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Cost analysis of scholarly communication in Germany

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Impacts of alternative publishing models
(Australia, UK, Netherlands, Denmark, USA and Germany)

- Australian Department of Education, Science and Training study of Research Communication Costs: Emerging Opportunities and Benefits;
- UK JISC study of the Economic Implications of Alternative Scholarly Publishing Models, in collaboration with Loughborough University;
- SURF and DEFF studies exploring the costs and benefits of alternative publishing models in the Netherlands and Denmark;
- A three-country comparison of the UK, Netherlands and Denmark for Knowledge Exchange;
- SPARC study of the potential impacts of the US *Federal Research Public Access Act* (FRPAA); and
- This study, bringing the German National Licensing Program (NLP) into the mix of alternative models.

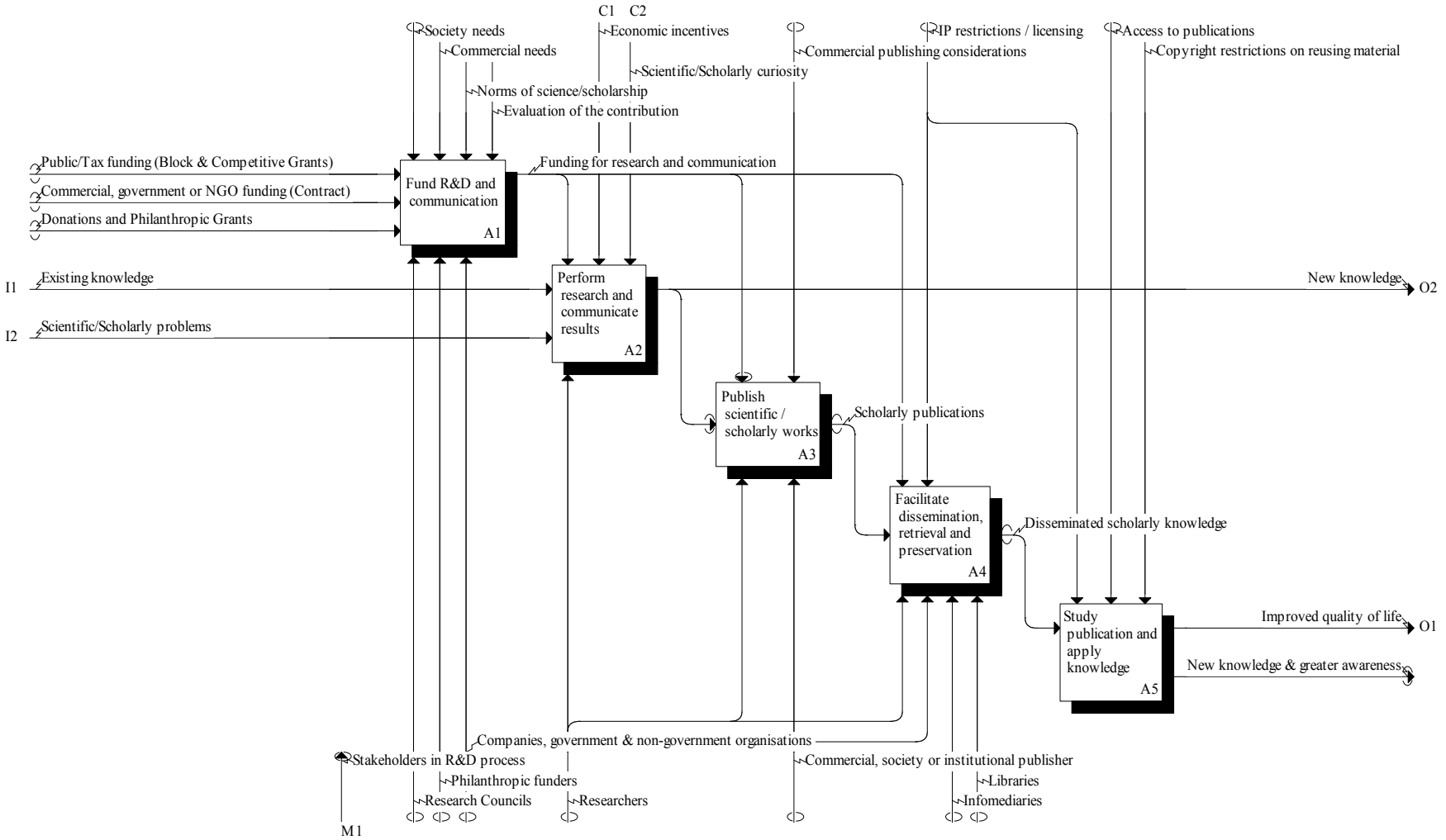
Alternative publishing models

(All include peer review, quality control & commercial margins)

- The studies focus on three alternative publishing models:
  - *Subscription publishing* – using individual reader subscriptions or the, so called, Big Deal for research libraries;
  - *Open access publishing* – where access is free to readers, and the authors, their employing or funding organisations pay for publication; and
  - *Self-archiving* – where authors deposit their work in on-line repositories, making it freely available to anyone with internet access.
- To ensure that all models include peer review and quality control, we explore two self-archiving models:
  - *Green OA* self-archiving in parallel with subscription publishing; and
  - An *overlay services* model of self-archiving with overlay production and peer review services.

The lifecycle process model

(http://www.cfses.com/EI-ASPM/SCLCGermany/)



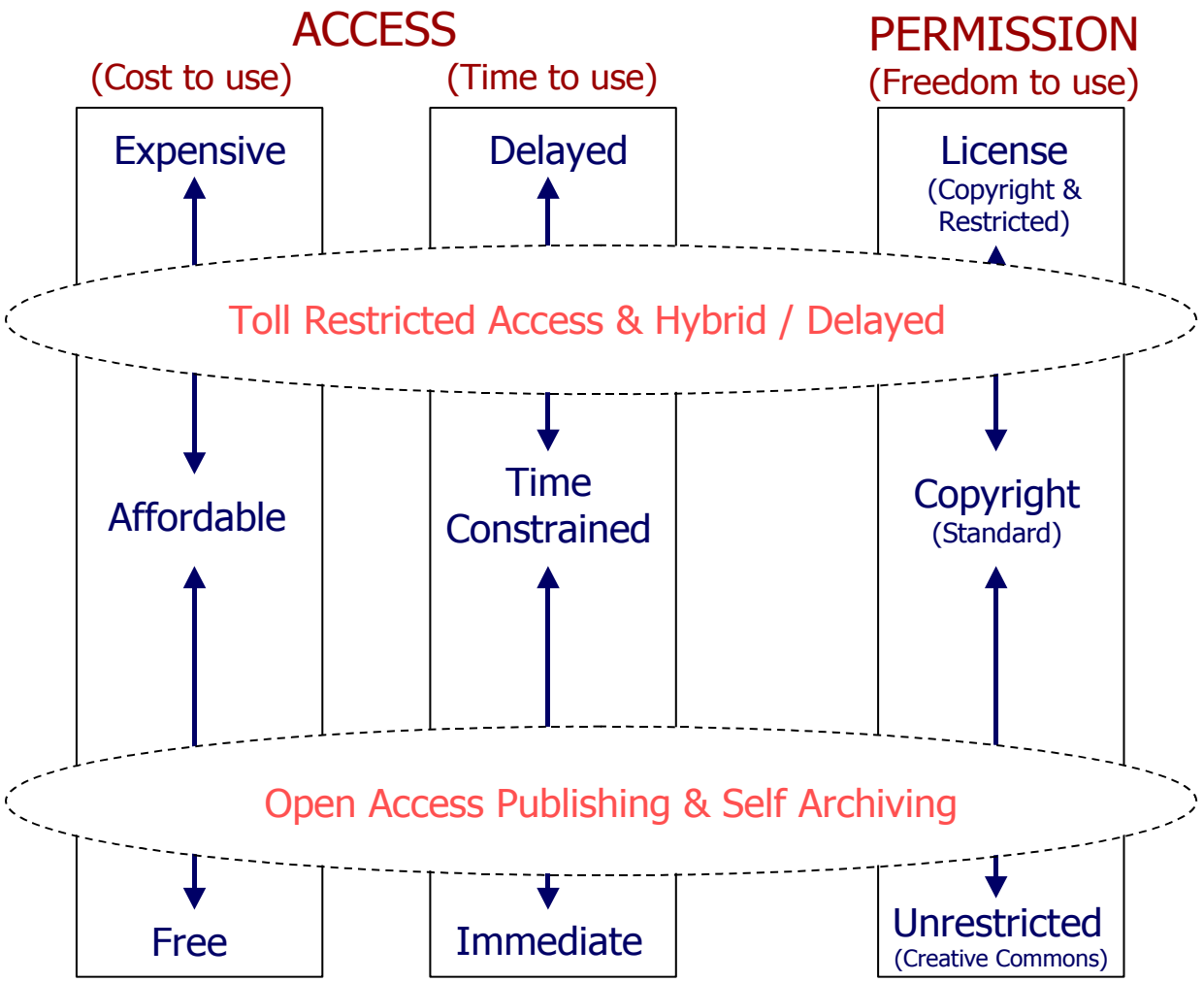
The activity cost model

(http://www.cfses.com/EI-ASPM/)

- We created a series of spreadsheets containing each of the elements identified in the lifecycle process model.
- There were more than 2,300 activity and data items costed, and another 500 basic data items (*e.g.* the number of researchers and publications, R&D spending, etc).
- Sources included: annual reports and responses from funding agencies and departments; national and international reporting of R&D expenditure and personnel; reports of the activities of universities and research institutes in Germany; locally sourced publication counts and the ISI and SCOPUS databases; the King and Tenopir tracking studies; Deutsche Bibliotheksstatistik and Goethe-Universität.

Potential dimensions of impact

(Access and Permission)



The macro model (returns to R&D)
(A modified Solow-Swan model)

- There is a vast literature on returns to R&D, which while varied shows that returns to publicly funded R&D are high – typically 20% to 60% a year.
- The standard approach assumes that all R&D generates useful knowledge (*efficiency*) and that all knowledge is equally accessible to anyone who could make productive use of it (*accessibility*), which is unrealistic.
- We introduce *accessibility* and *efficiency* into the standard model as negative or friction variables, and look at the impact of reducing the friction by increasing accessibility and efficiency.

A stepwise approach
(Four steps in the research process)

- We produced a detailed costing of all of the activities identified in the scholarly communication lifecycle model, focusing on areas where there were likely to be cost differences;
- We summed the costs of the publishing models through the main phases of the scholarly communication lifecycle, to explore potential system-wide cost differences;
- We used the modified Solow-Swan model to estimate the impact of changes in *accessibility* and *efficiency* on returns to R&D spending; and
- We compared costs and benefits over a 20 year transitional period, using these three elements.

German National Licensing Program
(This study performs a different comparison)

- This study brings the German National Licensing Program (NLP) into the mix of alternative models.
- The NLP provides enhanced access for researchers in Germany through centralised purchasing and licensing.
- There is a difference between this and previous studies, because subscription and OA publishing perform different roles and subscriptions do not cover the cost of subscription publishing.
- The previous studies compared the costs of publishing national output under alternative models, but the German study compares the costs of operating within alternative models.

Estimated annual activity costs
(Higher Education & Public Sector, EUR 2008)

GERMAN UNIVERSITIES & PUBLIC INSTITUTIONS (NLP)	*ESTIMATE*
Reading (Published Staff)	6,301,400,000
Writing (WoK based estimate, scaled)	2,383,300,000
Peer Review (Scaled to publication counts)	291,300,000
Editorial activities (Scaled to published staff)	141,400,000
Editorial board activities (Scaled to published staff)	15,600,000
Preparing Grant Applications (major funding agencies)	329,800,000
Reviewing Grant Applications (major funding agencies)	38,400,000
Publisher Costs (Scaled to publication counts)	668,200,000
Total Higher Education and Public Institutions System	10,169,400,000

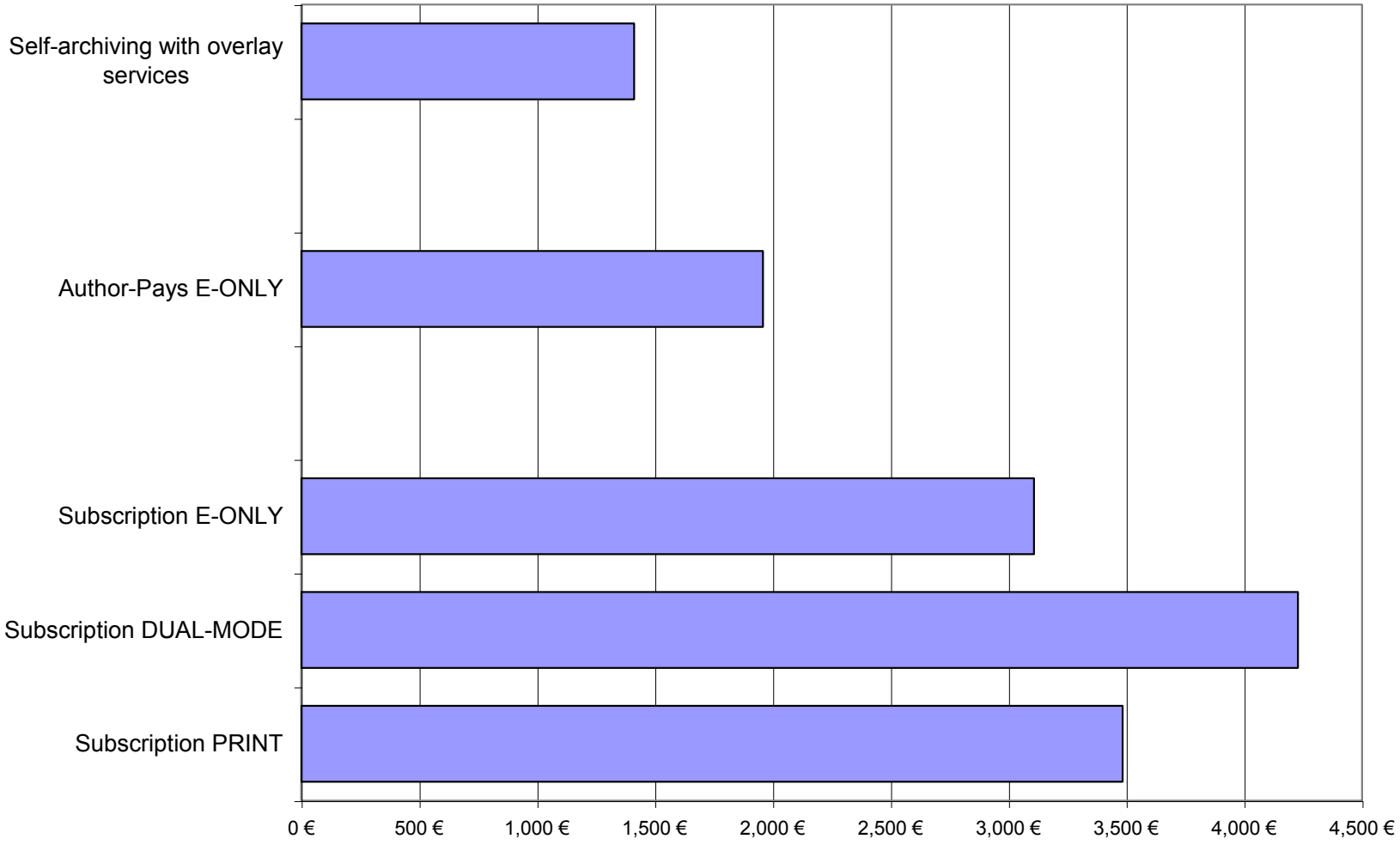
Source: German model: Authors' analysis.

Estimated annual costs by model
(Higher Education & Public Sector, EUR 2008)

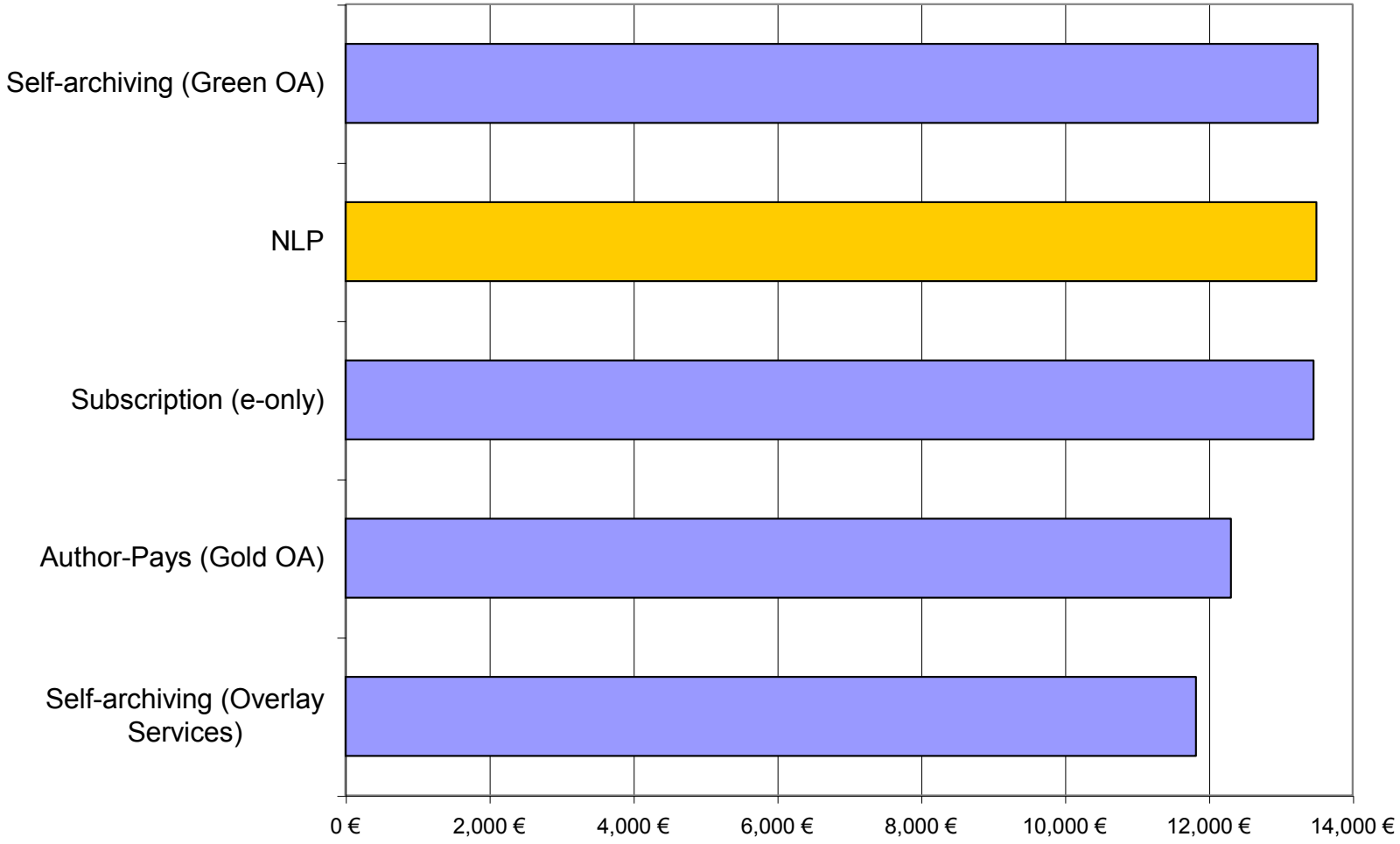
GERMAN HIGHER EDUCATION & PUBLIC INSTITUTIONS	*ESTIMATE*
Subscription or toll access publishing	
Library Acquisition (Wissenschaftliche Universal und Hochschulbibliotheken)	319,434,600
Estimated library non-Acquisition (Wissenschaftliche Universal und Hochschulbibliotheken)*	640,000,000
Open access publishing & self-archiving	
Author-pays fees for journal articles produced	184,142,400
Estimated Repository Costs	43,163,000
National Licensing Program	
NLP Acquisition	13,059,000
NLP non-Acquisition (including hosting)	23,721,000

Note: * Library non-acquisition costs are estimated at approximately double acquisition costs.
Source: German model: Authors' analysis.

Publisher production activity costs
(EUR per article, 2008)



Estimated system production costs
(E-only format in EUR per article, 2008)



Impact on returns to R&D

(Returns to R&D spending in EUR millions)

GERD	Rate of return to R&D				
EUR 65,622 million	20%	30%	40%	50%	60%
Per cent change in accessibility and efficiency	Recurring annual gain from increased accessibility & efficiency (million)				
1%	264	396	528	660	791
2%	530	795	1,060	1,326	1,591
5%	**1,345**	2,018	2,691	3,363	4,036
10%	2,756	4,134	5,512	6,890	8,268

Public Sector	Rate of return to R&D				
EUR 19,800 million	20%	30%	40%	50%	60%
Per cent change in accessibility and efficiency	Recurring annual gain from increased accessibility & efficiency (million)				
1%	80	119	159	199	239
2%	160	240	320	400	480
5%	**406**	609	812	1,015	1,218
10%	832	1,247	1,663	2,079	2,495

Note: Public sector is HERD plus GovERD.
Source: German model: Authors' analysis.

Benefit/Cost comparisons

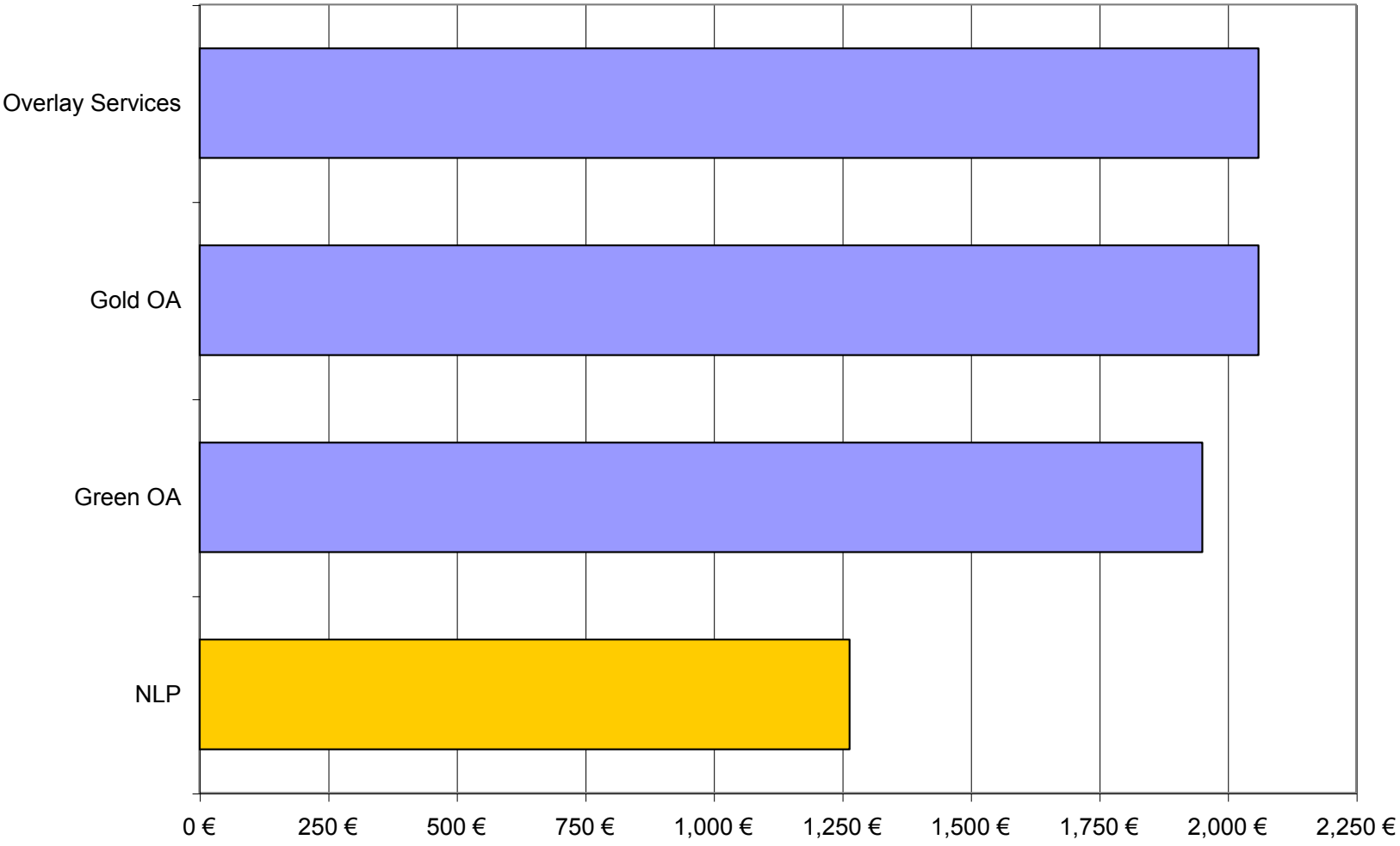
(EUR millions over 20 years and benefit/cost ratio)

Transitional Model	*Costs*	*Benefits*		*Benefit/Cost Ratio*
		Savings	*Increased returns*	
Open Access				
Scenario (German National OA)				
OA Publishing in HE & Public	1,898	197	1,863	1.1
OA Repositories in HE & Public (Green OA)	445	88	1,863	4.4
OA Repositories in HE & Public (Overlay Services)	1,779	197	1,863	1.2
OA Publishing Nationally	1,900	243	1,863	1.1
OA Repositories Nationally (Green OA)	647	133	1,863	3.1
OA Repositories Nationally (Overlay Services)	1,979	243	1,863	1.1
Scenario (Worldwide OA)				
OA Publishing in HE & Public	1,898	3,208	1,863	2.7
OA Repositories in HE & Public (Green OA)	445	1,425	1,863	7.4
OA Repositories in HE & Public (Overlay Services)	1,779	3,208	1,863	2.9
OA Publishing Nationally	1,900	3,950	1,863	3.1
OA Repositories Nationally (Green OA)	647	2,166	1,863	6.2
OA Repositories Nationally (Overlay Services)	1,979	3,950	1,863	2.9
National Licensing Program				
NLP in HE & Public	379	866	399	3.3
NLP National	379	1,326	399	4.5

Note: Compares alternative models against subscription or toll access, with costs, savings and benefits expressed in Net Present Value over 20 years (EUR millions). Increased returns to R&D relate to combined higher education and national public expenditure on R&D. The NLP transition is modelled in the same way as open access alternatives for comparative purposes even though the NLP has been in operation for four years.
Source: German model: Authors' analysis.

Benefit comparisons

(EUR millions over 20 years in Net Present Value)



Note: Compares national adoption in Higher Education and Public Sector Institutions.
Source: German model: Authors' analysis.

Issues and interpretation

- Subscription and OA models perform different roles, and subscriptions do not cover the cost of subscription publishing.
- The NLP is a long term commitment in a time of change, its relative cost-effectiveness may change.
- The NLP is already operating, but our model compares alternatives from implementation.
- The NLP is not really an alternative, it operates over a part of the subscription literature.
- Mixed models may exhibit scale and/or scope economies or dis-economies. Indeed, one would expect scope dis-economies, with mixes requiring parallel systems.

An international comparison
(Benefit/Cost Ratio from transitional model over 20 years)

	United Kingdom	*Germany*
OA Publishing (Gold OA)		
National (Worldwide OA)	1.8	3.1
National (Unilateral OA)	0.5	1.1
HE & Public (Worldwide OA)	1.7	2.7
HE & Public (Unilateral OA)	0.5	1.1
OA Self-archiving with overlay services		
National (Worldwide OA)	2.0	2.9
National (Unilateral OA)	0.6	1.1
HE & Public (Worldwide OA)	1.9	2.9
HE & Public (Unilateral OA)	0.5	1.2
OA Self-archiving (Green OA)		
National (Worldwide OA)	7.9	6.2
National (Unilateral OA)	3.5	3.1
HE & Public (Worldwide OA)	7.0	7.4
HE & Public (Unilateral OA)	3.2	4.4
NLP in HE & Public	..	3.3
NLP National	..	4.5

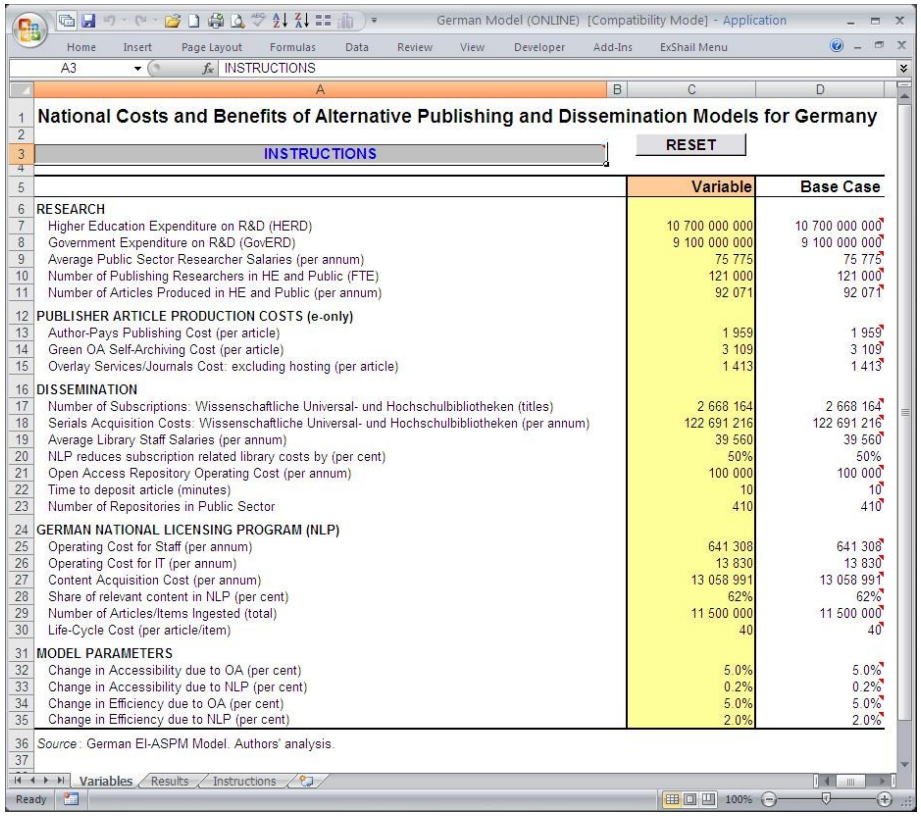
Notes: UK costs and benefits are converted to Euros using 2007-08 average annual exchange rates.
Source: JISC EI-ASPM and German models: Authors' analysis.

Summary and conclusions

- Alternative publishing and dissemination models have cost implications from producers, intermediaries and users of the content.
- They also have implications for the efficiency of research, the accessibility of research findings, and returns to research expenditure.
- Different publishing and dissemination models can make a material difference to the benefits realised, as well as the costs faced.
- The NLP returns substantial benefits and savings at a modest cost, but the future is uncertain and we should consider whether any of the alternative models is more or less uncertain than the others.

Links and references

(http://www.cfses.com/EI-ASPM/)

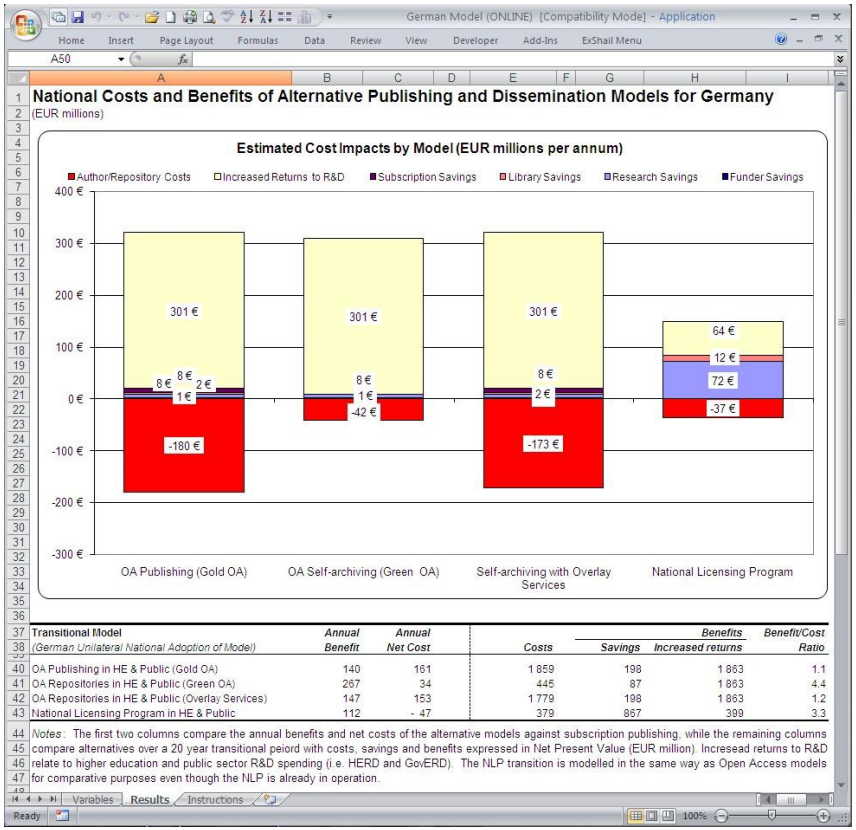


National Costs and Benefits of Alternative Publishing and Dissemination Models for Germany

INSTRUCTIONS | RESET

	Variable	Base Case
RESEARCH		
Higher Education Expenditure on R&D (HERD)	10 700 000 000	10 700 000 000
Government Expenditure on R&D (GovERD)	9 100 000 000	9 100 000 000
Average Public Sector Researcher Salaries (per annum)	75 775	75 775
Number of Publishing Researchers in HE and Public (FTE)	121 000	121 000
Number of Articles Produced in HE and Public (per annum)	92 071	92 071
PUBLISHER ARTICLE PRODUCTION COSTS (e-only)		
Author-Pays Publishing Cost (per article)	1 959	1 959
Green OA Self-Archiving Cost (per article)	3 109	3 109
Overlay Services/Journals Cost: excluding hosting (per article)	1 413	1 413
DISSEMINATION		
Number of Subscriptions: Wissenschaftliche Universal- und Hochschulbibliotheken (titles)	2 668 164	2 668 164
Serials Acquisition Costs: Wissenschaftliche Universal- und Hochschulbibliotheken (per annum)	122 691 216	122 691 216
Average Library Staff Salaries (per annum)	39 560	39 560
NLP reduces subscription related library costs by (per cent)	50%	50%
Open Access Repository Operating Cost (per annum)	100 000	100 000
Time to deposit article (minutes)	10	10
Number of Repositories in Public Sector	410	410
GERMAN NATIONAL LICENSING PROGRAM (NLP)		
Operating Cost for Staff (per annum)	641 308	641 308
Operating Cost for IT (per annum)	13 830	13 830
Content Acquisition Cost (per annum)	13 058 991	13 058 991
Share of relevant content in NLP (per cent)	62%	62%
Number of Articles/Items Ingested (total)	11 500 000	11 500 000
Life-Cycle Cost (per article/item)	40	40
MODEL PARAMETERS		
Change in Accessibility due to OA (per cent)	5.0%	5.0%
Change in Accessibility due to NLP (per cent)	0.2%	0.2%
Change in Efficiency due to OA (per cent)	5.0%	5.0%
Change in Efficiency due to NLP (per cent)	2.0%	2.0%

Source: German EI-ASPM Model. Authors' analysis.



Transitional Model (German Unilateral National Adoption of Model)	Annual Benefit	Annual Net Cost	Costs	Benefits: Savings	Benefits: Increased returns	Benefit/Cost Ratio
OA Publishing in HE & Public (Gold OA)	140	161	1 859	198	1 863	1.1
OA Repositories in HE & Public (Green OA)	267	34	445	87	1 863	4.4
OA Repositories in HE & Public (Overlay Services)	147	153	1 779	198	1 863	1.2
National Licensing Program in HE & Public	112	- 47	379	867	399	3.3

Notes: The first two columns compare the annual benefits and net costs of the alternative models against subscription publishing, while the remaining columns compare alternatives over a 20 year transitional peiord with costs, savings and benefits expressed in Net Present Value (EUR million). Incresead returns to R&D relate to higher education and public sector R&D spending (i.e. HERD and GovERD). The NLP transition is modelled in the same way as Open Access models for comparative purposes even though the NLP is already in operation.

German model is online at:
http://www.cfses.com/EI-ASPM/German Model (ONLINE).exe