Introduction

Understanding how the organization and funding of science affect scientific, economic and broader societal outcomes is important. Economics can play a key role in providing insight into the processes generating research outcomes and assessing how to ensure the benefits of this research to society. However, until relatively recently, there was little research in economics to guide decision making about the funding and organization of science. Paula Stephan's (1996) article, "The Economics of Science," helped lay the groundwork for a proliferation of research on how economic incentives and funding structures shape the research that fuels economic growth.

The three decades since have seen a surge of economics research on science, spurred by the development of large datasets and new methods, advancing our understanding of how the "Republic of Science" (Dasgupta & David 1994) operates. Although the field has made progress on understanding the impact of funding on science and the development of the scientific workforce, this research has raised concerns about imperfections in the organization of science funding and careers, and the alignment of scientific priorities with social objectives. We are currently at an inflexion point for research on the science of science, more than 80 years after Vannevar Bush published *Science--The Endless Frontier* (1945). This seminal work laid out a vision for the postwar application of science to combat illness, ensure national security, and promote economic growth. On the one hand, substantial progress has been made and opportunities for further progress are available. On the other hand, important challenges remain and new threats have arisen. We can celebrate past achievements, but also need to recognize that the post-1945 golden era of science may have come to an end. At a time when the Bush-era compact between government and universities is fracturing amidst a crisis of public trust and political attack, at a time when the technology frontier for science generation is fast developing, at a time when patterns of global collaboration are fast changing, we urgently need to understand how the scientific enterprise is transforming and how it can be made more resilient. New frameworks for staffing, conducting and funding science need to be developed to support 21st-century science. Economics of science researchers need, jointly with other scientists, funders, organizers and users of scientific research, to take up this challenge.

The Science of Science Funding Initiative at the NBER, supported by the Alfred P. Sloan Foundation, has since 2017 built and nurtured a community focused on the economics of science, through holding research meetings, disseminating research and supporting small scale projects (https://www.nber.org/science). The Initiative took up the challenge to evaluate progress in the economics of science and science funding, to identify important unanswered questions and to articulate an agenda for future research in the field. With this goal in mind, a conference was organized in the Fall 2025, bringing together a broad and diverse collection of participants in the scientific research enterprise. Participants included academic economists, scientists, current and former representatives of major science funding agencies and international organizations, and scientific journals. Discussions belied a sense of urgency about the necessity of rethinking the way the economic impacts of science are understood and communicated to policymakers and the broader public. The chapters in this volume arose from the presentations and discussions at that conference.

As described in the opening and closing summary chapters by Trajtenberg, the conference came at a moment of rapid change for the scientific enterprise. This holds most notably for US science, currently facing cuts to science funding and taxation of university endowments. Pending or proposed changes to visa policies for internationally mobile scientists have had a chilling effect on the US scientific enterprise. The extent to which Americans trust or value science as measured by the General Social Survey[1] has fallen among a large share of the voting public, adding to the gloom. According to a headline cited by one of the chapter authors, many in September 2025 felt they looked upon "American Science, Shattered."[2] Even among sophisticated policy makers, the precise magnitude and scope of the return on investments in science are in question. Although the US is at the epicenter, other parts of the world are exposed to stormy weather too.

An earlier moment of radical change in the history of science funding occurred at the end of World War II. Repeatedly over the course of the conference, presenters and discussants referred to Vannevar Bush's vision at the time of the establishment of the National Science Foundation and the National Institutes of Health (NIH). The chapter by Sampat describes the history of the NIH and describes core questions faced by the NIH over time, many of which remain remarkably salient today. Questions about the return on investment from NIH grants; the effectiveness of peer review; scientific priorities; and the organizational structure of the NIH have been present from the beginning. Sampat describes where progress has been made on these questions and where work still needs to be done. The chapter ends with a call for broader access to internal data on applicants and scores as a catalyst for progress in this field. Recognizing that "the postwar social contract faces its strongest challenges in decades," Sampat nonetheless sees a generational opportunity for the economics of science to rethink and transform the funding of the biomedical sciences for the better.

Despite the headwinds facing science, an alternative perspective also surfaced, namely that the current moment holds revolutionary potential for progress. Advances in Artificial Intelligence (AI) are in the process of transforming science. The chapter by Agrawal, McHale and Oettl provides a framework for thinking about how AI will affect science and consequently economic growth. They develop a model that can be used to reconcile the seemingly divergent views that AI will dramatically increase economic growth via scientific discovery, or have only modest impacts on growth while rendering large numbers of STEM workers unemployed. What we should expect depends on how AI changes the knowledge production function and the degree of complementarity of human judgment. The paper also stresses that the rate of advance of the

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[1] https://gss.norc.org/

[2] *STAT News*, https://www.statnews.com/american-science-shattered/

"jagged frontier" of AI-enabled science depends on advancements in AI science itself as well as on the ability of scientists to make use of AI—what the authors term "AI expertise."

Access to data has been a central theme for the development of the economics of science field, for example in papers focused on the importance of repositories and open access to data (e.g. Furman and Stern 2011). This theme has only increased in importance at a time when (as noted by Agrawal, McHale, and Oettl) a growing amount of cutting-edge AI-enabled research is happening, often inside for-profit firms. As very large datasets and complex algorithms have become increasingly used by researchers, a number of challenges have emerged for progress in the economics of science. According to Marx and Shvadron, these include computational barriers; dependence on specific data providers; research reproducibility and transparency; and inequality of computing resources. To address these challenges, Marx and Shvadron describe a new resource for the economics of science: the i3 BigQuery Workspace. An open access repository and hub for data and code sharing, the workspace can help ensure the quality of economics of science research using large datasets accessible for all.

Understanding how AI will shape the scientific process will be important to assess its impact on economic growth and employment. This challenges the economics of science community to revisit a core theme of the field, namely whether and how scientific research provides spillovers for the broader economy. The chapter by Jaffe, Shupp and Tartari revisits the findings of Jaffe (1989), one of the first attempts to document empirically the relationship between academic research and nearby innovation. As described in the chapter, tremendous progress has been made on this topic, particularly in developing empirical strategies to identify causal impacts of science on innovation and growth. At the same time, much of the literature has focused on the biopharmaceutical industry, where it is easier to identify links between science and innovation than in, for example, software. Jaffe, Shupp and Tartari encourage ongoing research on this topic to look for ways to measure the impacts of science on the data-driven economy and also consider how to measure impacts that are distributed globally and indirectly through complex supply chains. Understanding how AI will change the nature of the spillovers from academic science is discussed as an important direction for future research—for example, whether the increasing concentration of AI advances made by for-profit entities rather than universities will limit the open diffusion of ideas, or whether access to AI tools will help level the playing field for under-resourced scientists.

One of the thorniest problems in the economics of science is how best to organize the funding of science. At a time when the Bush model of science funding is seriously challenged, understanding the science funding process with its potential strengths and weaknesses has become even more important. Given the information asymmetries and fundamental uncertainty of engaging in basic science research, designing a mechanism for evaluating and funding proposals represents a host of challenges for science funders. One of the major challenges is how to encourage novelty and risk-taking in science to avoid missing big breakthroughs. Franzoni and Veugelers tackle this issue in their chapter, which revisits Franzoni, Veugelers and Stephan

(2022). Since that paper was written, the landscape has evolved considerably in terms of new empirical indicators and analyses of risk bias in funding, as well as new policy experimentation. It is important to stress that alleviating the biases against novel and risky proposals would increase the likelihood of breakthroughs, but cannot guarantee breakthroughs, which come with high inherent failure rates. This raises the question of how much risk society is willing to accept. Taking into account this caveat and reviewing the insights from latest analyses, Franzoni & Veugelers outline possible ways forward, recognizing that the promotion of breakthrough research needs to be addressed within the entire science system and not only at funding. Open questions for the future remain whether trends towards reducing public funding for research, directing more public funding towards specific research areas or missions and the use of AI in scientific research will particularly affect breakthrough research.

At the core of most science funding processes is peer review. How can the peer review model be improved? Boudreau's chapter discusses attempts to put scientific peer review itself under the microscope via Randomized Controlled Trials. The experimental evidence reviewed in this chapter does not support the oft-cited claim that peer review is ineffective or fundamentally broken. Rather, the accumulated findings point to a functioning institution operating under binding constraints. The scope for improvement is substantial, particularly along dimensions of speed, cost, and the allocation of evaluative effort, but innovation should proceed from realistic expectations about what peer review can and cannot accomplish. It functions most reliably as a filter for non-contributions, rather than as a ranking mechanism for frontier science. Especially promising—and still underdeveloped—directions for improving reliability in this filtering function concern automation and artificial intelligence. The implications from the early studies on this are that automation in scientific evaluation sharpens—rather than relaxes—the problem of ranking high-quality contributions, which is structurally constrained and must be acknowledged explicitly in system design.

Rethinking the funding structures involves asking not just how, but also why public money should be allocated to academic science. The chapter by Toivanen tackles this question, more specifically why a small open economy would invest in scientific research when it could free ride on research conducted in larger countries. Toivanen sees the answer coming from the benefits of academic research for developing domestic human capital.

However, a complete assessment of benefits from developing scientific human capital must account for the mobility of talent. Recent decades have seen large flows of human capital across countries. The chapter by Ganguli and MacGarvie describes an increase in international integration of science in terms of scientist and student mobility, international collaboration, and knowledge diffusion which now shows signs of going into reverse as the US "decouples" from China and other international partners. Similar to the seemingly timeless questions faced by the NIH in Sampat's chapter, the current moves toward disintegration in science have precursors in the first half of the twentieth century, as military conflict led to dramatic shifts in scientific resources as well as collaboration and mobility of scientists. As discussed by Ganguli and MacGarvie, the costs for scientific progress are clear.

The US has in recent years become highly dependent on international students and scholars to feed the pipeline of STEM workers. As restrictive visa policies narrow this pipeline, it is important to understand how to improve the training of scientists of domestic origin. The postdoctoral stage of scientific careers has drawn significant attention from policymakers and researchers, since it can involve highly skilled individuals working long hours at low wages for years. Ginther and Rosenbloom's chapter provides an overview of research on postdoctoral scholars and links trends in the employment of postdoctoral researchers in the STEM workforce to the structure of science funding, particularly the doubling of the NIH budget in the early 2000s. Ginther and Rosenbloom outline many questions for future research, noting (like Jaffe, Shupp and Tartari) the predominance of the life sciences in research on this topic, and call for more research on postdocs in the physical sciences and engineering. They also describe progress that has been made thanks to data investments like the UMETRICS Initiative and emphasize the importance of continued and improved data access (like Sampat, calling for access to internal data from funding agencies).

Although the volume was able to cover many important issues, could not cover all the critical questions in the economics of science. The volume omits detailed discussion of important questions about science developed outside research institutions, philanthropic funding of science, the relationship between science and national security, how to fund science to combat climate change, and the demographics of selection into and out of the scientific community. Nevertheless, taken together these chapters powerfully illustrate how the economics of science has fast developed into a vibrant field equipped with new data, new methods, and an increasingly sophisticated understanding of how scientific discovery, innovation, and economic growth interact. Yet just as this analytical capacity blooms, the foundations of the scientific enterprise and its role in society are being challenged on various fronts, as described in the opening paragraphs of this chapter.

What does this imply for where the economics of science field should go next? The concluding chapter by Trajtenberg draws together the themes that surfaced throughout the closing panel discussion of the Fall 2025 conference. The key message that emerged from this discussion is that the field going forward must combine academic rigor with institutional and social responsibility.

We need to better understand the political economy of science funding, how science is trusted and defended, and how the public perceives the scientific enterprise. Better data, methodologies and analysis about the social value of research are essential. The ensuing insights should then be reflected in the advancement of policies to ensure the continuous flourishing of science in an open world. This requires engagement, helping societies understand the benefits as well as the limitations of science and why it needs to thrive openly. For the economics of science, all of this implies a dual responsibility: to continue advancing the frontier of our knowledge, while at the same time ensuring that the insights generated are intelligible and meaningful for society at large.

Another challenge for the scientific enterprise discussed at the closing session of the conference is the changing geography of science, with a decline in the dominant position which the US enjoyed post WWII. The main danger for the global scientific enterprise is not changing positions of leadership, but rather an erosion of the institutional foundations that support openness, learning, and adaptation. Can global science remain a shared enterprise in an era of geopolitical rivalry?

The goal of this volume was to take stock of the state of the field and help to define its next phase by improving the quality and impact of research in the economics of science, and by engaging in the policy implications of its work. We hope this volume inspires scientists, funders, policy makers and the public at large all over the world to pave the way for the next golden age of science for society.

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