

Beyond Patents: Recent Work from NSF Science of Science & Innovation Policy (SciSIP) Program

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National Science Foundation

Government University Industry Research Roundtable

Better Tools Needed to Assess Impact of Science

John H. Marburger, 2005 AAAS Forum



Objective of the SciSIP program

- *“Support research designed to advance the scientific basis of science and innovation policy”*
- Research funded develop &/ improves and expands:
 - Models
 - Analytical tools
 - Data and metrics
- ...that can be applied in the science policy decision making process

If patents fall short
then what?

Beyond Patents

Three recent examples

- IProduct: A database of Linked Products-intellectual Property Rights
- Measuring R&D knowledge diffusion through large databases
- Measuring American Corporate Science
- Conclude with ideas for follow-up

EAGER 1645264:

IProduct: A database of Linked Products-intellectual Property Rights

Gaetan de Rassenfosse & Marie Thursby

- The 2011 Leahy-Smith America Invents Act
 - Virtual Patent Marking (VPM)
- Links innovative goods sold in the U.S. economy to the patents upon which they are based.
 - Tracks innovation to the point where it meets consumers, the true commercial end point of investments in science

TiVo Inc. is a leading provider of advanced television products, and TiVo's technology can be found in TiVo's retail products and in certain products offered by TiVo's commercial partners.

This page is intended to serve as notice under 35 U.S.C. § 287(a).

Retail Products

TiVo BOLT and BOLT+ U.S. Pat. Nos. D435,561, D445,801, 6,233,389, 6,327,418, 6,385,739, 6,490,722, 6,642,939, 6,643,798, 6,728,713, 6,757,837, 6,757,906, 6,792,195, 6,847,778, 6,850,691, 7,228,556, 7,321,716, 7,409,546, 7,493,015, 7,529,465, 7,543,325, 7,558,472, 7,661,121, 7,665,111, 7,779,437, 7,779,446, 7,840,986, 7,861,258, 7,877,768, 7,882,520, 7,889,964, 7,895,633, 7,933,950 7,934,170, 7,986,868, 8,036,514, 8,079,046, 8,107,795, 8,111,975, 8,135,264, 8,146,130, 8,171,285, 8,181,203, 8,220,021, 8,261,300, 8,301,648, 8,316,396, 8,321,901, 8,347,337, 8,443,389, 8,453,180, 8,453,193, 8,457,476, 8,464,309, 8,478,114, 8,526,781, 8,577,205, 8,660,410, 8,676,035, 8,812,850, 8,832,744, 8,943,527, 8,948,569, 8,959,099, 8,965,173, 8,965,182, 8,989,564, 9,036,981, 9,060,099, 9,083,941, 9,088,826, 9,106,881, 9,113,219. Other patents pending.

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TIVO
BOLT⁺

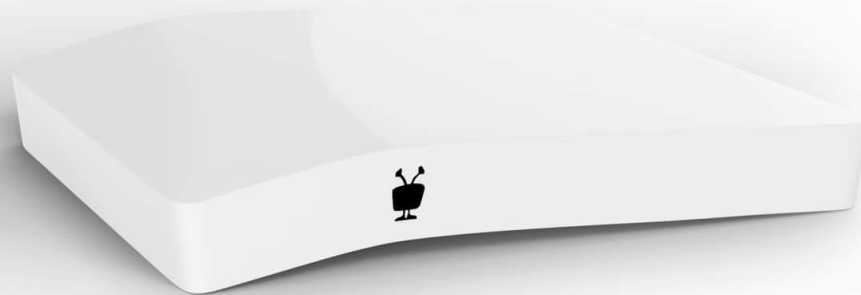


450
HD RECORDING HOURS

RECORD
6
SHOWS AT ONCE



TIVO
BOLT[®]



UP TO
150
HD RECORDING HOURS

RECORD
4
SHOWS AT ONCE



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IPRoduct: Linking Patents to Products



<http://iproduct.epfl.ch>

1735756:

Measuring R&D knowledge diffusion through large databases

Christine Freyman, SRI

- Connecting Patents with licensing agreements
 - Contracts for the use of IP
- Trace connections between federal funding and patenting and licensing
 - Extract government interest numbers from patents on a large scale
 - Link patents to projects in government funding databases
 - Extract licensing agreements from U.S. Securities and Exchange Commission (SEC)
- Link patents to their original sources of funding

Replaces hand curated or survey data

- 8,985 government interest acknowledgements on patents
- 4,653 unique government awards
- ~ 3,000 licensing agreements
- 48M publication records

Time to event for indicated events

Period	Mean (years)	Median (years)
Award to publication	2	2
Award to patent (direct)	9	8
Award to patent (linked by publication)	7	7
Award to license	12	10

EAGER 1643538:

Measuring American Corporate Science

Ashish Arora

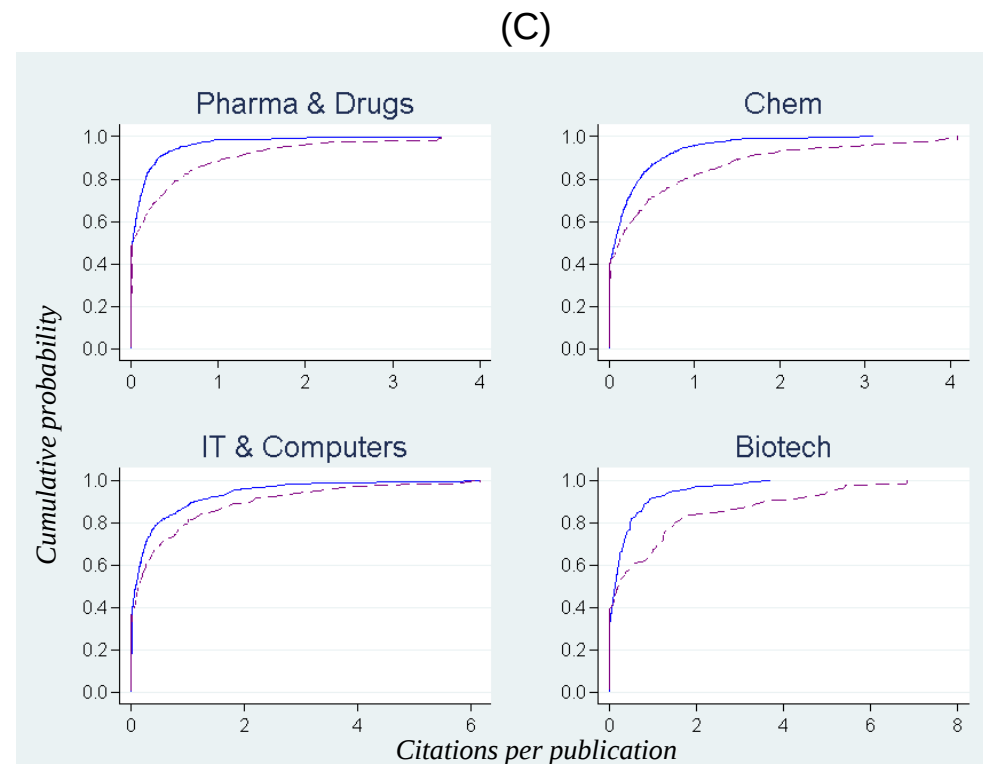
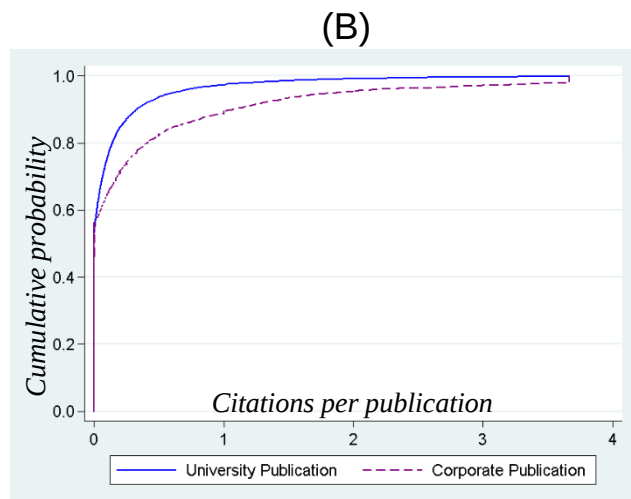
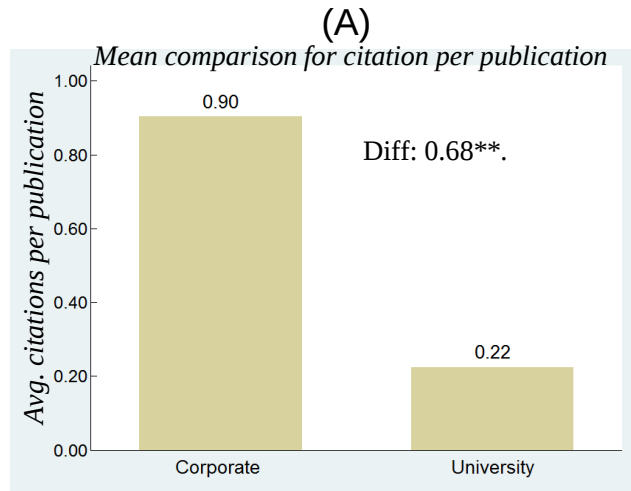
- The project links 4 million patents to about 20 million scientific articles
 - published between 1980 and 2006 from the Web of Science
 - New project extends to present time
- Patents are matched to about 4000 R&D performing publicly traded American corporations
- A firm can be characterized in terms of their contribution to science and their use of science.

More Linked Big Data

1. U.S. Compustat. Investment and stock market value for R&D performing publicly-listed firms
2. Scientific publications. Publications by firms (312k)
 - Automatic and manual match of Compustat and SDC to Thomson Web of Science (affiliation field)
3. Patents. Match USPTO and EPO patents to Compustat and SDC Platinum (M&A data)
4. Acquisitions. 29,752 acquisitions from Thomson SDC Platinum for the period 1985-2007
 - Deal value, shares acquired, assets, sales, industry
 - 2.5k publications and 115k patents
 - Track post-acquisition behavior

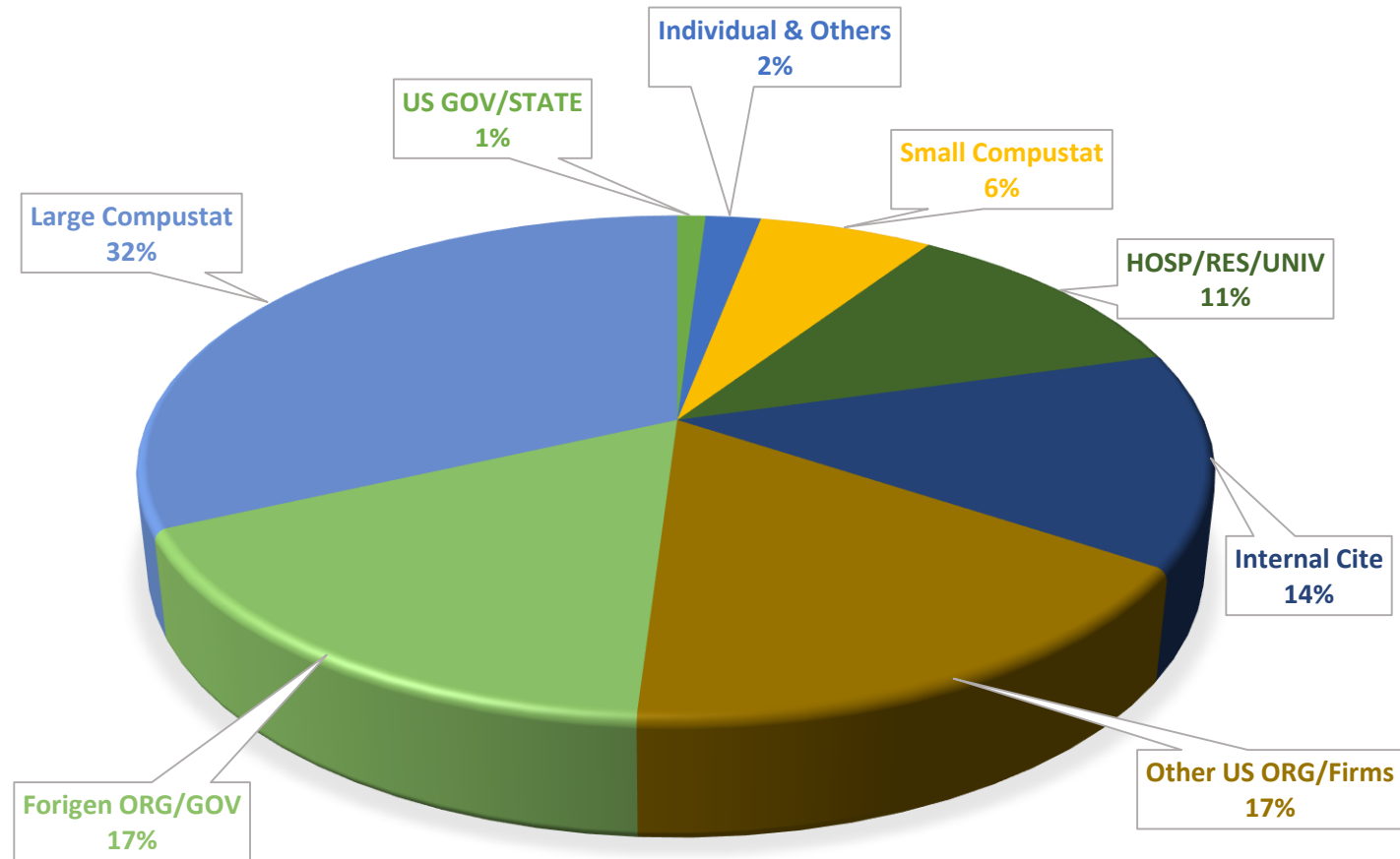
A corporate publication is six times more likely to be cited by a patent than a university publication

Use of University vs. Corporate Publications, 1980-2006



Note: The sample includes publications from the top 100 U.S. universities and corporate publications of our sample firms that were published over the sample period (1980-2006) and covered in Web of Science "Science Citation Index" and "Conference Proceedings Citation Index-Science". Patent citations per publication is measured by total citations (internal and external) per publication by corporate and non-corporate patents granted between 1980 and 2014. Figure A presents mean comparison for university vs. corporate publications by patent citation received per publication. Figures B and C plot the cumulative distribution of patent citations received per publication, by corporate and university publications. Number of patent citations per publication is presented with a proximity value in the 99th percentile of the sample. . Industry classification is based on the journal's subject category.

Who uses corporate science?



Notes: The sample includes all cited scientific publications published by our sample firms between 1980 and 2006 and cited through 2006. Large and Small Compustat firms are our Compustat sample firms with above and below an average of \$50m annual sales over the sample period, respectively. Internal citations include citations to the publications with at least one author employed by the firm.

Conclusions from Body of Work – Arora et al

- Results indicate that large firms are withdrawing from research
 - Large firms are investing less in research, and the stock market value of research is declining
 - Same patterns are reflected in acquisition price
- Decline in private value of science rather than increase in cost
 - Both value and quantity decline
- Pessimistic interpretation: Private research is in decline
 - Established companies can no longer emulate firms such as DuPont, AT&T or Merck
 - VC-backed firms are not substituting to “missing” corporate research
 - Increased importance of public funding?
- Less pessimistic interpretation: Established firms source inventions from universities
 - Reallocation of research from large corporate labs to more efficient and specialized research organizations
 - But, is university research substitutable for corporate research?

OUR LATEST INNOVATION
IS A GOOSE THAT LAYS
EGGS OF SOLID GOLD

THAT'S A DISTRACTION
FROM OUR CORE

AND WE HAVE
NO BUDGET FOR
GOOSE-RELATED
EXPENSES

ON THAT NOTE,
WE'LL NEED
THE FEATHERS
AND LIVER
FOR ANOTHER
PROJECT



Publicly Available Data

- The link to the website is <http://goldengoose.aipatents.com/CorpScience/>
 - Currently 1980-2006
- New Project extends data to 2016

Want to know more?

- https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501084
- Scienceofsciencepolicy.net
- New Platform for organizing outputs (Lee Fleming)
- To subscribe to the list: send the text “subscribe SCISIP” to listserv@listserv.nsf.gov
- Maryann Feldman, mfeldman@nsf.gov; maryann.feldman@gmail.com
- Phil Phan (after September 5, 2017)