

Who Needs Access to Research?

The Case of Pharmaceutical Industry

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Outline

- OA Usage beyond Academia
- Hypothesis
- Data Sources & Methodology
- Operational Variables
- Results
 - General Characteristics
 - Linear Regression
- Discussion
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OA Usage beyond Academia

- Qualifying the assumption that making research articles openly accessible to everyone will have an impact beyond academia
- This kind of “spillover” is usually cited in policies advocating Open Access
- Very little (mainly anecdotal evidence) is available so far:
 - “Likewise, almost no studies have evaluated whether free access to the scientific literature has had an impact on the use of scientific information in non-research contexts such as teaching, medical practice, industry, and government.” Davis et. al. (2011).

Pharmaceutical Industry

- Science-intensive
- Small companies suffer
- Several data sources available for industry
- “One cannot expect high productivity from the smaller emerging companies that collectively suffer from an inability to afford access to reports describing new discoveries in the biomedical sciences.” Lyman (2011)

Hypotheses

- Main Hypothesis:
 - Smaller firms utilize OA articles more than large firms
- Control Parameters:
 - As more OA articles become available, firms use more of them.
 - The ratio of non-OA articles cited by patents is higher when the patent is co-owned with a university.
 - The ratio of OA articles cited by patents is higher if the company collaborates with other companies (owner/partner)
 - The ratio of OA articles cited by patents is higher if the patented technology is not pharmaceutical

Data Sources



BUREAU VAN DIJK

Company information and business intelligence



DOAJ

DIRECTORY OF
OPEN ACCESS
JOURNALS

ROARMAP

Registry of Open Access Repository Mandates and Policies

Methodology

1. Collecting company financial data (those with A61K patents)
2. Matching patent data (grant date, collaborators, NPL citations)
3. Matching patent years with OA movement indicators
4. Running a Linear Regression to test hypotheses
5. Identifying patterns in company's access to scientific literature

Patent FrontPage

(12) **United States Patent**
Brune et al.

(10) **Patent No.:** **US 8,927,231 B2**

(45) **Date of Patent:** **Jan. 6, 2015**

(54) **SEPARATOME-BASED PROTEIN
EXPRESSION AND PURIFICATION
PLATFORM**

(71) Applicants: **Board of Trustees of the University of
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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/056,747**

(56) **References Cited**

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6,989,265	B2	1/2006	Blattner et al.	
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8,039,243	B2	10/2011	Blattner	
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2012/0183995	A1	7/2012	Ferrari et al.	
2012/0219994	A1	8/2012	Blattner et al.	

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EP 1483367 B1 5/2010

OTHER PUBLICATIONS

Amrein et al., "Purification and characterization of recombinant human p50csk protein-tyrosine kinase from an *Escherichia coli* expression system overproducing the bacterial chaperones GroES and GroEL" 92 Proceedings of the National Academy of Sciences USA 1048-1049 (1995).*

Shin et al., "Extracellular Recombinant Protein Production From an *Escherichia coli* Ipp Deletion Mutant" 101(6) Biotechnology and Bioengineering 1288-1296 (2008).*

Posfai et al., "Emergent Properties of Reduced-Genome *Escherichia coli*" 312 Science 1044-1046 (2006).*

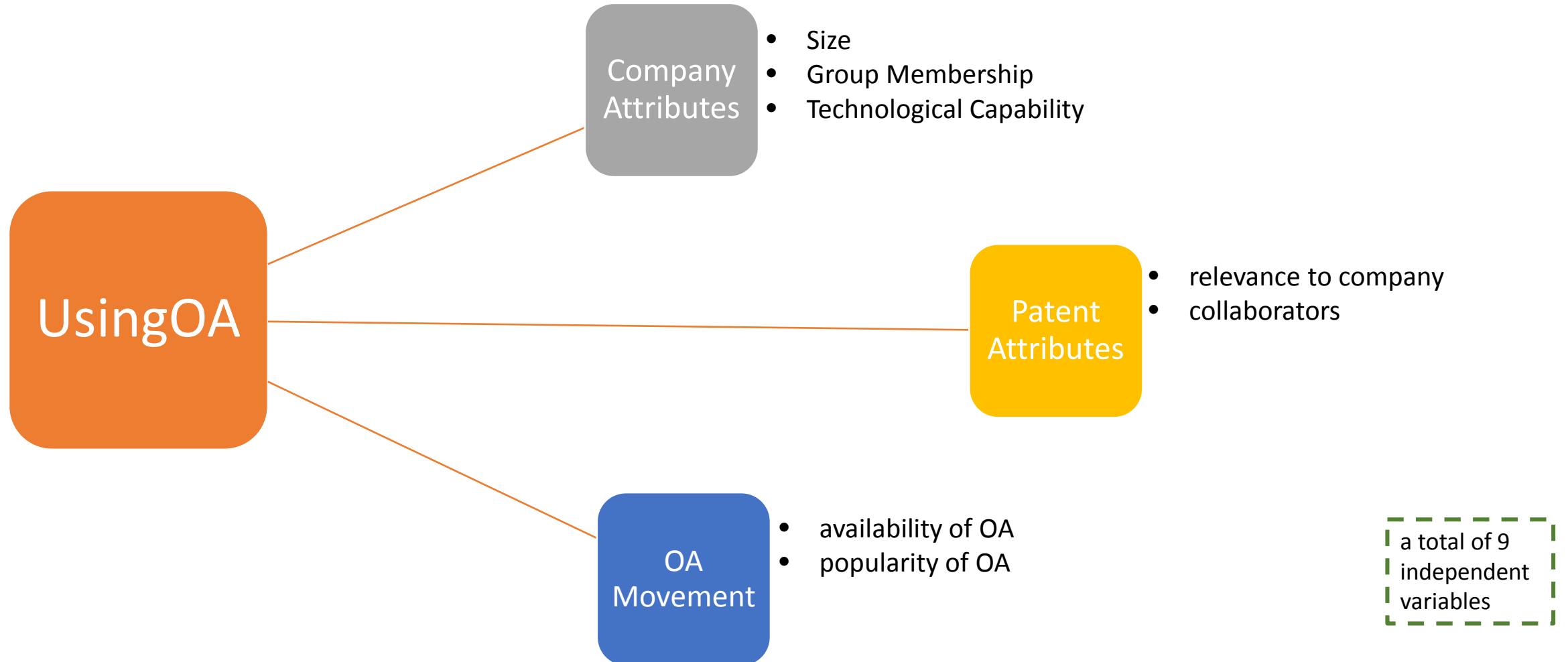
Yu et al. (2002) Nature Biotechnol. 20:1018-1023.

Acania et al. (2004) Journal of Molecular Recognition 17:236-247

Non-Patent Literature (NPL)

- journal articles
- search reports
- GeneBank records
- Company reports
- etc.

Regression Variables

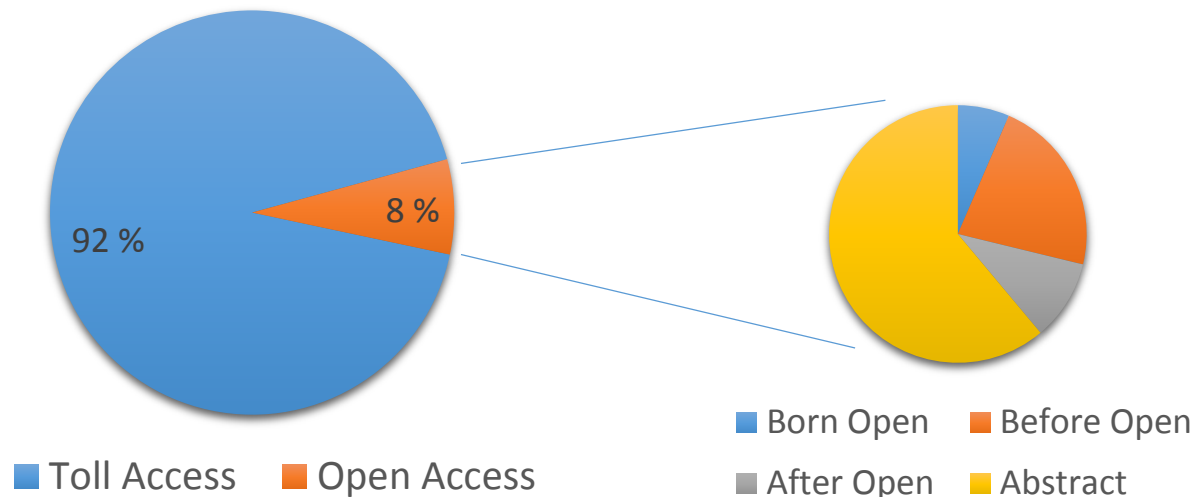


Operational Definitions

Variable of Interest	Corresponding Indicator
Using Open Access	citations to OA journals / all journals in non-patent citations
Company Size	turnover in USD (1 year before patent grant)
Company Size	number of employees (1 year before patent grant)
Company Technological Capability	total number of patent <u>documents</u> affiliated with the company
Patent Relevance	whether the patent is classified under A61, C07,C08,C12 (CPC)
University Collaborator	whether the company co-owns the patent with a university
Company Collaborator	whether the company co-owns the patent with another company
OA Availability	total number of DOAJ-listed journals (1 year before patent grant)
OA Awareness	total number of ROARMAP-listed OA mandates (1 year before patent grant)

Results (general)

Description	Company Count	Patent Count	Citation Count
All US Pharmaceutical Companies (excluding “very large”)	1447	13534	---
..... with US-registered patents between 2006 & 2015	654	9221	---
..... with matching financial data (1 year before patent grant)	354	1104	39037
..... that cite academic journals	280	825	28694
..... that cite Open Access journals	193	483	2177



Results (regression)

	Coefficients	Standard Error	P-value
Intercept	0.079528052	0.025225871	0.001677255
TurnoverUSDk	2.2716E-07	2.51463E-07	0.366604681
EmployeeCount	-8.57876E-05	4.55324E-05	0.059906983
GroupMember	0.003140609	0.033034095	0.924281221
RelatedClass	-0.001255594	0.020145863	0.950319173
PatentCount	-1.99357E-05	3.66052E-05	0.586167188
UnivCollab	-0.066499863	0.025620465	0.009613161
CompCollab	0.047283091	0.030029228	0.115744051
DOAJ	3.86958E-06	1.17576E-05	0.742155218
ROARMAP	3.30392E-05	0.000169614	0.845605189

Regression Statistics	
Multiple R	0.150487186
R Square	0.022646393
Adjusted R Square	0.011853531
Standard Error	0.167804525
Observations	825

Dependent Variable
OA Ratio = OA Count / Total Journal Count

	Coefficients	Standard Error	P-value
Intercept	0.754997	1.073173	0.481933
TurnoverUSDk	-3.5E-06	1.07E-05	0.745808
EmployeeCount	-0.00121	0.001937	0.533298
GroupMember	-1.47545	1.405354	0.294087
RelatedClass	0.893461	0.857056	0.2975
PatentCount	-0.00203	0.001557	0.192006
UnivCollab	-0.79038	1.08996	0.46857
CompCollab	0.272973	1.27752	0.830855
DOAJ	0.000332	0.0005	0.506531
ROARMAP	0.000828	0.007216	0.908621

Regression Statistics	
Multiple R	0.144167
R Square	0.020784
Adjusted R Square	0.009971
Standard Error	7.138832
Observations	825

Dependent Variable
OA Count

Results (regression, OA only)

	Coefficients	Standard Error	P-value
Intercept	0.303528	0.04541	6.55E-11
TurnoverUSDk	2.21E-07	3.62E-07	0.540544
EmployeeCount	-0.00013	6.69E-05	0.04881
GroupMember	0.049552	0.052425	0.345042
RelatedClass	-0.1439	0.038112	0.00018
PatentCount	1.52E-05	7.17E-05	0.832727
UnivCollab	-0.10512	0.038645	0.006767
CompCollab	0.08597	0.043991	0.051258
DOAJ	2.77E-05	1.91E-05	0.14808
ROARMAP	-0.00033	0.000282	0.23778

Regression Statistics	
Multiple R	0.266549
R Square	0.071048
Adjusted R Square	0.053373
Standard Error	0.190322
Observations	483

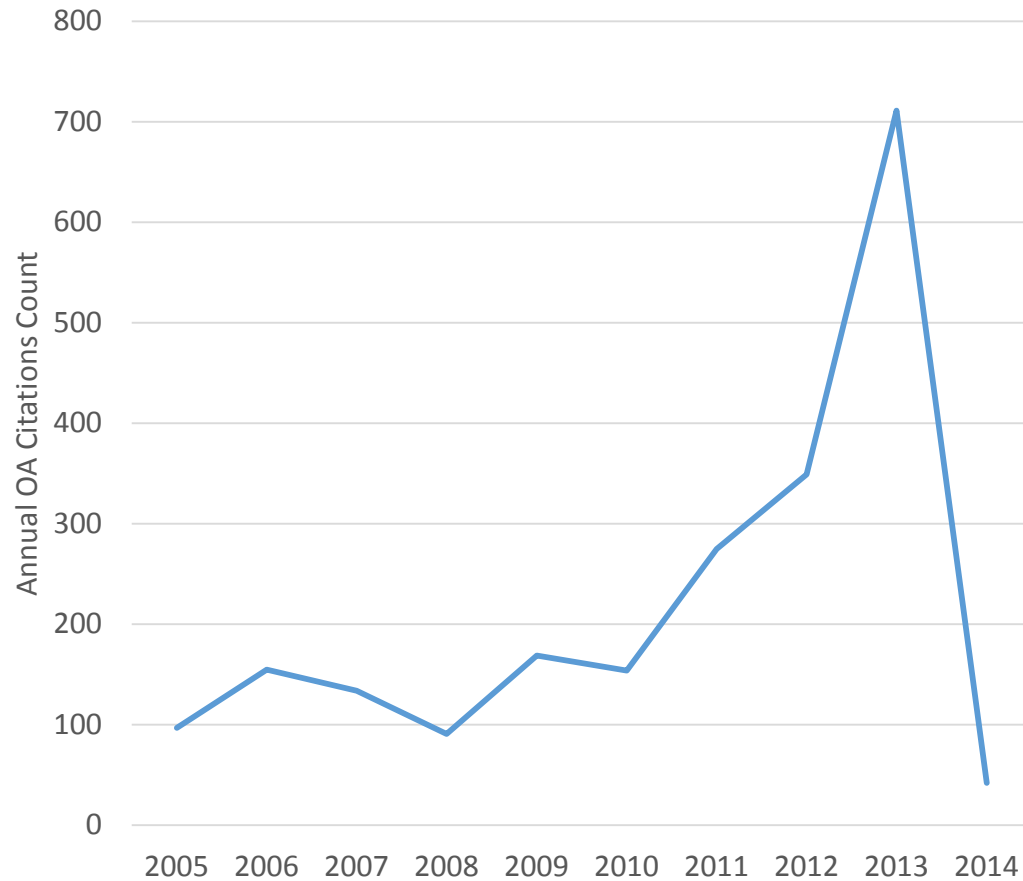
Dependent Variable
OA Ratio = OA Count / Total Journal Count

	Coefficients	Standard Error	P-value
Intercept	5.31197	2.115285	0.012363
TurnoverUSDk	-6.6E-06	1.68E-05	0.694977
EmployeeCount	-0.00184	0.003115	0.555868
GroupMember	-1.4023	2.442073	0.566089
RelatedClass	-1.64438	1.775337	0.354795
PatentCount	-0.00432	0.003342	0.196581
UnivCollab	-1.04411	1.800157	0.562182
CompCollab	0.494459	2.049197	0.809432
DOAJ	0.000966	0.00089	0.278144
ROARMAP	-0.00734	0.013133	0.576376

Regression Statistics	
Multiple R	0.174752
R Square	0.030538
Adjusted R Square	0.012092
Standard Error	8.865642
Observations	483

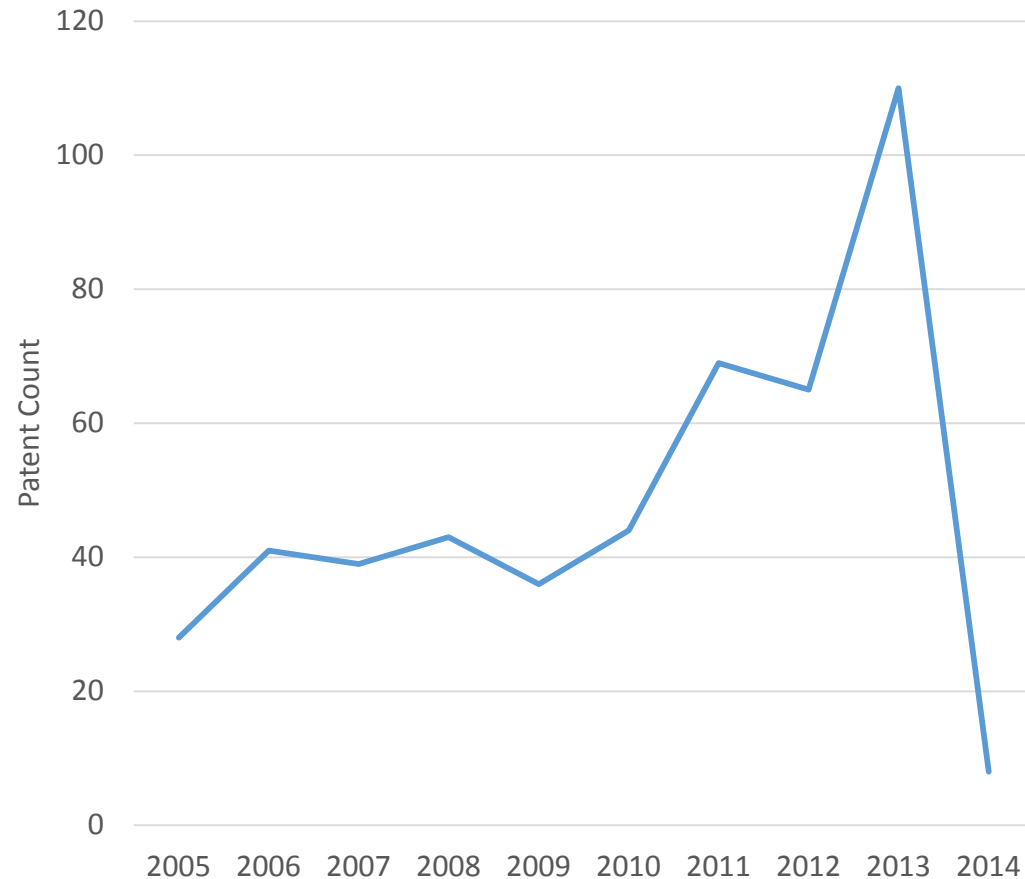
Dependent Variable
OA Count

Number of Citations to OA Journals



- Average annual increase of 38%
- Compared to 16% for Journal citations in general

Number of Patents Citing OA Journals



- Average annual increase of 22%
- Compared to 15% for patents citing journals in general

Discussion

- Underestimation due to disregarding green & hybrid OA
- relative short age of OA journals
- OA journals gaining ground in patent citations
- sample bias to companies with financial data
- importance of abstracts for patents / need for more OA

Options for Future Research

- suggestions for further manipulation??
- including hybrid & green OA
- focus on later years only
- matching with PubMed Central records

Thank You