SCIENCE POLICY

The Economic Logic of U.S. Science

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Increasingly science is about money. Publish or perish has been replaced by fund or famish. Scientific results and publications, while born of diligence and dedication and inspired by creative insights, simply do not get off the ground without resources. Scientists compete for scarce societal resources. With this funding come expectations of accountability and measurable outcomes, intensified by research assessment exercises and performance metrics. Moreover, at a time when the research system is evolving in response to precarious government funding, scientists should question whether the prevailing incentives and expectations are appropriate to move science in the most productive direction.

How Economics Shapes Science should be required reading for all scientists and students of science, who are increasingly called upon to adopt the language and logic of economics and engage in policy discussions. Paula Stephan (an economist at Georgia State University) makes her case in simple, easy-to-follow language, using timely examples. Each chapter provides a review of the topic, consideration of policy implications, and suggestions for future research.

The book starts by summarizing the case that private industry alone will not invest in the socially optimal level of research, which will ultimately decrease the rate of innovation and lower economic growth. The logic is worth repeating at a time when there are calls for limiting government support for research and researchers face pressures to engage in lower-risk projects. Stephan convincingly argues that monetary incentives increasingly determine the behavior of researchers at the expense of scientists' desire to participate in the joy of solving problems, receive recognition, and obtain a good reputation.

Stephan debunks the idea that science is a winner-take-all endeavor and argues for a tournament model that rewards different levels of skills and accomplishment. The current system often exacerbates relatively minor initial differences in the skill level of scientists, leading to resource inequality and disparities in achievement and income. Cohorts who enter a tight labor market are likely to find themselves at institutions of lower reputation, with fewer resources, higher teaching loads, and less distinguished colleagues. The consequences of these effects are difficult to overcome and endure over a researcher's career. Stephan documents how salaries in science have lost ground compared with other professions. This is indeed ironic at a time when science is considered fundamental for economic growth and international competitiveness—a case that Stephan reviews in the book's penultimate chapter (a useful summary of the logic behind current policy).

How Economics Shapes Science

by Paula Stephan

Harvard University Press, Cambridge, MA, 2012. 383 pp. $45, £33.95, €40.50. ISBN 9780674049710.

Stephan is specifically concerned with the disadvantages for younger scientists, who currently have a more difficult time establishing primacy within their chosen field. Research demands collaboration of a team of experts spanning multiple disciplines who are organized into hierarchy according to rank. Scientists starting their careers face additional difficulties because all sources of research support are subject to cyclical fluctuations. Whereas there are perennial warnings of a shortage of scientists and engineers, Stephan documents the surpluses in academic labor markets that can prompt universities to adapt their staffing structures, including increased reliance on non–tenure-track faculty and postdocs and offering tenure without a commitment to fund a scientist's salary. Stephan asks why people keep going to graduate school in the sciences if career results are so disappointing. She suggests the availability of stipends, overconfidence, and recruitment by faculty create incentives for an unsustainable system. She concludes that the system does not serve individual scientists well.

The final chapter offers a critical assessment of the university research system in the United States. Stephan asks whether we efficiently apportion costs and incentives or the system could be better. She argues that universities have adopted the management practices of real estate shopping malls, allocating space to the highest bidder with little concern for the totality of the scientific enterprise, the balance between disciplines, or the integrity of inquiry. Research with uncertain outcomes is discouraged when researchers rely on grants for their salary; collaboration is less likely when scientists are in constant competition. The current research paradigm discourages research that disproves theories, which risks loss of funding. Researchers are awarded for incrementally continuing a line of research, even when that research is no longer practical. This concluding chapter could also serve as the opening of another book, one that critically evaluates alternative approaches that might improve the efficiency of the scientific enterprise as well as the distribution of its rewards among individual scientists.

The science of science policy is coming of age. Stephan's 1996 article, "The economics of science" (*1*), was instrumental in defining the field, and this book will have similar impact. The National Science Foundation now runs a grants program, the Science of Science Innovation and Policy, aimed at understanding how science shapes innovation and technological progress. There is also an important interagency effort (STAR metrics) to collect and analyze data on the impact of federal spending on research and innovation outcomes. *How Economics Shapes Science* provides a comprehensive overview and introduction for scientists who would like to understand these developments. Indeed, the science of science policy will be enhanced when scientists, who have traditionally eschewed policy and politics, actively engage and contribute to the discussion.

References

1. P. E. Stephan, *J. Econ. Lit.* **34**, 1199 (1996).

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