chi2	677***	516***	103***	676***	513***	103***
Advanced						
I(Top 1% Atypical)	-0.186*	-0.245*	-0.033			
	(0.072)	(0.095)	(0.066)			
Atypicality Avg				0.017	0.016	0.017
				(0.022)	(0.027)	(0.022)
I(Top 1% Cited)	0.424***	0.481***	0.191**	0.423***	0.476***	0.190**
	(0.060)	(0.080)	(0.058)	(0.061)	(0.080)	(0.058)
N	3398	3398	2742	3398	3398	2742
Pseudo R2	0.088	0.116	0.022	0.085	0.113	0.022
Wald Chi2	311***	251***	78*	301***	242***	78*

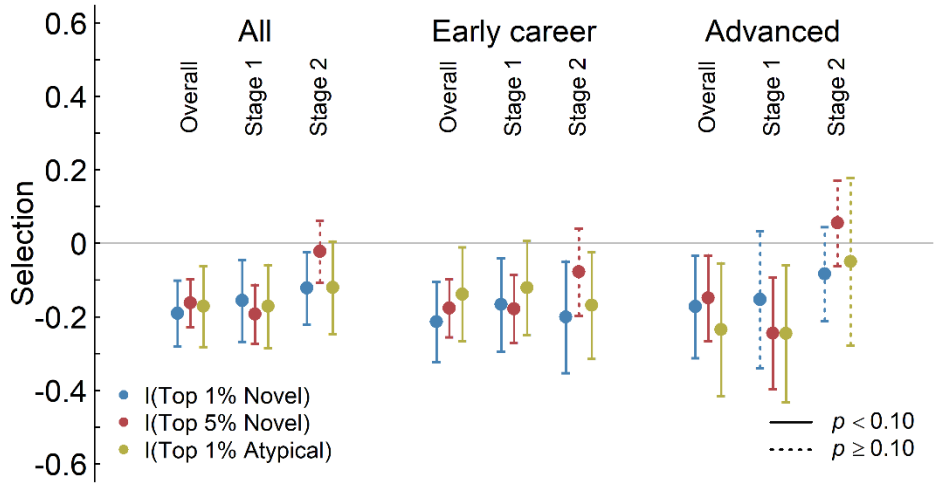
Note: This table replicates Table 1 but uses atypicality measures instead of the novelty measure. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Table S8B: Atypicality, Treatment

	I(Top 1% Atypical) Probit		Atypicality Avg OLS	
	Overall	Stage 2	Overall	Stage 2
	(1)	(2)	(3)	(4)
All				
Success	-0.156**	-0.094+	0.055	0.021
	(0.048)	(0.048)	(0.035)	(0.040)
After	-0.022	-0.017	0.271***	0.230***
	(0.052)	(0.055)	(0.041)	(0.047)
Success * After	0.081	0.075	-0.129**	-0.091+
	(0.064)	(0.067)	(0.049)	(0.054)
N	16616	12056	16616	12087
(Pseudo) R2	0.125	0.112	0.477	0.523
Wald Chi2	676***	914***		
F			114***	166***
Early career				
Success	-0.146*	-0.173*	0.056	-0.002
	(0.063)	(0.071)	(0.044)	(0.057)
After	0.043	-0.052	0.278***	0.188**
	(0.066)	(0.082)	(0.050)	(0.068)
Success * After	0.049	0.137	-0.132*	-0.052
	(0.085)	(0.098)	(0.061)	(0.077)
N	10208	6953	10208	6971
(Pseudo) R2	0.119	0.105	0.488	0.521
Wald Chi2	444***	471***		
F			77***	97***
Advanced				
Success	-0.200**	-0.019	0.059	0.041
	(0.076)	(0.065)	(0.060)	(0.053)
After	-0.146+	0.010	0.262***	0.277***
	(0.081)	(0.073)	(0.069)	(0.059)
Success * After	0.172+	0.019	-0.116	-0.134+
	(0.099)	(0.091)	(0.080)	(0.071)
N	6392	5103	6408	5116
(Pseudo) R2	0.146	0.115	0.487	0.552
Wald Chi2	346***	461***		
F			53***	91***

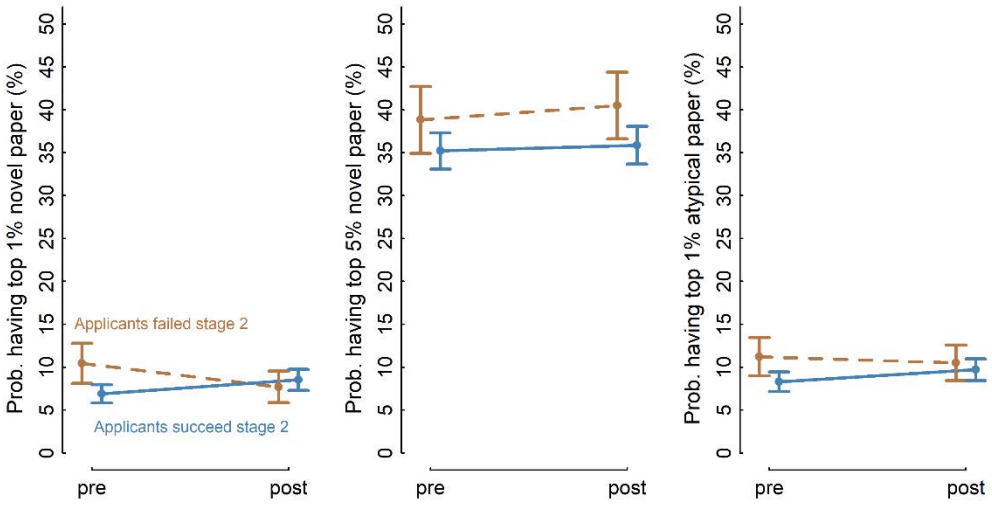
Note: This table replicates Table 2 but uses atypicality measures instead of the novelty measure. All specifications include as controls: log number of publications, gender, country dummies, panel dummies, and call year dummies. Total sample analysis (i.e., "All") additional controls for career stage (early career vs. advanced). *** p<.001, ** p<.01, * p<.05, + p<.10.

Figure S.1: Funding selection on risk-taking: novelty vs. atypicality.



Plots are marginal effects of the focal *high-risk* variable (i.e., having top 1% novel publications, having top 5% novel publications, having top 1% atypical publications) on selection success (i.e., overall, stage 1, and stage 2 success). In other words, coefficients of *I*(*Top Novel*) in Table 1 Column 2-4 and coefficients of *I*(*Top 5% Atypical*) in Table S7A, and *I*(*Top 1% Atypical*) in Table S8A Column 1-3. Vertical lines mark the confidence interval. Solid lines are significant at 0.10, while broken lines are insignificant at this level.

Figure S.2: Funding treatment on risk-taking for early career applicants: novelty vs. atypicality.



Plots are estimated probability of having top novel or atypical publications in pre- and post-application periods, for early-career applicants who failed stage 2 and early-career applicants succeeded stage 2 (i.e., grantees). Estimates are based on regressions reported in the early career sections of Table 2 Column 2, Table S7B Column 2, and Table S8B Column 2. Vertical lines mark the confidence interval.