National Network for Critical Technology Assessment

Joshua Graff Zivin

Philanthropy plays a vital role in de-risking science investment for the federal government

Research Issue

The United States is resetting its strategic thinking and policies for its Science, Technology, Engineering, and Innovation (hereafter the STE&I) enterprise. This effort derives partly from worrisome weaknesses in the American economy and partly from growing perceptions that innovation is slowing. Concerns over strategic competition and fundamental political disagreements with China have further charged the policy discussion. This paper advances the reassessment by improving our understanding of how philanthropic funding for science influences the research enterprise and its productivity.

Methods and Data

Our research process has utilized publicly available data, particularly those from National Center for Science and Engineering Statistics, for estimating the scale of investments in the STE&I system. From this, we have analyzed and estimated how to further disaggregate the data. In parallel, we have engaged in more than forty interviews to test our thinking with a wide variety of people across the STE&I enterprise. The interviewees ranged from university leaders and leaders of non-profit research institutions to leaders of US national academies to former leaders of science agencies in government, to researchers in science and technology, and to people at philanthropic foundations and organizations around the country. This process yielded us access to data at some institutions that allowed us to calibrate our data estimates. Nonetheless, this is an exploratory effort that will require additional data work to further ground truth and refine.

In parallel, we have taken a bottom-up approach to assess the degree to which philanthropic monies are supporting scientific research in critical technology areas as defined in the CHIPS and Science Act of 2022.

1. Artificial intelligence, machine learning, autonomy, and related advances.
2. High performance computing, semiconductors, and advanced computer hardware and software.
3. Quantum information science and technology.
4. Robotics, automation, and advanced manufacturing.
5. Natural and anthropogenic disaster prevention or mitigation.
6. Advanced communications technology and immersive technology.
7. Biotechnology, medical technology, genomics, and synthetic biology.
8. Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics.
9. Advanced energy and industrial efficiency technologies, such as batteries and advanced nuclear technologies, including but not limited to for the purposes of electric generation.

10. Advanced materials science, including composites 2D materials, other next-generation materials, and related manufacturing technologies.

We construct a list of keywords corresponding to technology areas listed above and then apply a natural language processing approach to grant purpose statements in a database of 990 Tax Forms from the universe of non-profit philanthropies to determine a flow of funds to each of the relevant scientific areas. We treat a grant as supporting a critical technology if the purpose statement uses any of the defined keywords. It is worth noting that purpose statements are written in lay language and are less than one sentence in length. As such, our numbers likely undercount the total philanthropic investments in these critical technology areas.

Insights

- The scale of philanthropic investments in basic science is large – roughly $16B per annum or around 15-20% of federal spending.
- Philanthropic monies are more flexible – more risk taking, longer time horizons, newer ways of organizing research, different approaches to developing human capital
- Together, they underscore the synergistic role of funding sources. Philanthropy not large enough to carry the load but plays a vital role in de-risking so that feds can take over promising domains.
- Philanthropic investment in critical technology areas totaled roughly $130M between 2010-2020.[1]
- The majority of these philanthropic funds were spent in 3 areas:
    1. Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics;
    2. Artificial intelligence, machine learning, autonomy, and related advances; and
    3. Robotics, automation, and advanced manufacturing.

Options and Trade-offs

Philanthropic giving generally reflects the idiosyncratic tastes of donors and the board they put in place. The size and distribution of philanthropic support for critical technology areas has implications for where government investments may be most ‘critical’ but not enough is known about the ‘productivity’ of those research endeavors to make informed allocation decisions.

Next Steps: Upcoming work and plans for integration by June

The next step in this project is to more directly engage with the network’s teams focusing on artificial intelligence, energy storage, biopharmaceuticals and semiconductors. To that end, we will work with the rest of the network to refine our dictionary of key terms related to those fields. Armed with these key terms, we hope to more carefully identify the flow of philanthropic monies across critical technology areas and to identify the largest donors and recipients of this funding.

---

[1] Note that our analysis is based on electronic filings of 990 forms. Electronic filing is less common for the early years of the data (it only became mandatory this year) and thus our data does not accurately reflect the universe of all giving during our study period, though its comprehensiveness greatly improves in the most recent years.