The Conceptual Framework for the Evaluation of Research Funding[1]

Julia Lane, New York University

Nicolas Jeanrenaud, New York University

[1] This paper draws heavily on work with too many colleagues to count, including Erling Barth, Nosh Contractor, Ian Foster, Danny Goroff, Paul Jensen, John King, Jacques Mairesse, David Newman, Jason Owen-Smith, Rebecca Rosen, Joshua Rosenbloom, Lou Schwarz, Paula Stephan, and Bruce Weinberg

Contents

1. Introduction

"As a nation with the fourth lowest population at the FIFA World Cup, Croatia knew they would need an edge if they were to make an impact. Sure, they have household names such as Luka Modric, Ivan Rakitic, Ivan Perisic and Mario Mandzukic. But their backroom team figured they would have to do more. Their solution was to embrace technology. Every side has video analysts, but none have had quite the same insight as Croatia—the only team in Russia using STATS Edge. The Chicago-based tech firm has been tracking football data since 1999 and in June launched a new football platform that uses artificial intelligence to analyse a team's performance, compare playing styles and conduct game-changing set-play analysis. You can even start to predict how an opponent might react to a specific scenario based on their past behaviour."[2]

The core questions to be answered in managing science--or soccer—are: What are the returns? And how can we improve them? For science, answers to the first question are patchy. Serious academic work suggests that the ***private*** returns to R&D investment in firms average around 20 to 30%, and the social returns are roughly twice that[1], [2]. Other work attributes much of productivity growth in the 1990's to investments in information technology, which were driven at least partly by investments in basic research [3]. Using a broad brush, the American Association of Universities[3] draws a dotted line between research grants and the invention of the Internet and the World Wide Web, MRI's, MP3 players, and Global Positioning Systems.

The demand for evidence-based policy extends beyond scientific research (*2*). Funding for international development, for public finance, for labor and welfare programs is increasingly dependent on measuring outcomes and results.(*3*) This focus is guiding budget decisions, informing program management, and shaping policy. But by and large, science investments are not based on evidence. There is no systematic answer to the very specific question of the link between government-funded R&D and economic growth. As Ben Bernanke, the former chairman of the US Federal Reserve, has pointed out, scholars do not know much about how

[2] https://bleacherreport.com/articles/2785918-revealed-the-technology-that-is-driving-croatias-world-cup-fairytale
[3] http://www.aau.edu/policy/article.aspx?id=4692 ; www.aau.edu/WorkArea/DownloadAsset.aspx?id=11556

federal support for R&D affects economic activity.[4] Indeed, as the cartoon would have it, often what scientists assert is that after research is funded "a miracle occurs" which then leads to serendipitous scientific breakthroughs. Policy-makers are asking for more details on Step 2.

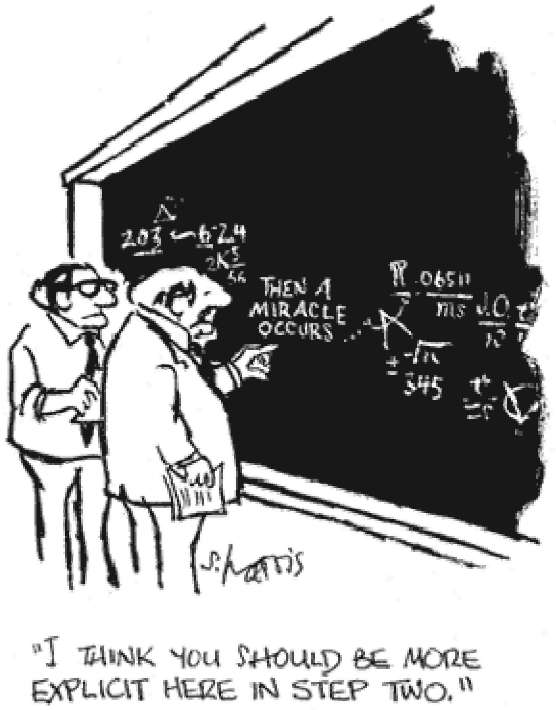

Figure 1: Unpacking the "miracle" of science

Impact evaluation is hard, particularly when the links between initial inputs and subsequent outcomes are non-linear and complex. However, most human activities are complicated, and other fields have had marked success, as outlined in the Empirical Framework White Paper. INCA and INSERM have taken major steps forward in using 21st century approaches to create a better framework, build better approaches to measurement and create a community to do better analysis. The future could be to build a new "StatsEdge" approach to research funding: using 21st

[4] Ben Bernanke, May 16, 2011 " Promoting Research and Development The Government's Role" http://www.federalreserve.gov/newsevents/speech/bernanke20110516a.htm

century tools to provide answers to the important questions of what are the returns to R&D, and how can we use new data and tools to produce better returns.

This white paper outlines a possible conceptual framework that could be applied to the field of science funding - beginning with what NOT to do(*5*).

2. What Not to Do

The current state of the art for research funders reflects the early stages of evaluation in other fields. There is extensive reliance on anecdotes, self-evaluation, and misleading primitive analyses. Each of these approaches result in deeply flawed analyses that harm the practice of science. A very insightful article summarized a decade of study and asserted, “Evaluators often rely on numerically–based shortcuts drawn from the closely related fields (Hood and Wilson, 2001) of bibliometrics and scientometrics — in particular, Thompson Scientific’s Journal Impact Factor (JIF). However, despite the popularity of this measure, it is slow (Brody and Harnad, 2005); narrow (Anderson, 2009); secretive and irreproducible (Rosner, et al., 2007); open to gaming (Falagas and Alexiou, 2008); and based on journals, not the articles they contain.” (*1*)

The reliance on anecdotes is pervasive. The National Science Foundation (NSF) routinely cites funding to Larry Page and Sergey Brin to claim credit for Google[5]; the Department of Defense takes credit for developing the internet; the National Institutes of Health (NIH) makes much of the value added of the Human Genome Project. Sometimes, however, there are no anecdotes but rather quite vacuous statements such as those made by Science Europe :

[5] The AAU refers to the return on investment from NSF’s original grant to Google as bigger than the “ratio of the red dot to the white circle” www.aau.edu/WorkArea/DownloadAsset.aspx?id=11556

"Research has always had a wide impact on society, but this does not always come in the form of a clearly defined outcome, application, or effect. It frequently occurs as a more gradual development in the understanding of the consequences of new knowledge. It may also happen long after the corresponding research was done, or be the outcome of repeated interactions between research and society. This can make societal impact difficult or impossible to trace back and attribute to the specific research from which it originated. In addition, that research may have already been evaluated without this impact having been taken into account" (*6*) p1

The result of anecdotal "evidence" is harmful because it means that the field is not competitive with other areas that have well developed scientific methodologies for documenting impact and are more successful in making the case for resources (*7*). As the Nature writer, Colin MacIlwain has pointed out, the evidence for the connection between research investments and economic activity is "patchy"(*8*).

Self-evaluation, while tempting, is rarely compelling and often expensive and time-consuming. For example, the European Research Council (ERC) recently released its self-evaluation of frontier research and made the absurd claim that "ERC frontier research leaves its mark: 73 percent breakthroughs or major advances"[6]

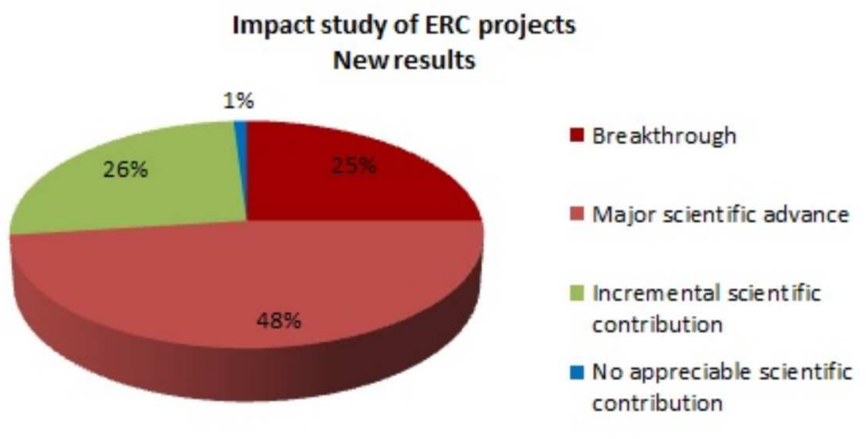

Figure 2: The "Impact" of ERC projects Source; European Research Council

6 https://erc.europa.eu/news/2017-qualitative-evaluation-projects

Self-evaluation can also lead to bureaucratic madness. The 2014 UK Research Excellence Framework, for example, cost almost £250 million, had 4 main panels, with 36 sub-panels, and 1,052 members resulting in over 7,000 case studies. The cost of that assessment was about 2.4% of the funding allocated to funding bodies spend over the following six years –and that did not include the cost of scientific time spent preparing for the review.(*9*)

Simply put, self-evaluation is hard to take seriously. At best they are descriptive and uninformative - policymakers still don't know *whether* or *which* research leads to economic growth or better public health– at worst, they are seen as self-serving.

There have also been primitive attempts at statistical analysis by untrained practitioners which have led to seriously flawed results. For example, in one of the most cited attempts to examine the link between research funding and productivity, the then director of National Institute of General Medical Sciences(NIGMS), Jeremy Berg, plotted average publications, and their impact factor, of grant recipients and found that that researcher productivity began to diminished as grant size exceeded $600,000 to $750,000. (28) Lorsch, Berg's successor as director of NIGMS, built on this research and a much earlier 1985 piece by Bruce Alberts, which outlined inefficiencies that can arise as labs become larger, to argue that inefficiencies are created when research funds are heavily concentrated among researchers rather than distributed more widely to the research community. The associated methodological challenges have formed the basis of an entire class at the University of Washington (www.callingbullshit.org)

"NIH's Rule of 21 - Part 1. The NIH wanted to restrict the number of grants that a single investigator could hold, and tried to justify this policy using data visualizations purported to illustrate decreasing marginal returns of investment in a given lab. Here we show that their graphs fail to demonstrate this and explain where they went wrong.

NIH's Rule of 21 - Part 2. It gets worse. The entire enterprise of looking at researcher output as a function of funding received, and then attempting to optimize the allocation of funding based on these data, is fundamentally flawed. We explain why." (*10*)

3. A Better Approach

Governments must and can do better: you cannot manage what you cannot measure, whether it's soccer or science. Understanding how returns are generated can offer new ways to increase returns. That requires looking at the three reasons why there is so little information on returns to government-funded research investments: an inappropriate conceptual framework, limited information on what is funded and with what results, and inadequate analysis. In turn, Government can do three things to deepen understanding of the returns to R&D investments – and, hence, improve returns: better framework, better measurement, and better analysis. Figure 2 provides an illustrative overview of the conceptual framework: research funding does not result in a magical creation of scientific and economic output – funding, rather, supports the purchase of people's time and scientific inputs which combined to create outputs. Understanding this process is the "step 2" that describes how the scientific miracle occurs.

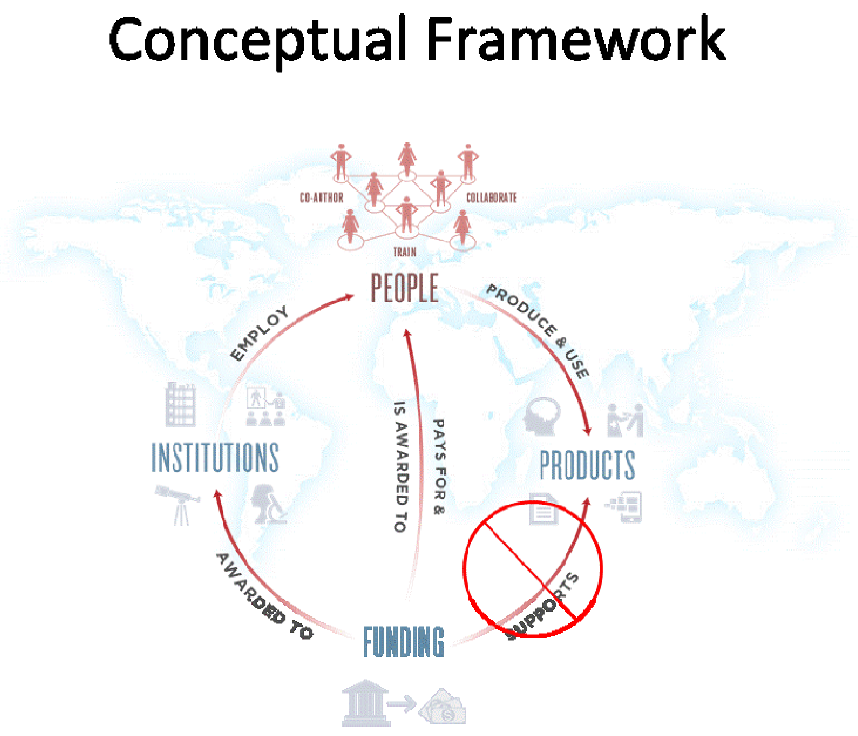

Figure 2

3.1 A Better (People-Centered) Framework

The current framework is document-centered. This is not surprising: science funders' mandate is to manage research, so their focus is the grant, and it is natural to administratively want to link research grants to research outputs. This is the wrong framework to use: documents don't do science, people do science. Science is not a slot machine wherein funding generates results in nice tidy document slices in three- to five- year time intervals. In fact, research ideas – the black box between research funding and results-- are transmitted through networks in long, circuitous and often non-linear fashion, over quite long periods. So the right framework begins with identifying the right unit of analysis - people - and examining how research funding builds public and private networks. The evidence is clear that people and networks are the drivers of innovation: the vibrant growth of Silicon Valley, Boston, San Diego and the Research Triangle was driven by each region's research institutions and the people within them. Thorough analysis increasingly points to the importance of intangible flows of knowledge, such as contacts at conferences, business networking, and student flows from the bench to the workplace[5], [6].

In the United States, universities and agencies – recognizing the need for accountability - are starting to build people centered data system, largely inspired by the STAR METRICS[7] project. The data show for the first time the building blocks of research based on people working together on projects: capturing information on the people who do the work and the firms who supply the scientific equipment. The approach avoids manual, burdensome reporting, and uses existing data drawn from the human resource records and financial reports of universities. It provides detailed insights into the production of science.

3.2 Better Measurement: What is the Money Spent on, and with What Results?

Describing *what* is funded and the *results* of funding is a precondition to estimating rates of return.

There is quite limited information on *what* research is funded. Individual agencies provide information on individual grants: for example, the European Union's CORDIS (https://cordis.europa.eu/projects/home_en.html), NSF's research.gov (http://www.research.gov/) and the NIH reporter (http://projectreporter.nih.gov/reporter.cfm) are very useful tools for capturing information about individual awards, but do not provide a good overview of the funding landscape for research in particular fields or across agencies.

[7] Science and Technology for America's Reinvestment—Measuring the Effects of Research on Innovation, Competitiveness, and Science https://www.starmetrics.nih.gov/

Research funders still use 20th century tools in the 21st century - they rely on people filling out forms to figure out what science is being done and with what results. Better approaches exist (and are used by Dimensions). Text analysis can be used to describe the landscape of so much written text and apply machine learning to describe science. One such approach – topic modeling – has been successfully used to describe scientific research portfolios in France[8]. Similar approaches have been developed by a new major enterprise - Dimensions[9] - which both brings together grants, publications, citations, clinical trials and patents in one place and also uses text analysis to describe the content; the approach is described in the Data and Methodology White Paper.

The core idea is that for every project that is funded, there is some written description of WHAT is funded that can be mined to describe the research topic. The research topics can be used to better understand the extent to which a field of research is supported, where gaps exist, and where there are scientific strengths. Research funders can and should build tools that can track the path from research grants to the growth of scientific networks to public health and commercialization: tools which could make a valuable connection between basic research, applied research, technology development, and technology deployment.

There is still very limited information about the *results* of research funding-- few answers to questions like “What have we learned about funded research?” and “What is the economic impact of research funding?”[8]. One example of the U.S. government’s interest in finding out more, the E-Government Act of 2002 (§207) requires federal agencies documenting R&D investments to develop policies to better disseminate the results of research performed by

[8] HELIOS Feasibility Report, Observatoire des sciences et des techniques, 2012
[9] https://www.digital-science.com/products/dimensions/

Federal agencies and federally funded research and development centers.[10] Another example is when Congress asked how the SciSIP (and STAR METRICS) program was providing information about scientific knowledge (such as publications and citations), social outcomes (such as health and environment), economic growth (through patents, firm startups and other measures), and workforce outcomes (through student mobility and employment) [9]. As Chairman Lipinski noted,

> "While many of us would agree that science has had a positive impact on our lives, I think we actually know very little about how the process of innovation works. What kinds of research programs or institutional structures are most effective? How do investments in R&D translate to more jobs, improved health, and overall societal wellbeing? How should we balance investments in basic and applied research? With millions of Americans out of work, it becomes more critical than ever that we find answers to these questions." (*11*)

In sum, the issues identified by legislative leaders are the same as those identified by administrative officials such as Bernanke(*12*).

Fortunately, it is now becoming possible to also use new computational technologies to capture information on research outputs. Because so much knowledge is transferred through personal communication, among the most important research products now are the training and placement of students and postdoctoral fellows: information on these pathways can now be routinely captured through such activities as STAR METRICS. In addition, research products are increasingly both digital and accessible via the Web, making it possible to obtain much relevant information via Web scraping and automated inference. Patent data are available from the World Intellectual Property Office[11] So are the metadata, and often the full text, for many research

---

10 http://www.gpo.gov/fdsys/pkg/PLAW-107publ347/pdf/PLAW-107publ347.pdf

11 http://www.wipo.int/patentscope/en/

publications.[12] It is also possible to more efficiently trace researcher activities through automated methods such as ORCID, which is described in the Data and Methodology White Paper.

3.3 Better Analysis: An Independent Analytical Community and Voice

The science advisor to President Bush, Jack Marburger, pointed out the need for better analysis with his usual eloquence:

> "The inevitable absence of policy discipline in U.S. federal government decision-making creates an imperative for some system of public education that fosters rational policy outcomes. The existence of an academic field of science of science policy is a necessary precondition for such a system. Policies can be formed and carried through rationally only when a sufficient number of men and women follow them in a deep, thoughtful, and open way. Science policy, in its broadest sense, has become so important that it deserves the enduring scrutiny from a profession of its own. This is the promise of the academic discipline of the science of science policy."(*2*)

The emerging field of sports statistics should be emulated for investments in R&D. The Massachusetts Institute of Technology holds annual conferences on Sports Analytics – in which such soccer focused companies as StatsEdge (the analysts used by Croatia) present and share knowledge about new technical ways of using data to improve decision-making[13]. The same should be done for the analysis of public R&D. Researchers could make use of frontier computational and statistical approaches to combine (i) existing data from science funders on what has been funded, (ii) existing data from research organizations on who has been funded and other key inputs into the production of science, and (iii) new types of data on research results from wide-ranging online, administrative and statistical sources.

In the United States, just such a community infrastructure has been built. A university led coalition has established the Institute for Research on Innovation and Science (IRIS website

[12] See for example http://rd-dashboard.nitrd.gov/
[13] https://www.stats.com/edge-2/

at http://iris.irs.umich.edu). In that coalition, 55 universities are in varying stages of discussion and negotiation about joining IRIS, with 32 universities having fully executed MOUs, for a total of 87 campuses. Current IRIS member universities conducted roughly $22.6 billion in R&D (~31% of the national total) and granted almost 15,000 doctorates (~27% of the national total) in 2016, the most recent year for which these data are available. An extensive community of graduate students, postdocs and faculty has been established and access the data in a secure Virtual Data Environment.

The reports produced by IRIS are used in a broad range of activities by member institutions and other groups. Individual universities make use of the data products for both internal and external purposes. Internally the most common data users are Senior Research Officers and Graduate Deans. Externally, State and Federal Relations and Communications officers make use of IRIS reports and data in their work with the public and with state and federal elected officials. Aggregate IRIS data is also seeing wide use. For instance, the Big Ten Academic Alliance relied on IRIS data for portions of their most recent annual report. IRIS data were featured in a meeting between OMB Director Mick Mulvaney, AAU President Mary Sue Coleman, and the Presidents of the University of Michigan and Ohio State University. Additionally, IRIS data visualizations were used in two publications by the AAAS Lincoln Project. A selected list of publications is provided in the appendix.

4. Summary

Maintaining and expanding R&D requires building a better understanding of the returns to R&D investments. The conceptual framework described here provides a scientific basis for doing so – and in a way that the research community that is being studied can be engaged in describing both the inputs and outputs of research (step 2 of the New Yorker cartoon), as well as validating the results. This is the scientific approach to providing answers of what are the returns to R&D, and how can we use new data and tools to produce better returns.

5. References

[1] B. Hall and J. Mairesse, "Empirical studies of innovation in the knowledge-driven economy," *Econ. Innov. New Technol.*, no. 15, pp. 289–299, 2006.

[2] J. Mairesse, P. Mohnen, and E. Kremp, "The Importance of R&D and Innovation for Productivity: A Reexamination in Light of the French Innovation Survey," *Ann. Econ. Stat. / Ann. d'Économie Stat.*, 2005.

[3] Z. Griliches, "Productivity, R&D, and the data constraint," *Am. Econ. Rev.*, vol. 84, 1994.

[4] C. MacIlwain, "Science economics: What science is really worth," *Nature*, vol. 465, no. 7299, pp. 682–684, 2010.

[5] C. Corrado, J. Haskel, and C. Jona□Lasinio, "Knowledge spillovers, ICT and productivity growth," *Oxf. Bull. Econ. Stat.*, 2017.

[6] J. Haskel and S. Westlake, *Capitalism Without Capital: The Rise of the Intangible Economy*. Princeton University Press, 2017.

[7] National Research COuncil, "Data on Federal Research and Development Investments: A Pathway to Modernization," 2010.

[8] D. Walsh, "NOT SAFE FOR FUNDING: THE N.S.F. AND THE ECONOMICS OF SCIENCE," *The New Yorker*, 2013.

[9] J. Lane, "Science of Science and Innovation Policy." 2010.

[10] D. Lipinski, "The Science of Science and Innovation Policy," in *Opening statement, 9/23/2010*, 2010.

6. Appendix: Examples of What Can Be Done

Science Funding and Short-Term Economic Activity

Weinberg BA, Owen-Smith J, Rosen RF, Schwarz L, McFadden Allen B, Weiss RE, & Lane JI
***Science* 4 April 2014;** Vol. 344(6179), pp. 41-43 DOI: 10.1126/science.1250055
http://www.sciencemag.org/content/344/6179/41.full

Abstract
There is considerable interest among policy-makers in documenting short-term effects of science funding. A multiyear scientific journey that leads to long-term fruits of research, such as a moon landing, is more tangible if there is visible nearer-term activity, such as the presence of astronauts. Yet systematic data on such activities have not heretofore existed. The only source of information for describing the production of most science is surveys that have been called "a rough estimate, frequently based on unexamined assumptions that originated years earlier.

New Linked Data on Research Investments: Scientific Workforce, Productivity, and Public Value Lane JI, Owen-Smith J, Rosen RF, & Weinberg BA; **Research Policy December 2014;** *Vol. 44(9), pp. 1659-1671 DOI: 10.1016/j.respol.2014.12.013;* http://www.sciencedirect.com/science/article/pii/S0048733315000025

Abstract
Longitudinal micro-data derived from transaction level information about wage and vendor payments made by Federal grants on multiple US campuses are being developed in a partnership involving researchers, university administrators, representatives of Federal agencies, and others. This paper describes the UMETRICS data initiative that has been implemented under the auspices of the Committee on Institutional Cooperation. The resulting data set reflects an emerging conceptual framework for analyzing the process, products, and impact of research. It grows from and engages the work of a diverse and vibrant community. This paper situates the UMETRICS effort in the context of research evaluation and ongoing data infrastructure efforts in order to highlight its novel and valuable features. Refocusing data construction in this field around individuals, networks, and teams offers dramatic possibilities for data linkage, the evaluation of research investments, and the development of rigorous conceptual and empirical models. Two preliminary analyses of the scientific workforce and network approaches to characterizing scientific teams ground a discussion of future directions and a call for increased community engagement.

Wrapping It Up in a Person: Examining Employment and Earnings Outcomes for Ph.D. Recipients
Zolas N, Goldschlag N, Jarmin RS, Stephan P, Owen- Smith J, Rosen RF, McFadden Allen B, Weinberg BA, & Lane JI; *Science 11 December 2015;* Vol. 350(6266), *pp. 1367-1371;* DOI: 10.1126/science.aac5949
http://www.sciencemag.org/content/350/6266/1367.full
Supplementary material: http://econ.ohio-state.edu/weinberg/Science-aac5949_Zolas-SM-PUBLISHED.pdf

Abstract
In evaluating research investments, it is important to establish whether the expertise gained by researchers in conducting their projects propagates into the broader economy. For eight universities, it was possible to combine data from the UMETRICS project, which provided administrative records on graduate students supported by funded research, with data from the U.S. Census Bureau. The analysis covers 2010–2012 earnings and placement outcomes of people receiving doctorates in 2009–2011. Almost 40% of supported doctorate recipients, both federally and nonfederally funded, entered industry and, when they did, they disproportionately got jobs at large and high-wage establishments in high-tech and professional service industries. Although Ph.D. recipients spread nationally, there

was also geographic clustering in employment near the universities that trained and employed the researchers. We also show large differences across fields in placement outcomes.

STEM Training and Early Career Outcomes of Female and Male Graduate Students: Evidence from UMETRICS Data Linked to the 2010 Census

Buffington C, Cerf B, Jones C, & Weinberg BA; ***American Economic Review*** **May 2016;** 106(5), pp. 333–338
DOI: 10.1257/aer.p20161124 ; https://www.aeaweb.org/articles?id=10.1257/aer.p20161124

Abstract
Women are underrepresented in science and engineering, with the underrepresentation increasing in career stage. We analyze gender differences at critical junctures in the STEM pathway–graduate training and the early career–using UMETRICS administrative data matched to the 2010 Census and W-2s. We find strong gender separation in teams, although the effects of this are ambiguous. While no clear disadvantages exist in training environments, women earn 10% less than men once we include a wide range of controls, most notably field of study. This gap disappears once we control for women's marital status and presence of children.

Why the U.S. Science and Engineering Workforce is Aging Rapidly

Blau D, & Weinberg BA; ***Proceedings of the National Academy of Sciences*, 14 February 2017;** Vol. 114(15), 3879-3884 DOI: 10.1073/pnas.16117481114/-/DCSupplemental;
http://www.pnas.org/content/114/15/3879.short

Abstract

The science and engineering workforce has aged rapidly in recent years, both in absolute terms and relative to the workforce as a whole. This is a potential concern if the larger number of older scientists crowds out younger scientists, making it difficult for them to establish independent careers. In addition, scientists are believed to be most creative earlier in their careers, so the aging of the workforce may slow the pace of scientific progress. The authors developed and simulated a demographic model, which shows that a substantial majority of recent aging is a result of the aging of the large baby boom cohort of scientists. However, changes in behavior have also played a significant role, in particular a decline in the retirement rate of older scientists, induced in part by the elimination of mandatory retirement in universities in 1994. Furthermore, the age distribution of the scientific workforce is still adjusting. Current retirement rates and other determinants of employment in science imply a steady-state mean age 2.3 years higher than the 2008 level of 48.6.

Proximity and Economic Activity: An Analysis of Vendor-University Transactions

Goldschlag N, Lane JI, Weinberg BA , Zolas, N; ***Journal of Regional Science,*** **2018: 1-20;** DOI: 10.111/jors.12397
https://onlinelibrary.wiley.com/doi/abs/10.1111/jors.12397

Abstract

This paper uses transaction□based data to provide new insights into the link between the geographic proximity of businesses and associated economic activity. It develops two new measures of, and a set of stylized facts about, the distances between observed transactions between customers and vendors for a research intensive sector. Spending on research inputs is more likely with businesses physically closer to universities than those further away. Firms supplying a university project in one year are more likely to subsequently open an establishment near that university. Vendors who have supplied a project, are subsequently more likely to be a vendor on the same or related project.

Research Experience as Human Capital in New Business Outcomes

Lane JI, Jarmin RS, Goldschlag N, & Zolas N

Forthcoming in CRIW volume on *The Measurement and Diffusion of Innovation*

Abstract

Human capital is typically cited as an important contributor to the survival, growth and innovative activity of new businesses. This paper contributes to the literature by both developing novel measures of human capital and examining the link between those measures and the outcomes of young firms. It builds on several strands of the literature which emphasize the importance of employee workplace experience as a dimension of human capital. It shows that the effects of work experience differ substantially by where an employee worked and is valued differently by firms in different sectors. This is particularly true for research experience, which is consistent with the notion that on the job training in complex tasks should be valuable to firms with complex production technologies. This paper will be included as a book chapter in the NBER CRIW volume on *The Measurement and Diffusion of Innovation* (Carol Corrado, Javier Miranda, Jonathan Haskel, and Daniel Sichel, eds., University of Chicago Press, forthcoming)

Media Mentions

- *Fix Incentives* (Nature: Perspective September 1, 2016) Julia Lane
- *Who Feels the Pain of Science Research Budget Cuts?* (The Conversation/Salon March 29, 2017) Bruce Weinberg
- *A call to action to build social science data infrastructure* (Nature Human Behaviour April 7, 2017) Julia Lane
- *The social sciences need to build new foundations* (Significance Magazine June 9, 2017) Julia Lane
- *Watching the players, not the scoreboard* (Nature: Comment November 2, 2017) Julia Lane

- *Tax bill would imperil nation's innovation, future* (Columbus Dispatch December 14, 2017)
  Bruce Weinberg, Jason Owen-Smith, and Julia Lane
- *A roadmap to a nationwide data infrastructure for evidence-based policy making* (ANNALS, AAPSS, Vol 675, Issue 1, January 2018) Andrew Reamer and Julia Lane
- *Building an infrastructure to support the use of government administrative data for program performance and social science research* (ANNALS, AAPSS, Vol 675, Issue 1, January 2018) Julia Lane
- *Biologists lose out in post-PhD earnings analysis* (Nature: News December 10, 2015)
- *Where new PhD grads find work — and who earns the most with their degree* (Washington Post December 10, 2015)
- *PhDs pay: study reveals economic benefit of funding doctorates* (Times Higher Education December 10, 2015)
- *Science and math PhDs earn about $65,000 — more than double what arts majors do* (Vox December 11, 2015)
- *ProQuest Dissertation Database Provides Critical Information for Research Projects Across the US* (PR Newswire March 22, 2016)
- *Assessment: Academic return* (Nature May 4, 2016)
- *There's a huge gender pay gap for STEM careers — just one year after graduation* (Vox May 11, 2016)
- *Facing Skepticism, colleges set out to prove their value* (PBS Newshour January 22, 2016)
- *The Price of Doing a Postdoc* (Science: Share January 10, 2017)
- *Trump Administration Proposes Big Cuts in Medical Research* (NPR Health Shots March 16, 2017)
- *Communicating the Value of University Research When Science is Under Attack* (Inside Higher Ed April 6, 2017)
- *The Looming Decline of the Public Research University* (Washington Monthly September/October 2017)