

Why many funding schemes harm rather than support research

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To the editor –

Researchers are spending an increasing fraction of their time on applying for funding. However, despite extensive efforts invested in applications and evaluations, the current funding system appears to largely fail in its task to reliably rank the relative research quality of proposals.¹⁻³ Hence, the current funding system to a considerable degree represents a lottery – and a strikingly inefficient one at that.⁴⁻⁶

These observations raise a more general question: do the benefits of current funding schemes outweigh their costs, on both the individual and societal level? At first glance, any initiative that provides resources for research seems beneficial to research and society. However, writing grant proposals reduces the time available for research, and the sum of these opportunity costs has to be weighed against the sum of awarded funding.

Some real-world examples: the ERC Advanced Grant awards 2.5m€ with a success rate of ~10%, equaling a mean expected return for an average proposal of 250k€. In comparison, the

Marie Skłodowska-Curie Actions Postdoc Fellowships have a considerably lower expected average return of 30k€ (~200k€ with ~15% success rate). Also most other funding schemes involve a considerably lower expected return than the ERC Advanced Grant, however often require a similar amount of application efforts. Two funding programs we came across, by smaller funding bodies, award grants of 50k€ and 30k€ with success rates of 5% and 2.5%, respectively. The mean expected return of an average proposal for these programs is only 2.5k€ and 750€, respectively, against which (opportunity) costs of the application have to be weighed. Considering typical salary and overhead costs for research positions, if the cumulative work going into an average grant application adds up to considerably more than a couple of days, these grant schemes draw more resources from the scientific community than they add – with the (comparably smaller) costs of review and administration not even considered.

Figure 1 quantifies the extent of this problem from two different angles: the net return that an individual grant yields on average as a function of the time invested in the proposal; and the total net return as a function of the funding rate. The smaller the grant and the funding rate, the faster one reaches a negative net return: the costs of the applicants' time invested in the proposals exceed the granted funding.

A zero net return corresponds to a situation where all funding is spent *solely* on the distribution of funding – not a single hour of actual research would be funded yet. Only if the expected funding value considerably exceeds the costs of the distribution, i.e. producing and evaluating grant proposals plus administrative overheads, do funding organizations actually support research, otherwise they effectively impede it.

Several solutions exist to remedy this unfortunate situation. First, funding agencies should calculate if a planned call can be expected to invest more resources into the system than it draws from it, considering all costs not only by the agency and its reviewers, but in particular on the side of applicants.

Second, to allow researchers to perform their own cost/benefit analyses before applying for a grant, funders should publish accurate numbers on success rates in previous calls, and evaluate the average time spent on proposals by applicants. For researchers who would like to explore the expected value of a planned grant application, we provide a simple online calculation

tool that weighs the funding amount against time investment and success rates:

<http://f.unding.com>.

Third, current funding initiatives should consider a more fundamental overhaul of their distribution strategies to reduce the required time investment by applicants. Promising options are two-stage application procedures; switching from *de facto* to *actual* funding lotteries;⁷ peer-to-peer funding;⁸ and a general shift from competitive distribution to increased base funding of universities.⁹⁻¹⁰

Such strategies might appear less merit-driven than a peer-reviewed selection of the most excellent applications in a competitive grant call. However, considering the shortcomings of current practices of funding distribution and the prevalence of funding schemes with negative net effects, more efficient alternatives will pay off for research as a whole.

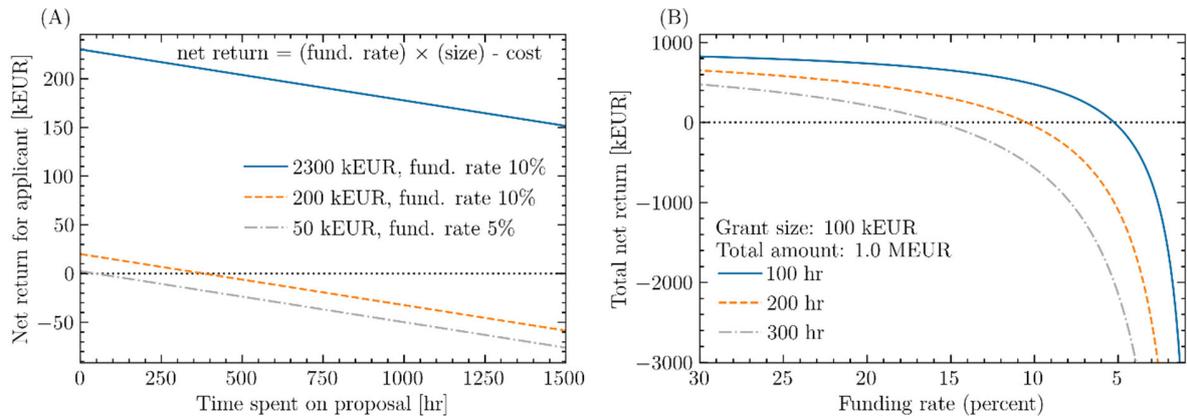


Figure 1. Associations between time investment, funding rates, and net return of funding schemes. For simplicity, we focus on the applicants' time investment only, representing the lion's share of the involved efforts anyway. **(A)** Expected net return for an individual applicant of a grant (in €1000) as a function of time spent on the proposal, for three example grant sizes and funding rates. **(B)** Total net return for all applicants (= total funding amount, minus total cost of submitted proposals), as a function of the success rate. The three lines stand for different mean time invested into proposals. All results assume a representative annual gross salary cost of €90k.

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Author contributions

All authors conceived and wrote the article.

Conflicts of interests

All authors have an interest in an efficient and fair funding system. Other than that, all authors declare no competing interests.

Data and materials availability

All data, code, and materials are available from the authors without restrictions.

Supplementary Materials:

We provide a simple calculation tool for our considerations online: <http://f.unding.com>