

On the Relationship between Peer Review-based Selection Decisions in Individual Research Funding and Applicants' Publication Performance: The Case of the ERC Starting Grants¹

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Abstract

This paper investigates funding decisions' dependence on past publication performance amongst applicants for the European Research Council's (ERC) Starting Grants Program (StG). Additionally, publication data will be contrasted with the assessment of StG applicants in terms of the ERC application/evaluation process and individual publication strategies generated by an online survey. The empirical results will be discussed against the background of studies on similar funding schemes for young scientists (BIF: Bornmann, 2007; MAGW/EMBO: Bornmann & *al.*, 2010; INGVAR: Melin & Danell 2006, and especially the ENP: Hornbostel & *al.*, 2009; Neufeld & v. Ins, 2011). Most of these evaluation studies focus on the respective peer review system by bibliometrically investigating its ability to select the "best" applicants for funding while coming to different results. However, an overview of the studies reveals that potential differences in the past publication performance between approved and rejected applicants not only depend on selection decisions (or the peer review) but also on further program-specific factors such as finiteness/openness of the overall budget and the level of self- or "pre-selection" amongst potential applicants. Since the ERC StG is a highly prestigious international funding program with demanding eligibility requirements and low acceptance rates, it constitutes a unique example case for further investigating these issues.

Introduction

In our STI conference paper we will deliver first empirical results from the bibliometric analyses and the online survey conducted in the MERCI project (Monitoring European Research Council's Implementation of Excellence). MERCI is an ongoing evaluation study which aims to assess the "Starting Grants" (StG) funding line of the European Research Council (ERC), one of the most prestigious programs for young scientists (see Textbox 1). Given the fact that the StG program is such a substantial instrument—about 50 percent of the ERC's annual budget is intended for this program—the ERC is highly interested in evaluating whether the funding scheme succeeds in attracting excellent up-and-coming young researchers from all over the world.

¹ Our study is part of MERCI (Monitoring European Research Council's Implementation of Excellence), which is funded by the European Commission as a CSA-project (co-ordination and support action) for the European Research Council through the Seventh Framework Programme (FP7-IDEAS, 2007-2013).

Textbox 1. The ERC Starting Grants in brief.

The ERC Starting Grants (implemented in 2007)

Eligibility requirements

- PhD received between two and twelve years prior to the opening date of a StG call
- promising track record including one important publication without the participation of their PhD supervisor
- significant publications (as main author) in major international peer-reviewed scientific journals
- presentations at well-established international conferences, granted patents, awards, prizes etc.
- excellent research proposal (2007: initial short abstract, since 2009: initial full proposal)

Funding

- up to €1.5 million (in some circumstances up to €2 million) per grant
- Duration: up to 5 years

Acceptance rates

- 2007 call: 3 percent
- 2009 call: 10 percent
- 2010 call: 16 percent
- 2011 call: 12 percent

Source: <http://erc.europa.eu/starting-grants> [02-29-2012]

Within the framework of MERCI's triangulation approach (bibliometric analysis, semi-structured interviews and an online panel survey) a bibliometric analysis is conducted in order to provide information about the level of funded applicants' publication performance – both in comparison with that of not funded applicants and with international standards (e.g. in terms of discipline specifics). Comparable evaluation studies of funding schemes providing individual research grants usually introduce bibliometric indicators as objective and reliable measures of individual applicants' peer reviewed scientific output which are capable of answering the question whether the “best” applicants were selected for funding (cf. Bornmann & *al.*, 2008; Campbell & *al.*, 2010). For example, while investigating the publication performance of applicants to the section Social and Behavioral Sciences of the Dutch Organization for Scientific Research [NOW], (MAGW) van den Besselaar & Leydesdorff (2009) and Bornmann & *al.* (2010) found a higher average number of publications and citations for the group of approved applicants than for the rejected applicants. This difference is ascribed to a lack of “low performers” amongst the group of funded applicants. The authors argue that the selection mechanism is able to identify and discard “[...] the tail of the distribution. However, within the top half of the distribution, neither the review outcomes nor past-performance measures correlate positively with the decisions of the council (v. d. Besselaar and Leydesdorff 2009, p. 285).

Melin und Danell (2006) give an example of a highly selective program in their investigation of the publication performance of applicants for the Individual Grant for the Advancement of Research Leaders (INGVAR) provided by the Swedish Foundation for Strategic Research (SSF). The authors compared applicants who reached the final stage of the selection process (top eight

percent) of which half went on to receive funding (success rate of 4 percent). In terms of productivity measures (whole and fractional counting), there were no great differences between both groups—in fact, rejected applicants on average show slightly higher values. However, regarding a normalized² journal impact factor, approved applicants outperform their rejected counterparts.

For the case of the Emmy Noether-Program (ENP, German Research Foundation), Neufeld and v. Ins (2011) reveal rather small differences between the groups of funded and not funded applicants. They argue that the relative indiscriminate nature of both groups to a certain point depends on the selectivity of the program (expressed in the eligibility requirements), on the performance level in the addressed target group, and consequently, on the level of self- or “pre”-selection amongst potential applicants. If nearly all applicants show ‘sufficient’ past publication performance—i.e. the distribution of performance indicator values amongst *all* applicants lacks “low performers”—other criteria become effective and funding decisions become bibliometrically ‘invisible’. Certainly the ‘quality of the proposal’ is supposed to play an important role in this regard, but further factors also have to be taken into account.

Within the framework of our multi-method approach, we will therefore systematically bring together results of the bibliometric analysis and the online survey. This will allow us to control for a wider range of third variables (such as socio-demographic variables, teaching activities, visits abroad, and personal publication strategies) which might explain part of the variance in publication performance and funding decisions.

In the following section, we will describe the gathering and preparation of publication data, the publication and citation windows applied, as well as the chosen indicators for our bibliometric analysis. Furthermore, we give some background information about the MERCI online survey.

Data and Methods

Bibliometric data and indicators

A central eligibility requirement the ERC has established for the StG application consists of significant publications (as main author) in major international peer-reviewed scientific journals. On the general level, our bibliometric analyses aim at showing in how far this requirement is met by the applicants. On the individual level, we intend to find out whether a higher past publication performance is associated with a higher chance of success.

For the STI conference, we focus our bibliometric analyses on publication data of StG 2009 applicants. Due to the fact that the data protection regulations of the ERC are very strict, we are constrained to consider only those StG applicants for our study who accepted the transfer of their personal data. Of the 2009 StG cohort, 932 out of 2,513 applicants accepted this provision. As the Social Sciences and Humanities (SSH) are not sufficiently represented in the Web of Science (WoS) data base, we included only those (consenting) StG applicants whose proposals were assigned to the ERC panels of Life science (LS) and/or Physical sciences and Engineering (PE). Thus, our sample for the bibliometric analysis comprises 758 StG applicants in total (Table 1).

² The authors divided the relative journal impact factor (JIF) by the median JIF of the respective WoS journal category.

Table 1. Sample of ERC applicants for bibliometric studies (StG 2009 cohort).

StG 2009 Sample - MERCI Bibliometrie	Rejected	Funded	Total
Life science	268	55	323
Physical science and engineering	360	75	435
Total	628	130	758

Publications from the years 2003 to 2011 were searched in the WoS. To guarantee a high quality of data we chose a two-step validation process: In a first step a validation of the publications was conducted by the Institute of Science and Technology Studies Bielefeld (IWT)³—first and foremost in terms of the homonymy of authors’ names. In a second step, a fine-tuned validation procedure will be carried out by the StG applicants themselves via an online tool: Each applicant will be invited to check his/her publication list and to delete and/or add publications. This validation step is foreseen for April/May 2012. Based on experiences with this feature from our ENP evaluation, it can be assumed that this procedure will lead to a considerable improvement in data accuracy.

After this manual data cleaning process, related citations will be researched in the WoS. The publication window comprises the year of the call and the four preceding years. The citation window covers three years (year of publication and two subsequent years). Only documents of the WoS-type ‘article’ are to be included.

Publication performance is usually defined by the two dimensions, *output* and *impact*, whereas output is reflected by various methods of counting articles and impact is modelled by citation-based measures. In order to assess the StG applicant’s output and impact, the following indicators will be calculated: number of articles, fractional number of articles, and the number of first authorships (straight counts).

We chose the *number of citations* and the *field normalized* citation rate as measures of impact.

Although the StG program addresses *young* investigators, the selectivity of the program suggests the presence of highly cited papers amongst StG applicants. Thus, we consider the investigation of the number/share of publications in the top ten/top five percentile of cited papers worldwide.

The selection of indicators in this study is not exclusively oriented towards bibliometric adequacy but also reflects the approach to reconstruct bibliometrically the reviewers’ or the board’s funding decisions. This especially applies to the Journal Impact Factor (JIF) which is not seen as an objective measure for research performance. Nevertheless, it may correspond to the reviewers’ assessment of the prestige or ‘relevance’ of the journals an individual applicant has published in and hence may therefore influence reviewers’ overall judgment. The JIF is included in our analyses for these reasons alone.

³ The IWT Bielefeld is our MERCI cooperation partner for the bibliometric analysis.

Online survey

Studies dealing with the publication performance of applicants usually rely mainly on bibliometric data. In many cases there is no, or at best only some basic demographic information available about the individual applicants involved. Hence, the MERCI online panel (two waves and an intermediate survey) includes questions that directly address the applicants' personal background, teaching activities, visits abroad, publication habits and strategies as well as the further use of rejected StG proposals (discarding, revision, re-submission etc.). The first wave of the panel survey has already been implemented for the StG 2009 and StG 2010 cohorts. In order to systematically bring together the results of the bibliometric analysis and the online survey we refer to the StG 2009 cohort here. As mentioned above, only StG applicants who consented to the transfer of personal data could be contacted to participate in the survey. Of these 165 approved StG applicants, 111 participated in our survey (response rate of 68%); furthermore, 432 out of 766 rejected applicants took part in the survey (which is a response rate of 57%). Of the rejected respondents, 126 applied for a grant in the Life Sciences and a total of 146 applied in the Natural Sciences. The Engineering Sciences attracted a total of 76 applicants, while the Humanities and Social and Behavioural Sciences only saw a small amount of applicants (32 and 38, respectively). The composition is similar for the StGrantees in our sample. Of the 111 total respondents, 40 work in the field of Natural Sciences, 31 in Life Sciences, 15 in Engineering Sciences, 13 in Social and Behavioural Sciences and 11 in the Humanities. In table 2 the research fields are aggregated according to the ERC panels. Compared with a genuine bibliometric analysis, our online survey presents the opportunity to learn about personal publication strategies; that is, the preferences for publishing research findings and the perception of prevalent publication practices. All measures rely on self-reporting by the respondents.

Table 2. Sample of the online survey (StG 2009 cohort) by ERC Panels
Source: iFQ MERCI online survey.

Status of applicant	Social Sciences and Humanities	Life Sciences	Physical Science and Engineering ⁴	Missing	Total
rejected	67	126	222	17	432
approved	24	31	55	1	111
Total	91	157	277	18	543

Expected results

The preparation and validation of bibliometric data will be completed in May 2012 and, thus, first results will be available in summer 2012. In addition to the findings documented in literature and our own experience with the ENP evaluation, we can also rely on the online survey of the StG 2009 cohort carried out in autumn 2010.

From the studies mentioned above we conclude that the higher the self- or “pre-selection” amongst the whole group of applicants, the less distributions, means, and medians of bibliometric measures are expected to differ between approved and rejected applicants. What can be assumed at this stage about the extent of self-selection regarding the ERC starting grants? On the one hand, the

⁴ The classification of research fields in the MERCI online survey has been aggregated according to the ERC panels. Natural and Engineering Sciences are subsumed under “Physical Science and Engineering.”

demanding eligibility requirements are indicative for preventing “low performers” from applying. Even so, the high reputation of the funding scheme and the responsibility involved with a successful application may discourage potential candidates with an inferior track record more than others. Aside from that, the requirement that a full proposal has to be submitted for the first step of the ERC evaluation process constitutes another hurdle for a StG application.⁵ A further point which has to be taken into account is the low acceptance rate—amounting to 3 percent (StG 2007) and 16 percent (StG 2010)—caused by a capped budget. The relatively high risk of being rejected despite putting a great deal of effort into writing a full proposal speaks against an application.

Assuming that there are more high performing applicants than available budget, a significant number of high potentials can not be considered for funding. If the quality thresholds/judgments ex- or implicitly applied by reviewers are raised due to restricted resources and/or a category of “fundable, but not funded” applicants is explicitly distinguished, these applicants may raise the performance level of the rejected group.

On the other hand, the ERC StG program is internationally renowned and open for young scientists from all over the world. Thus, it may constitute a chance for young scientists with few funding alternatives in their country of origin to “try their luck” even if the StG application requirements are not comprehensively met.

In this context it is interesting to investigate whether the StG applicants attribute the ERC acceptance or rejection to the number of publications and the reputation of the journals in which they have published. Our analysis shows that successful applicants ascribe far more importance to their publication activities with regards to their acceptance to the ERC program than the rejected ones (cf. Table 3). However, the estimation of rejected applicants concerning the importance of publications varies to a much greater extent. For this reason, it seems more meaningful to consider the individual frequency distributions (information in valid percentages, cf. Figure 1). As expected, both groups tend to view publications and reputation of journals as an ‘important’ to ‘very important’ criterion for the StG application. Both rejected and accepted applicants allocate more importance to the reputation of the journals in which they have already published than to the number of publications. This trend is much more pronounced amongst the StGrantees: 3 out of 5 deem the reputation highly important.

Interestingly, nearly 38 percent of the rejected applicants think the number of publications or the reputation of the journal respectively is less or not important at all whereas in the group of successful applicants nearly no one shares this view. Assuming that the assessment of the importance publications may have for funding decisions correlates with the applicants’ actual performance, this finding would correspond very well to the “lack of low performers” which Bornmann & *al.* (2010) identified in terms of the rejected applicants of the MAGW program.

⁵ This requirement was established for the 2nd StG call in the year 2009. For the 1st call in 2007, a short description of the StG research project was requested. Due to the abundance of applications in the year 2007 (9,167 applications in total of which 299 were selected) and the corresponding management of applications, there was no StG call in the year 2008.

Table 3. Perceived influence of publication activities on evaluation of proposal (StG 2009).
Source: iFQ MERCI online survey.

Status of applicant		Number of publications	Reputation of journals	Reputation of coauthors
Rejected (N=323)	Mean	3.25	3.32	2.32
	Median	3.33	3.52	2.15
	Std. Deviation	1.44	1.54	1.22
Approved (N=86)	Mean	4.17	4.57	2.92
	Median	4.27	4.63	2.92
	Std. Deviation	0.87	0.68	1.03
Mann-Whitney U Test (p-value)		0.000	0.000	0.000

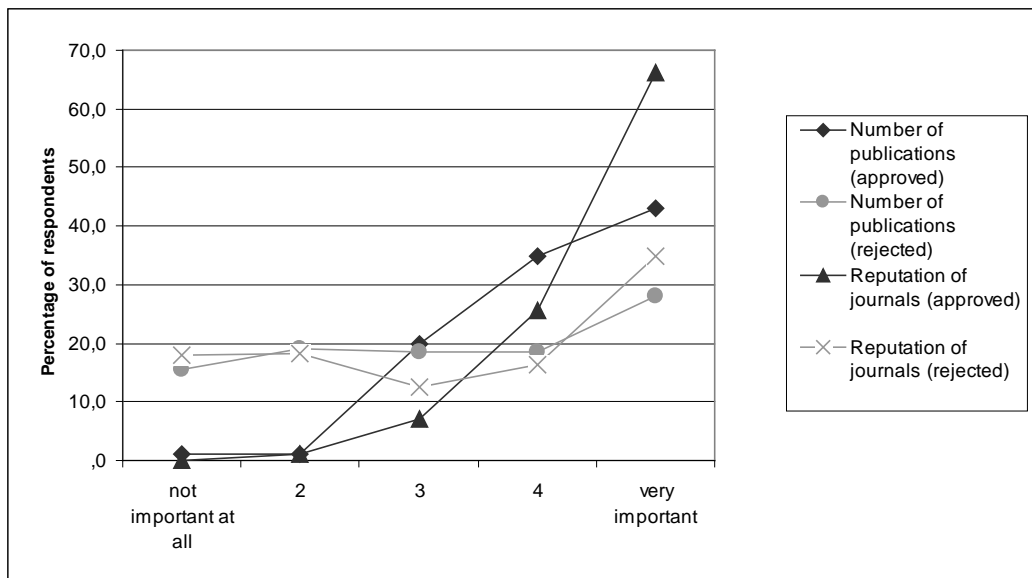


Figure 1. Importance of the number of publications and the journal’s reputation for the ERC evaluation from the StG applicant’s point of view—grouped percentages (StG 2009 cohort). Source: iFQ MERCI online survey.

However, it is also possible that rejected applicants with many publications in ‘reputable’ journals do not perceive the number of publications as the reason for their rejection.

Finally, we asked applicants about their *actual publication activity* in the two years *before* the StG application. The numbers presented in table 4 contradict the thesis that in high selective funding schemes bibliometric differences between the groups of approved and rejected applicants are weak in an unexpected way: It turns out that, on average, the number stated by rejected applicants significantly exceeds the number stated by approved applicants in terms of manuscripts a) they have worked on, b) they have initiated, c) they have supposed to be published in peer-reviewed journals, and d) that have been accepted by peer reviewed journals and rejected manuscripts that have resubmitted to other peer reviewed journals. As publication data tend to be highly skewed, it is worth taking a look at the underlying distributions.

Table 4. Publication activity in the two years before the StG application (StG 2009 cohort, Life Sciences and Physical and Engineering Sciences). Source: iFQ MERCI online survey.

Status of applicant		Number of manuscripts	Number of manuscripts initiated by author	Number of manuscripts supposed to be published in peer-reviewed journals	Number of manuscripts accepted by peer reviewed journals	Number of manuscripts resubmitted to other peer reviewed journals	Number of resubmitted manuscripts published by peer reviewed journals
rejected (N=333)	Mean	25.80	16.68	20.34	16.35	4.04	4.25
	Median	17.10	9.80	14.35	10.88	2.07	2.07
	Std. Deviation	26.23	18.70	19.41	16.69	6.06	6.69
approved (N=83)	Mean	19.81	12.63	16.76	13.43	3.25	3.28
	Median	10.75	7.40	9.64	7.38	1.29	1.35
	Std. Deviation	25.12	17.55	20.30	16.55	7.63	7.63
Mann-Whitney U Test (p-value)		0.006	0.024	0.011	0.030	0.028	0.032

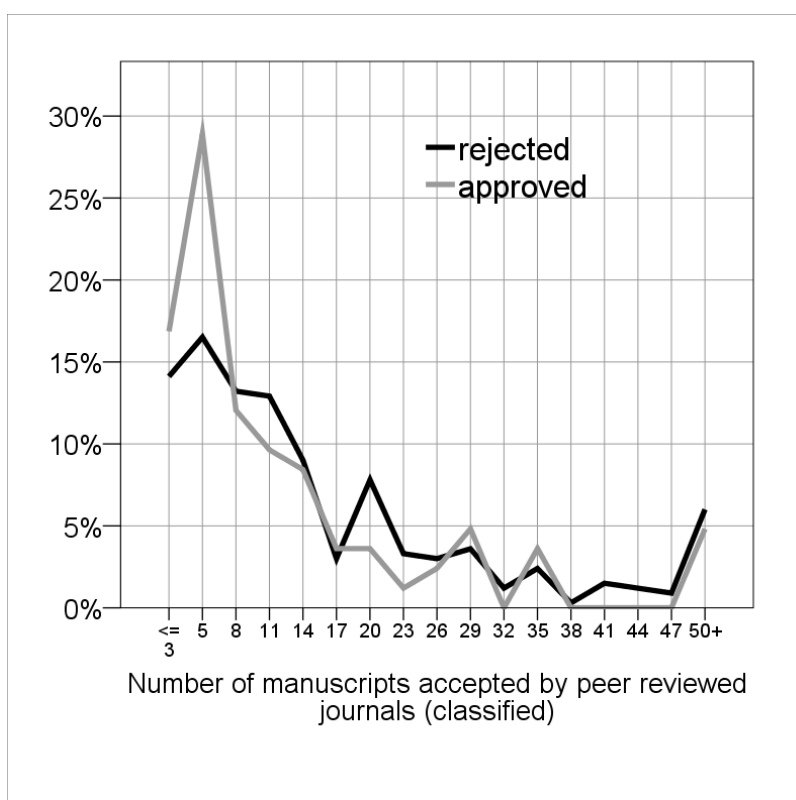


Figure 2. Online survey: Number of manuscripts accepted by peer reviewed journals within the last two years (StG 2009 cohort: Life Sciences and Physical and Engineering Sciences, n = 416, cf. Table 2)–classified data with values representing class centers (grouped percentages). Source: iFQ MERCI online survey.

Figure 2 provides a view on the distribution of the number of manuscripts accepted by peer reviewed papers for both groups in the two years before the StG application (grouped percentages). It shows that only about 15 percent of all respondents stated that three or less manuscripts were accepted by peer reviewed journals. Hence, it seems that “low performers” are underrepresented amongst *all* applicants of the ERC program. This result roughly corresponds to our bibliometric finding for the ENP in which we did a similar analysis for Medicine and Biology. However, it has to be taken into account that in the case of the ENP the publication window covered *five* instead of two years before the application and that also the “years after PhD” differ between the two programs (ENP: two up to four years, StG: up to twelve years). Looking at the category of five (four to six) publications, the main difference between approved and rejected applicants becomes obvious. Nearly 29 percent of the approved applicants fall into this category whereas only 16.5 percent of the rejected do so.

At this point, it is too early to fully explain this outcome, but we assume that with the help of our bibliometric analysis we can further reveal reasons for the higher number of publications produced by the rejected StG applicants. Especially the comparisons of JIFs and citation based indicators might explain in how far impact or ‘quality’ dimensions play a role in the ERC StG funding decision.

References

- Besselaar, P. v.d. & Leydesdorff, L. (2009). Past Performance, Peer Review and Project Selection: A Case Study in the Social and Behavioral Sciences. *Research Evaluation*, 18 (4), 273-288.
- Bornmann, L. & Daniel, H.-D. (2007). Convergent Validation of Peer Review Decisions Using the h Index. Extent of and Reasons for Type I and Type II Errors. *Journal of Informetrics*, 1 (3), 204-213.
- Bornmann, L., Leydesdorff, L. & Besselaar, P. v.d. (2010). A Meta Evaluation of Scientific Research Proposals: Different Ways of Comparing Rejected to Awarded Applications. *Journal of Informetrics*, 4 (3), 211-220.
- Bornmann, L., Wallon, G. & Ledin, A. (2008). Does the Committee Peer Review Select the Best Applicants for Funding? An Investigation of the Selection Process for Two European Molecular Biology Organization Programmes. *PLoS One*, 3 (10), e3480.
- Campbell, D., Picard-Aitken, M. Côté, G. & al. (2010). Bibliometrics as a Performance Measurement Tool for Research Evaluation: The Case of Research Funded by the National Cancer Institute of Canada. *American Journal of Evaluation*, 31 (1), 66-83.
- Hornbostel, S., Böhmer, S., Klingsporn, B., Neufeld, J. & Ins, M. v. (2009). Funding of Young Scientists and Scientific Excellence. Special Issue of *Scientometrics* on the 11th International Conference on the International Society for Scientometrics and Infometrics (Madrid June 2007), 79 (1), 171-190.
- Melin, G. & Danell, R. (2006). The Top Eight Percent: Development of Approved and Rejected Applicants for a Prestigious Grant in Sweden. *Science and Public Policy*, 33 (10), 702-712.
- Neufeld, J. & Ins, M. v. (2011). Informed peer review and uninformed bibliometrics? *Research Evaluation*, 20(1), 31-46.
- Neufeld, J. (2011). Funding Programs for Young Scientists—Who Applies, and Who Does Not? Poster Presentation. STI Indicators Conference 2011: Actors and networks in European Science, European Network Indicators Designers (ENID), September 7-9, 2011, Rome, Italy.