Guest Speaker Presentation Thursday Afternoon June 2015

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Institute for Research on Innovation and Science (IRIS)

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Key ideas

- Demonstrate value for money invested in research
- Document the value of education
- Insure permanent, independent, statistical evidence

Overview

- Background
- What has been achieved
- Immediate Next Steps
- The future

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Background

In 2012, our society invested $209 in academic research for every man, woman, and child in the US

- We make those investments to develop human knowledge and to improve quality of life and well being.
- How do we understand and improve those effects?

The Challenge

- Universities spend a lot on research, but we know too little about what those investments produce
- We have trouble
  - explaining and justifying what we do
  - modifying and improving our processes
  - documenting the full public value of our work
- Existing data and models are insufficient

One answer

Treat R&D funding like a straightforward investment, prioritize the *really* important stuff.

Prioritizing Grants

Even with a smaller budget, we can increase our investments in transformative science and basic research by simply setting priorities and better managing the resources available.

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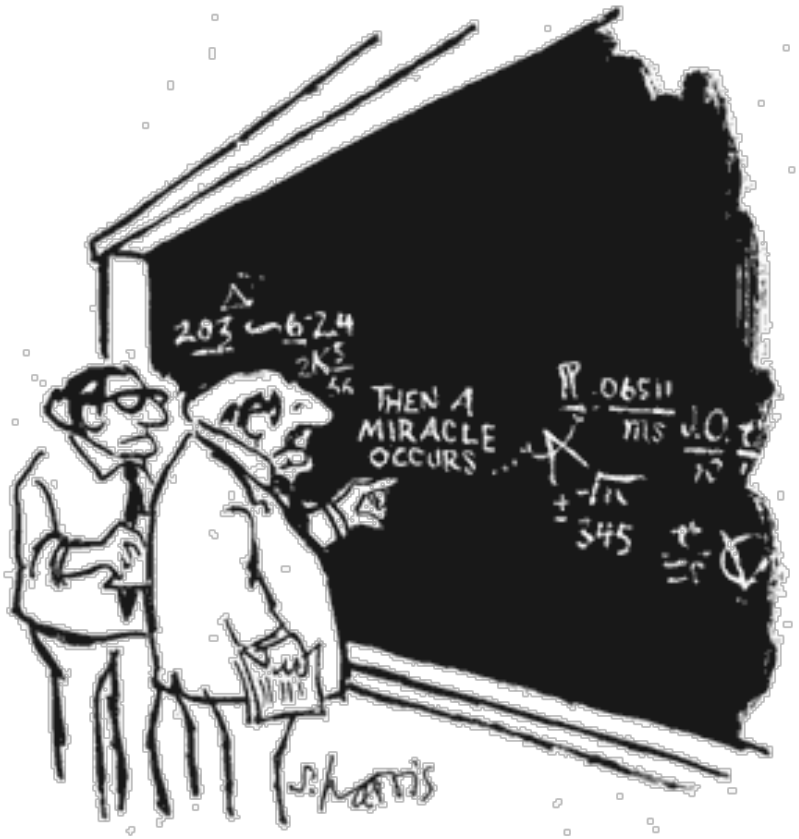
While the scientific mind seeks to understand all aspects of the world around us, some research topics are simply more likely to contribute to truly meaningful discoveries or knowledge.

Letter dated March 12, 2013, Senator Tom Coburn to Subra Suresh, NSF Director

Competing Budgetary Priorities



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

A conceptual framework

Our Response

- Establish a university-led institute to provide independent scientific evidence on the social and economic impact of research.
- Return timely, research-informed products to universities.

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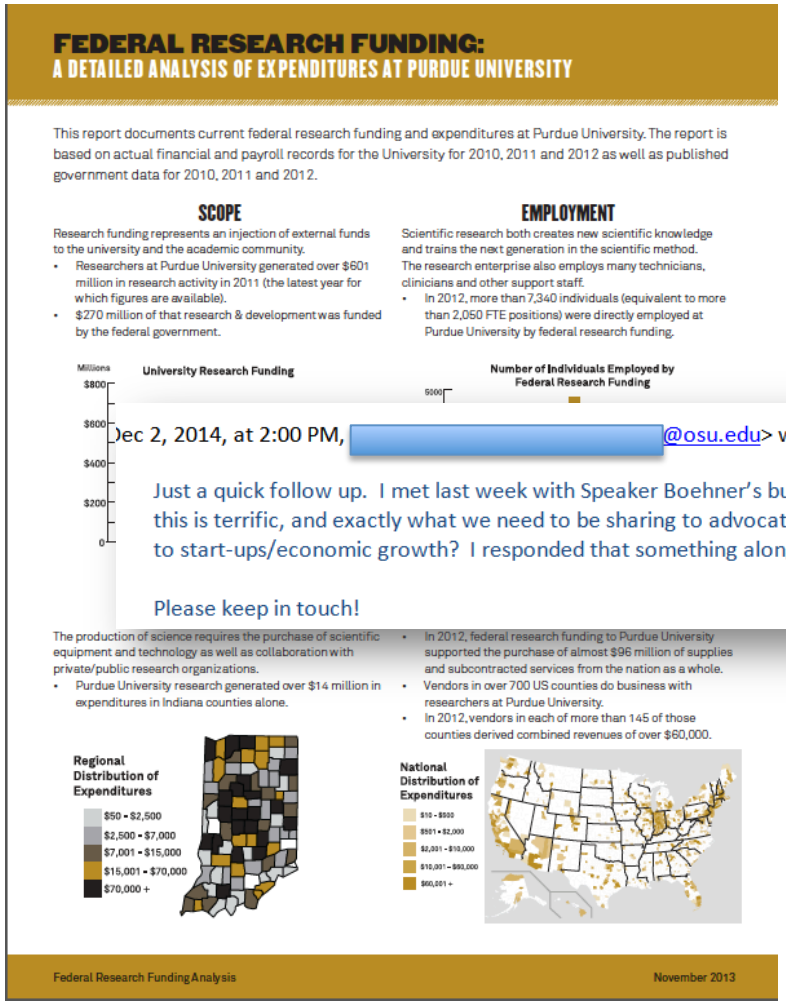
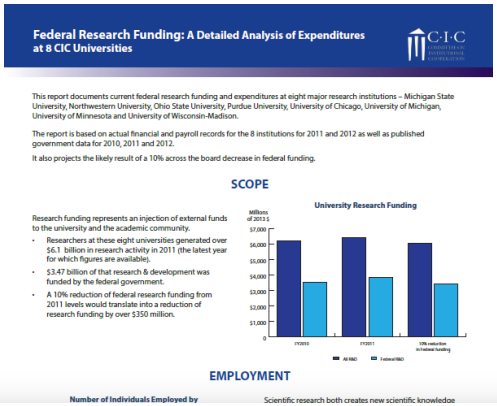
What has been achieved
UMETRICS + CENSUS

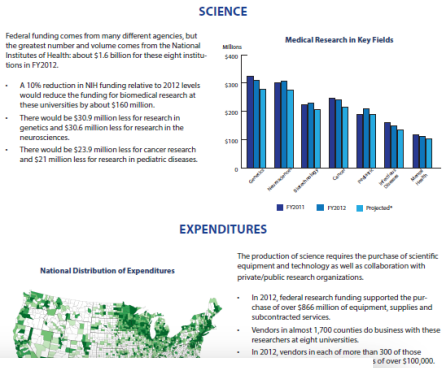
UMETRICS

- is a CIC initiative to create independent statistical evidence about the value of university research
- provides valuable information for outreach to Federal, State, and Local constituents
- integrates university administrative data with restricted U.S. Census Bureau data product

What has been produced







Dec 2, 2014, at 2:00 PM, [redacted]@osu.edu> wrote:

Just a quick follow up. I met last week with Speaker Boehner's budget/appropriations policy advisor and shared the Ohio State Umetrics 2 pager. She responded – this is terrific, and exactly what we need to be sharing to advocate for continued investments in federal research. And then she asked if this data could be linked to start-ups/economic growth? I responded that something along those lines was in the works.

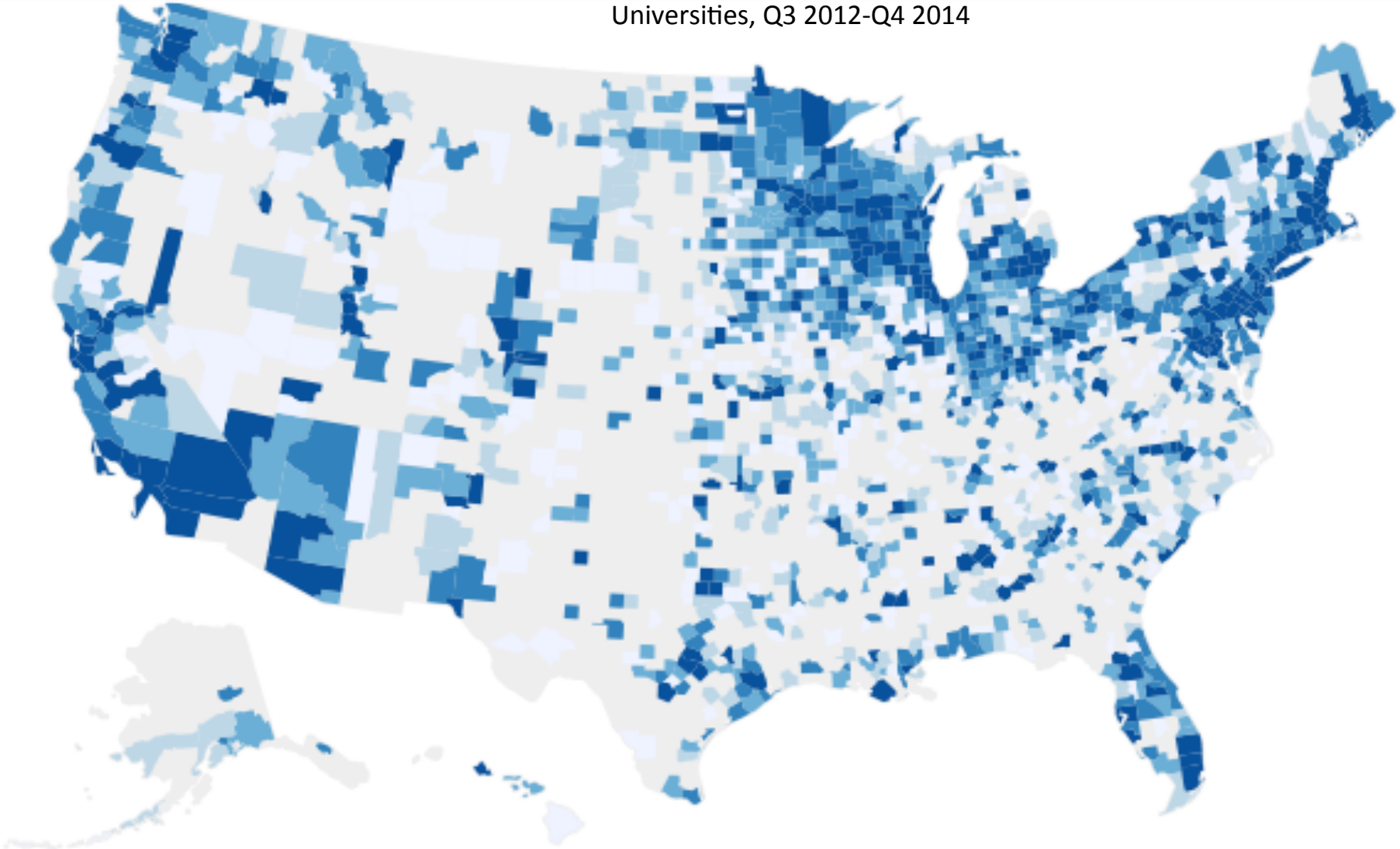
Please keep in touch!

- Michigan: state legislature/regents
- OSU: Boehner's office
- Purdue: state and federal delegations

UMETRICS currently provides

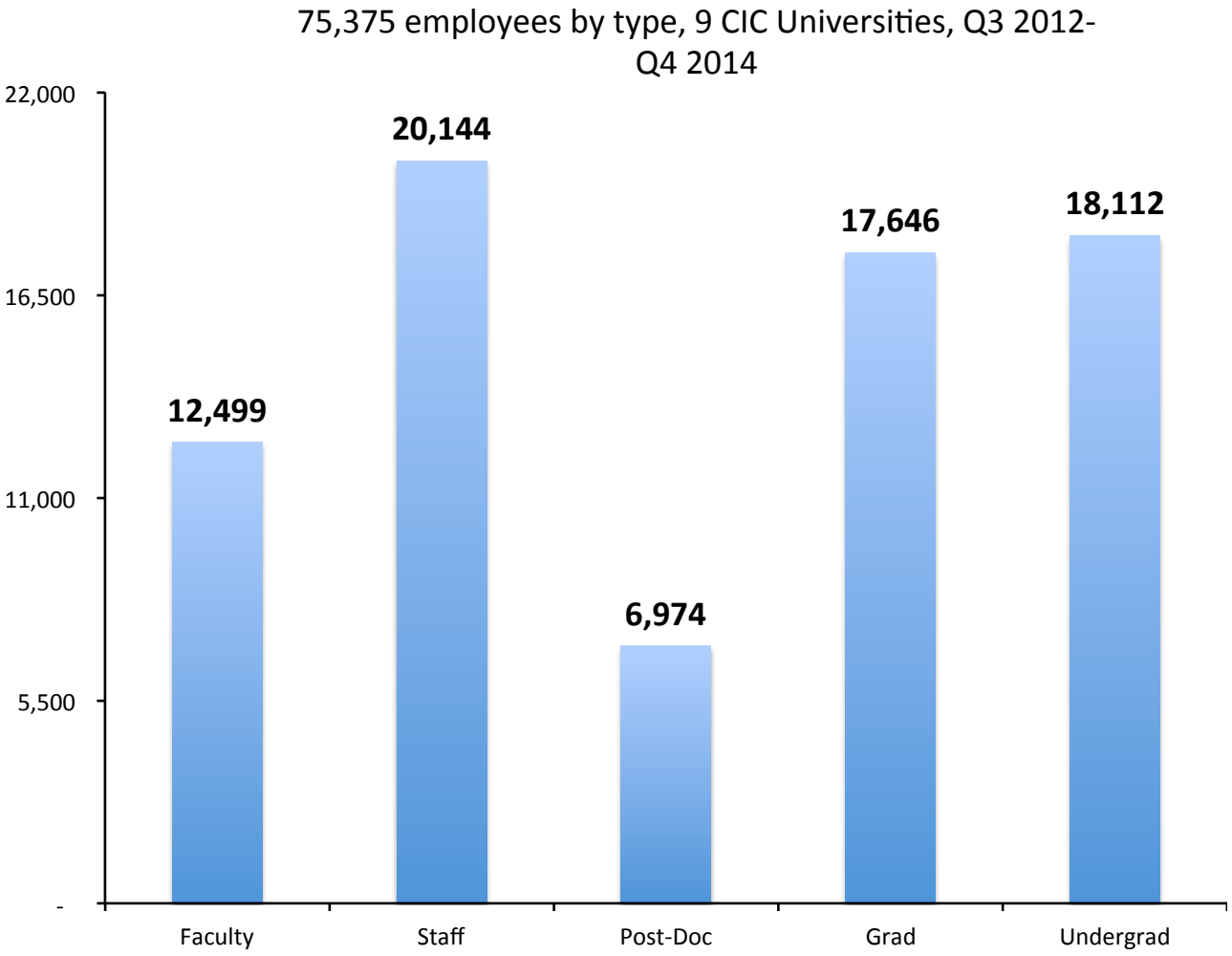
Independent statistical evidence about national, regional & local economic impact

$1.949 Billion in Direct Cost Vendor Purchases from 9 CIC Universities, Q3 2012-Q4 2014



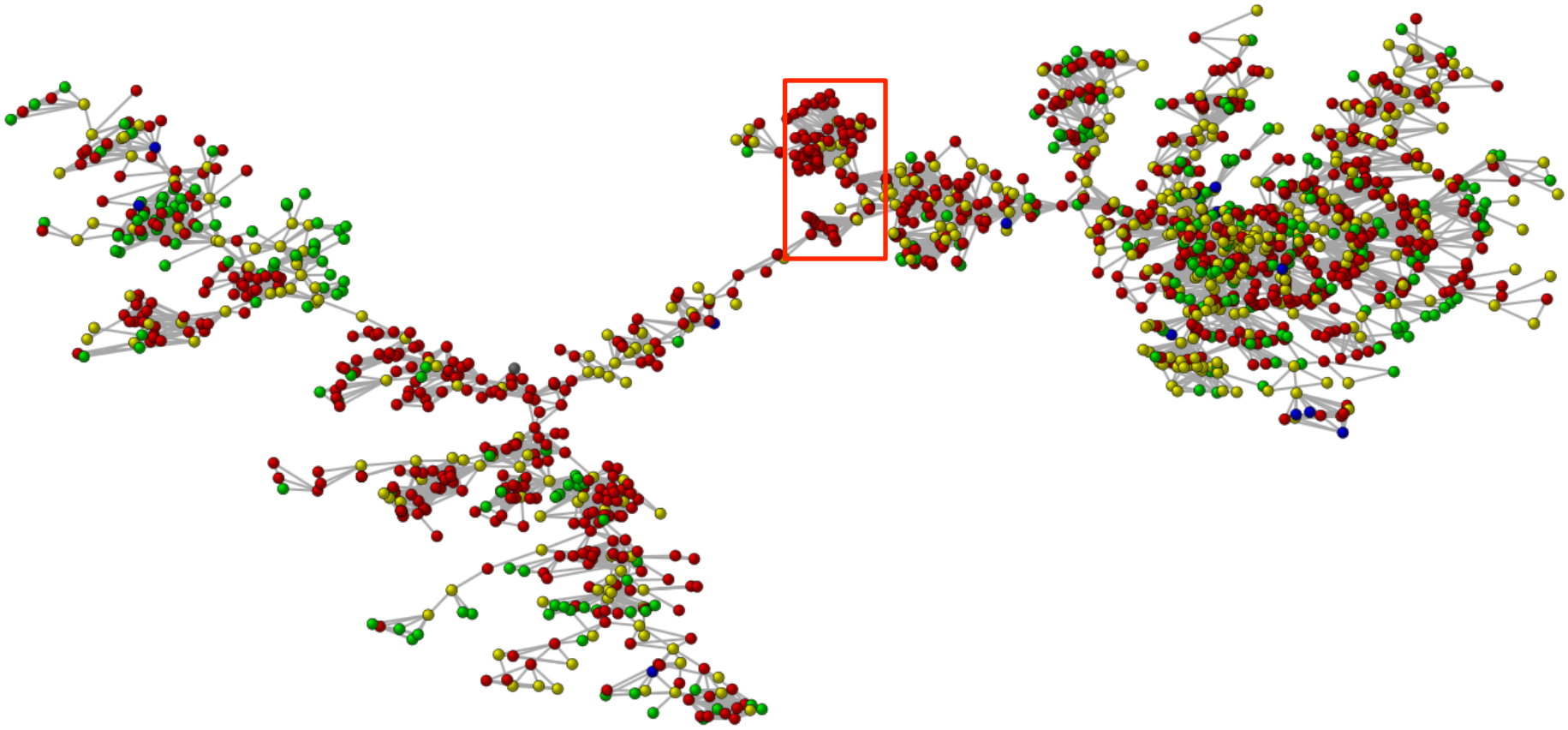
UMETRICS currently provides

Independent statistical evidence about academic workforce composition



UMETRICS Currently provides

Independent statistical evidence about academic research collaborations



Networks provide insights into conditions of training and their relationship to career outcomes

Links to academic outputs (publications, patents, grant information) inform innovation

Research outputs from this approach

POLICYFORUM

SCIENCE INNOVATION

Assessing the Impact of Science Funding

Julia Lane

Quantifying the outcomes of investment in science is not an easy task.

POLICYFORUM

RESEARCH FUNDING

Science Funding and Short-Term Economic Activity

Expenditures from grant funds support many different types of workers and vendors across the nation.

POLICYFORUM

RESEARCH FUNDING

Measuring the Results of Science Investments

Science agencies and research institutions are building the infrastructure to evaluate results of federal funding of scientific research.

nature

OPINION

Let's make science metrics more scientific

An open and consistent system for measuring academic performance, based on reasoned theory, would boost science, says Julia Lane.

ARTICLE IN PRESS

Research Policy xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

New linked data on research investments: Scientific workforce, productivity, and public value

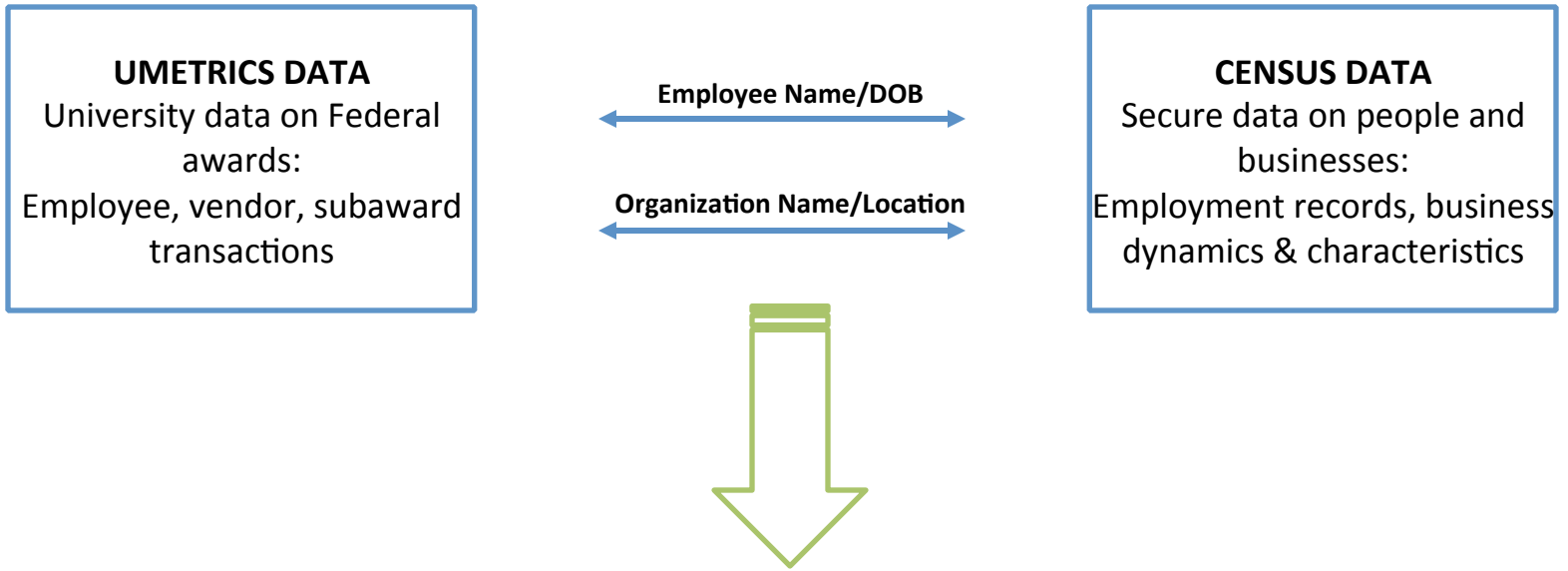
Julia I. Lane, Jason Owen-Smith, Rebecca F. Rosen, Bruce A. Weinberg

Census Links

- Census data contains information on (essentially) the population of organizations that employ people and the population of people who are employed in the US
- **Preliminary** findings rigorously screened to protect privacy
- More Census work remains to be done to validate
- No burden on universities – work all done at Census

Work done by Nikolas Zolas, Catherine Buffington, Nathan Goldschlag & Julia Lane

Linking UMETRICS to CENSUS data to generate new indicators



Analyze by: Occupational category | Funding agency | Research area | Years since leaving university

Where do research employees get their next jobs?

2010 Cohort 2-digit NAICS

NAICS	NAICS Description	LBD	All Universities
11	Forestry, Fishing, Hunting, and Agriculture Support	1.12%	0.77%
21	Mining	0.59%	0.36%
22	Utilities	0.72%	0.32%
23	Construction	4.64%	2.63%
31-33	Manufacturing	9.75%	12.24%
42	Wholesale Trade		
44-45	Retail Trade		
48-49	Transportation and Warehousing		
51	Information		
52	Finance and Insurance		
53	Real Estate and Rental and Leasing		
54	Professional, Scientific, and Technical Services		
55	Management of Companies and Enterprises		
56	Administrative and Support and Waste Management and Remediation Services		
62	Health Care and Social Assistance		
71	Arts, Entertainment, and Recreation		
72	Accommodation and Food Services		
81	Other Services (except Public Administration)		

2010 Cohort 3-digit NAICS (Manufacturing)

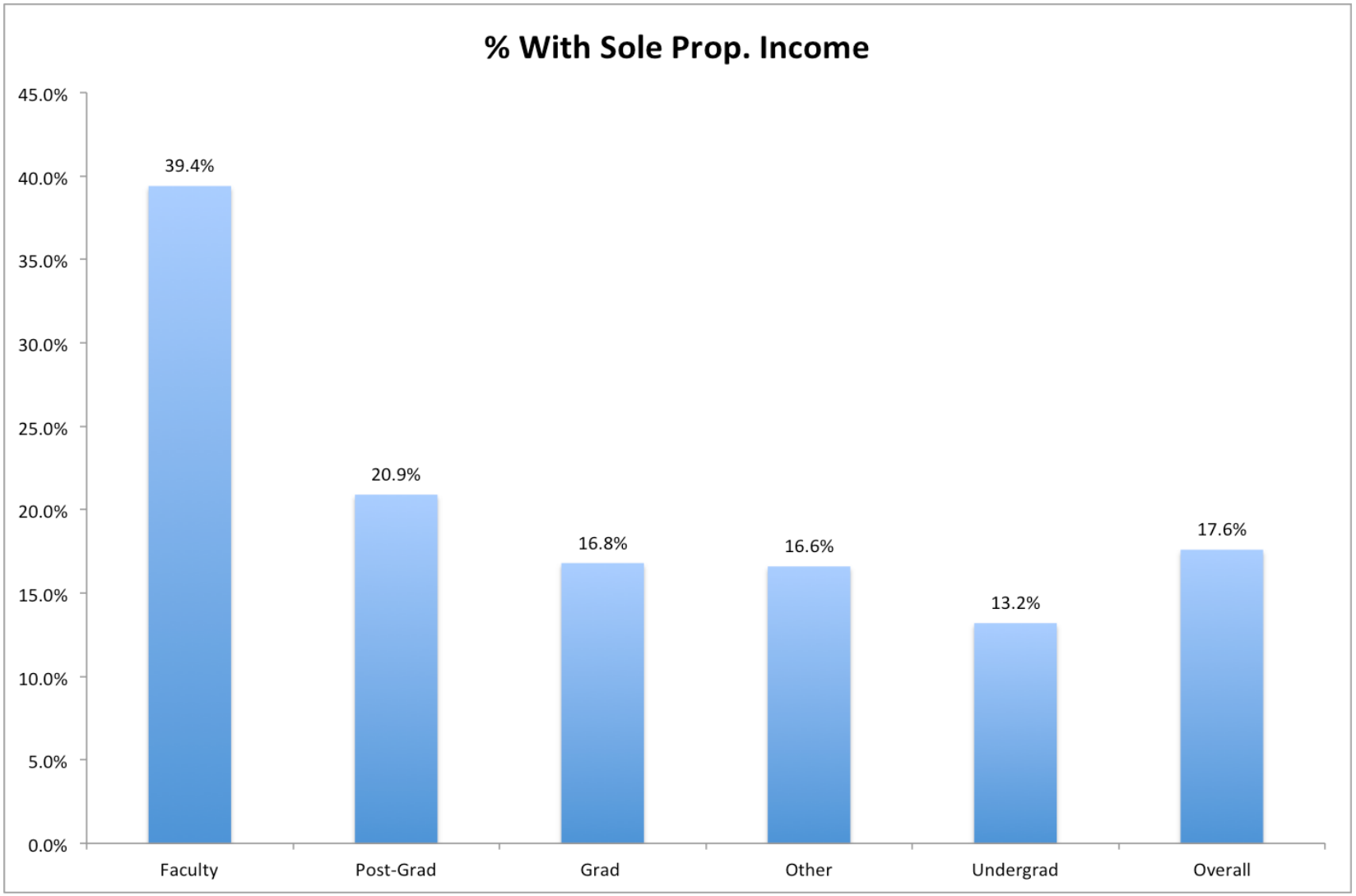
NAICS	NAICS Description	LBD	All Universities
330	Primary Metal Manufacturing	0.00%	0.01%
331	Primary Metal Manufacturing	0.33%	0.28%
332	Fabricated Metal Product Manufacturing	1.18%	1.01%
333	Machinery Manufacturing	0.85%	1.38%
334	Computer and Electronic Product Manufacturing	0.78%	1.73%
335	Electrical Equipment, Appliance, and Component Manufacturing		
336	Transportation Equipment Manufacturing		
337	Furniture and Related Product Manufacturing		
339	Miscellaneous Manufacturing		
541	Professional, Scientific, and Technical Services		
621	Ambulatory Health Care Services		
622	Hospitals		
623	Nursing and Residential Care Facilities		
624	Social Assistance		

2010 Cohort 4-digit NAICS (Computer & Electronics Manufacturing)

NAICS	NAICS Description	LBD	All Universities
3341	Computer and Peripheral Equipment Manufacturing	0.06%	0.26%
3342	Communications Equipment Manufacturing	0.10%	0.17%
3343	Audio and Video Equipment Manufacturing	0.01%	0.02%
3344	Semiconductor and Other Electronic Component Manufacturing	0.25%	0.54%
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	0.34%	0.74%
3346	Manufacturing and Reproducing Magnetic and Optical Media	0.01%	0.00%
5411	Legal Services	1.02%	1.23%
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	1.15%	1.29%
5413	Architectural, Engineering, and Related Services	1.13%	1.92%
5414	Specialized Design Services	0.09%	0.04%
5415	Computer Systems Design and Related Services	1.30%	1.99%
5416	Management, Scientific, and Technical Consulting Services	0.86%	1.67%
5417	Scientific Research and Development Services	0.63%	0.00%

Over three years (2010 – 2012) just over 59% get jobs in industry, just under 33% get jobs in academia.

How many are entrepreneurs?



N= 6294 N= 2296 N= 6057 N= 29938 N= 5690 N=50275

PRELIMINARY RESULTS Please do not cite
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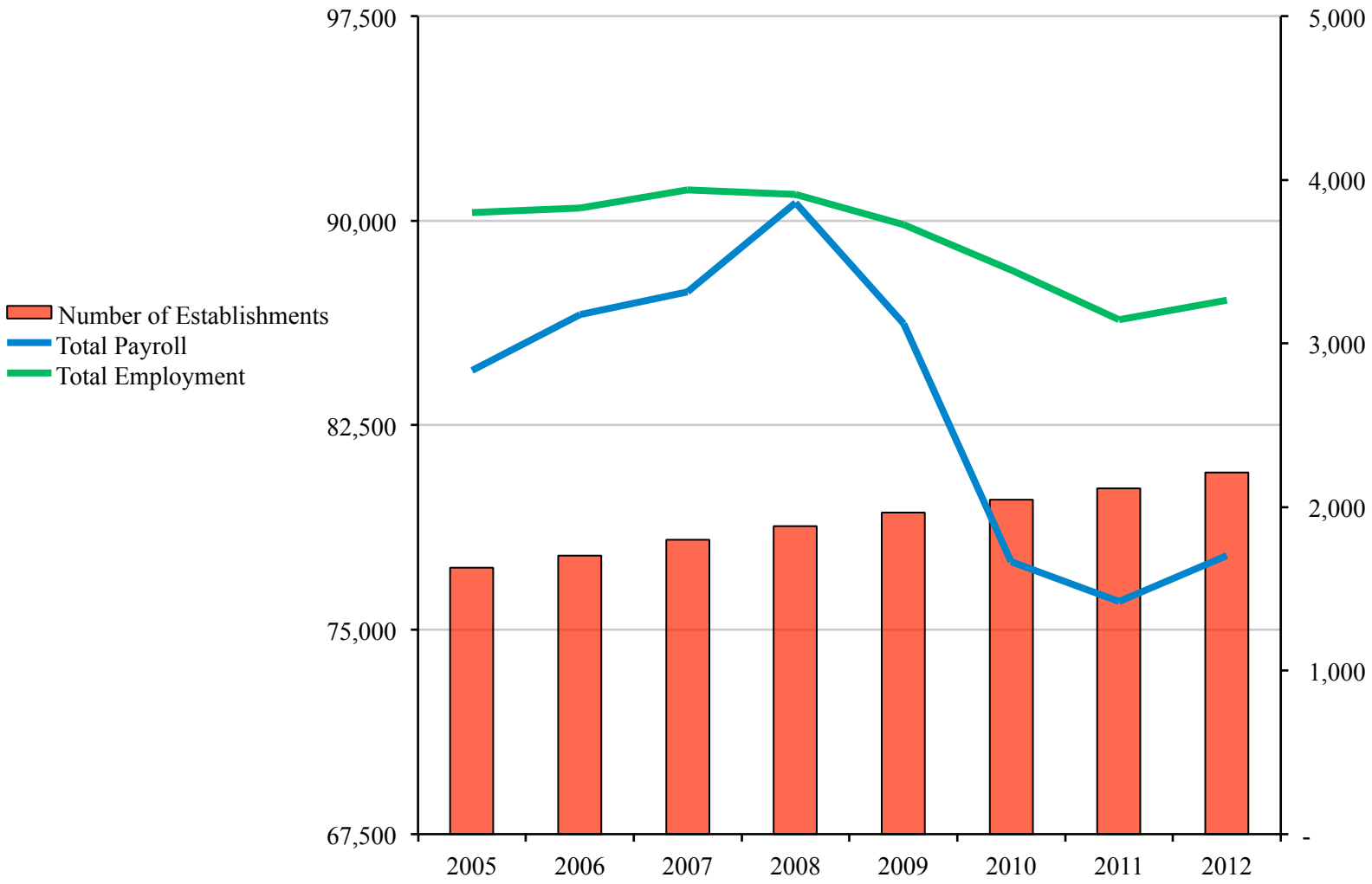
Business Dynamics for the Companies They Found



1700-2200 new firms employing **3000-4000** people **per year** (2005-2012)

PRELIMINARY RESULTS Please do not cite
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Vendor Activity by Industry

- At a single university we find a focus on
  - Semiconductors and electronics
  - Engineering services
  - Research services

NAICS	NAICS Description	Univ X	US
331	Primary Metal Manufacturing	0.20%	0.36%
332	Fabricated Metal Product Manufacturing	9.68%	1.68%
333	Machinery Manufacturing	4.67%	0.92%
334	**Computer and Electronic Product Manufacturing**	**17.63%**	0.62%
335	Electrical Equipment, Appliance, and Component Manufacturing	2.01%	0.25%
336	Transportation Equipment Manufacturing	0.47%	0.64%
337	Furniture and Related Product Manufacturing	0.53%	0.39%
339	Miscellaneous Manufacturing	1.63%	0.58%
541	**Professional, Scientific, and Technical Services**	**17.32%**	8.27%
	All 3-Digit Industries	100.00%	100.00%

NAICS	NAICS Description	Univ X	US
3341	Computer and Peripheral Equipment Manufacturing	1.11%	0.08%
3342	Communications Equipment Manufacturing	0.99%	0.08%
3343	Audio and Video Equipment Manufacturing	(D)	0.02%
3344	**Semiconductor and Other Electronic Component Manufacturing**	**8.25%**	0.21%
3345	**Navigational, Measuring, Electromedical, and Control Instruments Manufacturing**	**7.07%**	0.22%
3346	Manufacturing and Reproducing Magnetic and Optical Media	(D)	0.02%
5411	Legal Services	0.36%	1.44%
5412	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	0.28%	0.50%
5413	**Architectural, Engineering, and Related Services**	**7.55%**	1.25%
5414	Specialized Design Services	0.07%	0.22%
5415	Computer Systems Design and Related Services	2.93%	2.23%
5416	Management, Scientific, and Technical Consulting Services	1.23%	1.10%
5417	**Scientific Research and Development Services**	**4.60%**	0.29%
	All 4-Digit Industries	100.00%	100.00%

Top Vendor Industries – Detail

- How do these industries compare to the average?
- Mostly older, with more receipts and payroll, and higher average wages

NAICS	Share of Young Firms	Age	Employment	Payroll	Receipts	Average Wage	Employment Growth
Chemical Manufacturing	-20.56%	26.83%	120.66%	254.06%	416.06%	45.32%	126.67%
Fabricated Metal Product Manufacturing	-52.06%	49.30%	48.96%	82.10%	81.33%	15.25%	108.08%
Machinery Manufacturing	-51.24%	55.73%	80.40%	156.90%	160.11%	34.46%	161.60%
Computer and Electronic Product Manufacturing	-27.57%	27.02%	102.16%	227.21%	202.75%	51.79%	28.19%
Miscellaneous Manufacturing	-28.11%	23.76%	3.71%	23.17%	24.39%	-0.90%	10.38%
Merchant Wholesalers, Durable Goods	-25.05%	17.04%	-23.66%	11.12%	196.09%	35.27%	-26.38%
Merchant Wholesalers, Nondurable Goods	-12.29%	10.42%	-10.13%	16.95%	493.91%	23.75%	-25.37%
Professional, Scientific, and Technical Services	9.58%	-14.28%	-48.76%	-16.26%	-37.42%	45.81%	-29.26%

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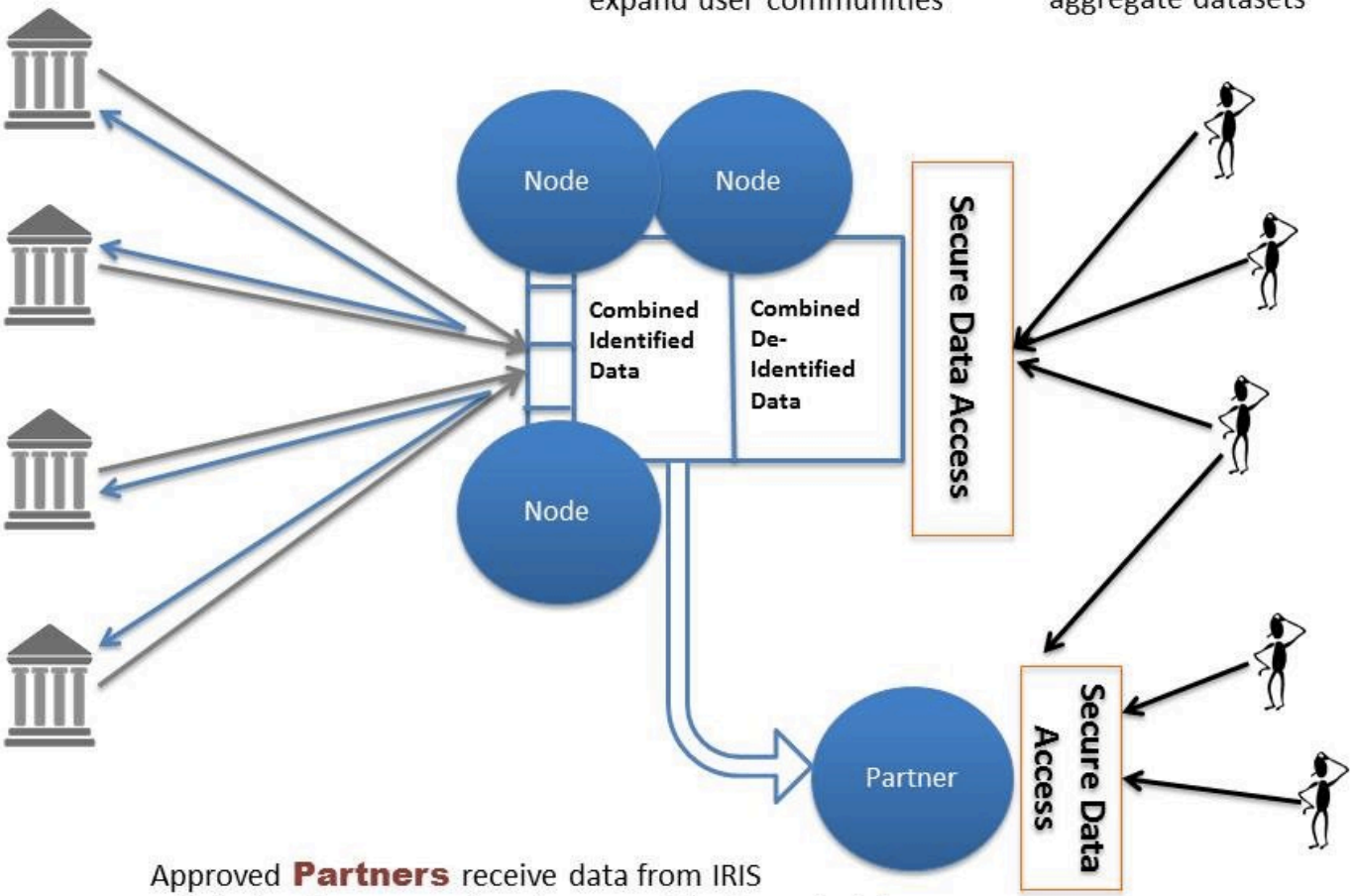
The **Institute for Research on Innovation & Science (IRIS)** is a new, IRB-approved platform to make UMETRICS a trusted and permanent national data resource for the academic community. It is member-driven, created by and for universities. IRIS's core data facility is located at the University of Michigan's Institute for Social Research.

Institute for Research on Innovation & Science (IRIS)

Member universities contribute data, support infrastructure and receive campus-specific and aggregate products

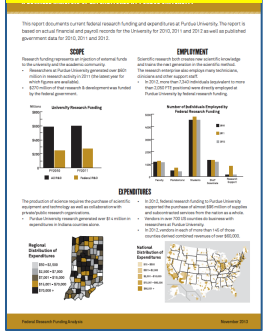
Approved **Nodes** materially improve data, develop products, and expand user communities

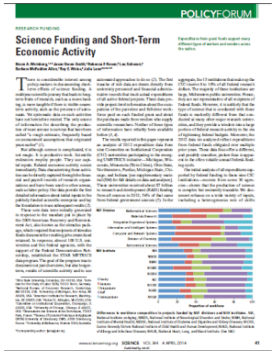
Approved **Users** securely access de-identified, aggregate datasets



Approved **Partners** receive data from IRIS which they improve and make accessible through their own secure systems

Creating new research and reports





UMETRICS @ IRIS

UMETRICS participants:

Goal: National Coverage in 3-5 Years

- >150 institutions
- All 50 states
- >90% R&D Spending

Seed Funding for IRIS infrastructure:

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Future Possibilities

New work with existing data

1. National workforce (particularly post-doc) composition
2. Network of subcontract relationships across campuses allows e.g. analysis of initial and sustaining effects of multi-institution investments (e.g. STCs, EERCs, CTSAs, infrastructure commitments)
3. National distribution of vendor spending by county/congressional district

Additional research through Census Research Data Center Network

Future Possibilities

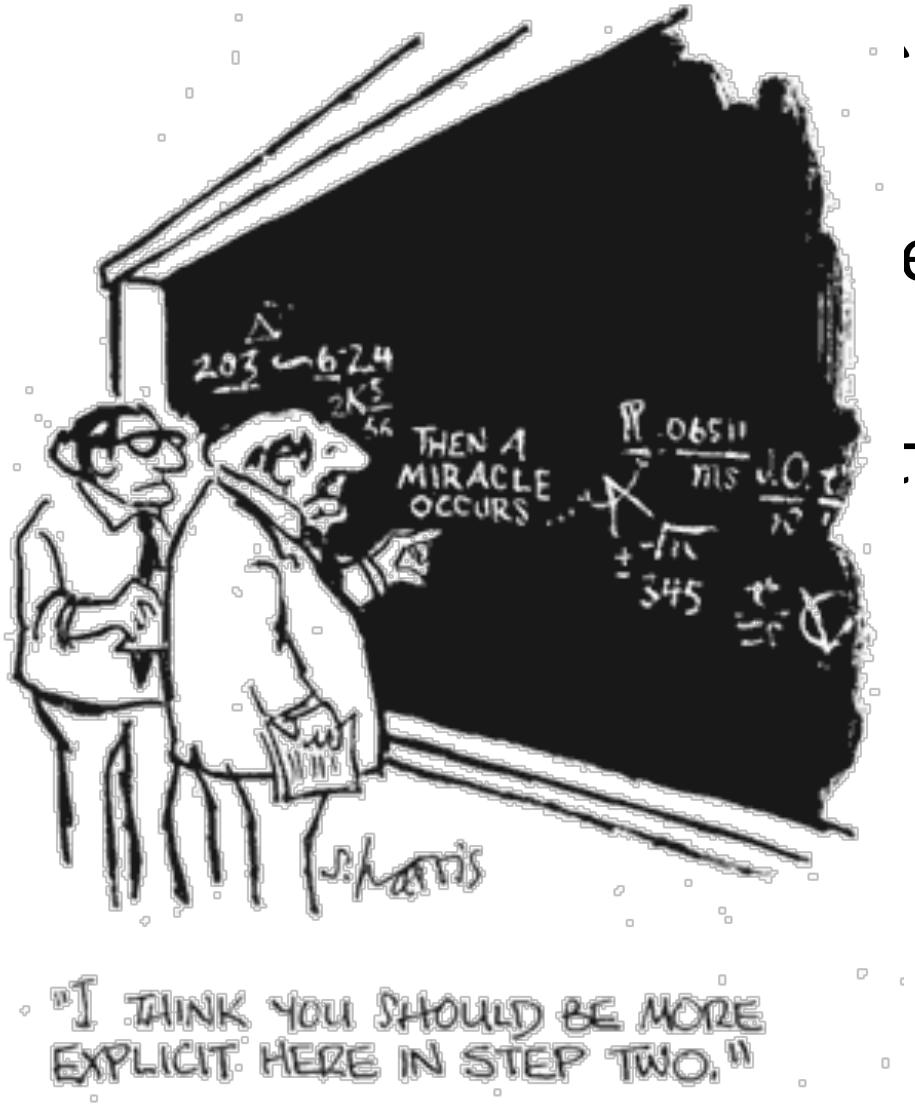
Future Possibilities with linkages include

1. Economic outcomes (e.g. placement rates, earnings/career trajectories, startups/firm productivity & growth) by agency, topic, mechanism.
2. Scientific outcomes (e.g. dissertation/publication/patenting outcomes) through partnership with libraries (ARL and SHARE)
3. Undergraduate engagement in research, educational, and career outcomes

Additional research through Census Research Data Center Network

Key ideas

- Demonstr ed in research
- Document
- Insure per istical evidence



- IRIS is open to "early adopting" member institutions through **September 1, 2015**
- Early adopters will help finalize governance structure
- IRIS will reopen to new members when national governance is in place
- Contact **Jason Owen-Smith (jdos@umich.edu)** with questions about becoming an "early adopter"

Questions & Reactions?

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Thank You