Time to tackle the incumbency advantage in science

A survey of scientists shows strong support for funding policies that would distribute funds more evenly among laboratories and thereby benefit new and smaller research groups

Andrea Ballabeni¹, David Hemenway¹ & Giorgio Scita²

There is something called the “incumbency advantage” in biomedical research: established laboratories have an advantage over newer laboratories when it comes to securing research funding. There are several interrelated factors that contribute to this phenomenon. First, research proposals are usually based on a considerable amount of preliminary data, which means that younger scientists have more difficulties putting competitive proposals together, even when these contain brilliant ideas [1,2]. Second, the complexity and length of grant application guidelines and criteria can work against scientists who do not have enough expertise with application procedures, or assistants who can help them [2]. Third, the review committees that evaluate research proposals often seem to be biased in favor of established scientists with a solid track record. Indeed, there is evidence that review processes favor the “insiders and the familiar” over the “unknown”, even without intentional bias (see “Further Reading”). Fourth, consensus biases toward mainstream and orthodox ideas/approaches again favor the large and well-established laboratories over small and newly established ones [1,2]. While “seasoned investigators are inclined to stick to the tried-and-true formulas for success” [1], young investigators are more likely to test new ideas/approaches. Fifth, large research programs can also be favored simply by “inertia” biases, especially given their “financial dependency” [1].

The incumbency advantage therefore creates an unfair situation for young investigators. It is not only a matter of equal opportunities, but it also decreases the overall

efficiency of the system in several ways. First, many innovative research projects by young PIs remain unfunded. This is a problem, because newly established laboratories often have innovative ideas. Second, the incumbency advantage leads to “over-funding” of some laboratories, and there is evidence of a negative correlation between funding and laboratory efficiency (see “Further Reading”). Third, as hiring more laboratory personnel could be a solution to “over-funding”, the bias in favor of established scientists can result in too-large laboratories, which experience diseconomies of scale [1]. A PI cannot meticulously oversee large numbers of postdoc and student projects; the more laboratory members, the less the supervision. Fourth, the incumbency advantage drives many young scientists to other careers, which exacerbates the problem in the long run.

“The incumbency advantage therefore creates an unfair situation for young investigators”

Addressing the problem

What can be done to increase fairness for young or less famous scientists, improve the efficiency of the funding system, and reward creativity and “out-of-the-box” thinking? Two policies have been proposed: to put a cap on how much funding any given laboratory can receive and to implement funding

schemes with the capability, possibly through less centralized procedures, to fund an additional number of scientists [1,3,4]. While other policies such as increasing overall funding or putting special funds aside solely for younger researchers have been introduced, we will not discuss these ideas.

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In order to evaluate the potential costs and benefits of any proposed policy, it is important to determine its feasibility and to gauge the attitudes of the scientific community. We conducted a survey covering many different topics and sampled a large number of researchers in basic biological or biomedical research. We received responses from nearly 900 (885) scientists at different stages of their careers from four scientific hubs (two in the USA, one in UK, and one in Italy) [5]. As part of this survey, we asked these scientists about the two policy proposals.

Scientists’ attitudes

We tested scientists’ attitudes concerning funding policies by asking their level of agreement with the following statement (A): “There should be a cap to how much a given

¹ Harvard T.H. Chan School of Public Health, Boston, MA, USA

² Institute FIRC of Molecular Oncology & Department of Oncology and HematoOncology, IFOM Foundation, University of Milan, Milan, Italy. E-mail: giorgio.scita@ifom.eu
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Figure 1. Results from our survey on alternative policies for research funding.

Data are based on 885 responses from 4 research sites in the USA, the UK, and Italy.

scientist/laboratory can be funded, in order to attenuate the bias in favor of established scientists/laboratories". 71.0% of respondents agreed, including 70.2% of principal investigators and 79.0% of postdocs (Fig 1A). For the second policy, we asked for agreement with the following statement/policy (B): "Grants should not always be assigned in an 'all-or-none' fashion. Instead there should be the possibility to partially fund scientific projects/scientists so that more projects/scientists are funded even if this would decrease the numbers of projects/scientists fully funded". 71.3% of surveyed scientists agreed, including 66.7% of principal investigators and 77.7% of postdocs (Fig 1B). Moreover, 77.6% of the scientists who agreed with statement (A) were also in agreement with statement (B). Our results suggest that a large majority of scientists—and especially younger scientists—would favor these two policies.

Two other problems identified by responses to our prior surveys [6,7] regard the long and detailed research proposals required for grant application, which divert substantial time and energy from actual research activity, and the tendency to fund incremental mainstream proposals over more heterodox and paradigm-shifting ideas. To ameliorate these problems, scholars have suggested that funds should be allocated not only based on research proposals, but more

on the evaluation of the overall quality of the scientists. There are several successful cases of funds assigned in this way, but the vast majority of funding currently requires the evaluation of detailed research proposals [1,2].

Since such a policy could increase the incumbency advantage, our survey also tested the level of agreement with the following statement/policy (C): "In the future, an increasing share of funding should be granted to the scientists rather than to the projects". 55.1% of surveyed scientists agreed, including 59.7% of the principal investigators and 53.3% of the postdocs (Fig 1C). The results show that the majority of scientists, especially the principal investigators and older scientists, are in favor of a policy that would allocate funding based more on the overall scientists' quality than on project proposals.

Interestingly, 56.5 and 55.0% of the scientists that were in agreement with (A) and (B), respectively, were also in agreement with (C), and 72.7 and 70.9% of the scientists that were in agreement with (C) were also in agreement with (A) and (B), respectively. It is also worth pointing out that unlike policies (A) and (B), the opinions on policy (C) differed significantly between the different sites, suggesting that local policies and cultural milieu influence the views on this topic. Agreement varied from a minimum of 41.3% (Milan area, Italy) to a

maximum of 73.3% (Southern California, USA). Still, in three out of the four scientific hubs, the majority of scientists were in agreement with policy (C).

A dichotomy of opinions?

It may seem counterintuitive that many scientists could rationally be in favor of all three policies. After all, granting funding to individual scientists rather than to projects (policy C) appears to be in opposition to the policies of funding smaller (or parts of) projects and putting a cap on funding. Perhaps some scientists are aware that (C) could neutralize or even overcome the effect of (A) and (B), but they consider eliminating time-consuming proposal writing more important than the incumbency advantage. Or scientists might believe policies (A) and (B) would be effective in reducing the incumbency advantage even in the presence of policy (C). It is certainly possible that putting a cap on how much funding a laboratory or a principal investigator can receive (A) and/or eliminating all-or-nothing funding (B) might decrease the current incumbency advantage even if grants were to be assigned to individuals instead of projects (C). Moreover, assigning funding directly to scientists does not necessarily imply favoring established laboratories. Research proposals and scientists are currently evaluated by panels, which are often composed of long-established scientists, who are *de facto* not "peers" of younger investigators. On the contrary, using a more horizontal system of evaluation, like the one based on "collective allocation" recently proposed [4], might promote more funding for young or out-of-the-box thinkers. Indeed, in a "collective allocation" type of system, younger and less famous scientists would have a role in deciding how to allocate funding and would probably be more likely to know and credit their counterparts.

“... the advantages of having more scientists funded and a more even distribution of research grants are perceived as greater than the disadvantages of decreasing the average funding per scientist”

Box 1: Further reading**The weaknesses of peer review**

Fang FC, Casadevall A (2009) NIH peer review reform—change we need, or lipstick on a pig? *Infect Immun* **77**: 929–932

Nicholson JM, Ioannidis JP (2012) Research grants: conform and be funded. *Nature* **492**: 34–36

Staats C (2014) State of the Science: Implicit Bias Review 2014. Kirwan Institute

Danthi NS, Wu CO, DiMichele DM, Hoots WK, Lauer MS (2015) Citation impact of NHLBI R01 grants funded through the American Recovery and Reinvestment Act as compared to R01 grants funded through a standard payline. *Circ Res* **116**: 784–788

Gallo SA, Carpenter AS, Irwin D, McPartland CD, Travis J, Reynnders S, Thompson LA, Glisson SR (2014) The validation of peer review through research impact measures and the implications for funding strategies. *PLoS One* **9**: e106474

The correlation between grant size and productivity

Fortin JM, Currie DJ (2013) Big science vs. little science: how scientific impact scales with funding. *PLoS One* **8**: e65263

Kaltman JR, Evans FJ, Danthi NS, Wu CO, DiMichele DM, Lauer MS (2014) Prior publication productivity, grant percentile ranking, and topic-normalized citation impact of NHLBI cardiovascular R01 grants. *Circ Res* **115**: 617–624

Berg J (2010) Another look at measuring the scientific output and impact of NIGMS grants. <http://go.nature.com/dae21z>.

The correlation between lab size and productivity

Wadman M (2010) Study says middle sized labs do best. *Nature* **468**: 356–357

Woolston C (2015) Bigger is not better when it comes to lab size. *Nature* **518**: 141

Stephan P (2012) Research efficiency: Perverse incentives. *Nature* **484**: 29–31.

Cook I, Grange S, Eyre-Walker A (2015) Research groups: How big should they be? *PeerJ* **3**: e989

Alberts BM (1985) Limits to growth: In biology, small science is good science. *Cell* **41**: 337–338

We believe that these three policies might increase the fairness of the funding system by giving everyone similar opportunities and by appropriately valuing the relative merits of all scientists through a more proportional and less all-or-nothing approach. Moreover, these transformations might also increase efficiency. It is likely that policies (A) and (B) are supported by the surveyed scientists because they would reduce “over-funding”—or inefficient funding—reduce the average size of laboratories, and increase the number of funded scientists, especially the less established ones. This should help promote innovative research, increase efficiency, and ensure a well-structured workforce in the long run. We conclude that the advantages of having more scientists funded and a more even distribution of research grants are perceived as greater than the disadvantages of decreasing the average funding per scientist. Furthermore, policy (C)

would reduce the amount of time and resources spent on proposal writing and bureaucratic work and might promote more controversial, paradigm-shifting research. These proposed policies could therefore produce more knowledge and more benefits to the society.

Collecting data and promoting discussion are preconditions for developing sound policy recommendations and creating the momentum needed for change [3,8]. Additional information would of course help determine whether or not our interpretation of our survey data is correct. Future investigations should also help us understand why some scientists are not in favor of the proposed policies, and whether the reasons are related to differences in career stages or geographical locations. We hope that we have shed light on the need to innovate and improve the research system and stimulate policy-focused studies and discussion.

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Conflict of interest

The authors declare that they have no conflict of interest.

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