Economic impacts of OA in Europe and the USA

John Houghton

Centre for Strategic Economic Studies
Victoria University, Australia
John.Houghton@pobox.com

Implications of alternative publishing models
(UK, Netherlands, Denmark, Germany and United States)

- 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 for Knowledge Exchange.
- DFG study, in collaboration with Goethe Universität in Frankfurt, bringing the German National Licensing Program (NLP) into the mix of alternative models.
- Alma Swan's recent JISC study using the on-line cost model to explore cost impacts for UK universities.
- SPARC study of the potential impacts of US *Federal Research Public Access Act* (FRPAA).

Exploring costs AND benefits

(Research communication costs and benefits)

Costs, costs, costs...!

The goal should be the most cost-effective system, not (necessarily) the cheapest.

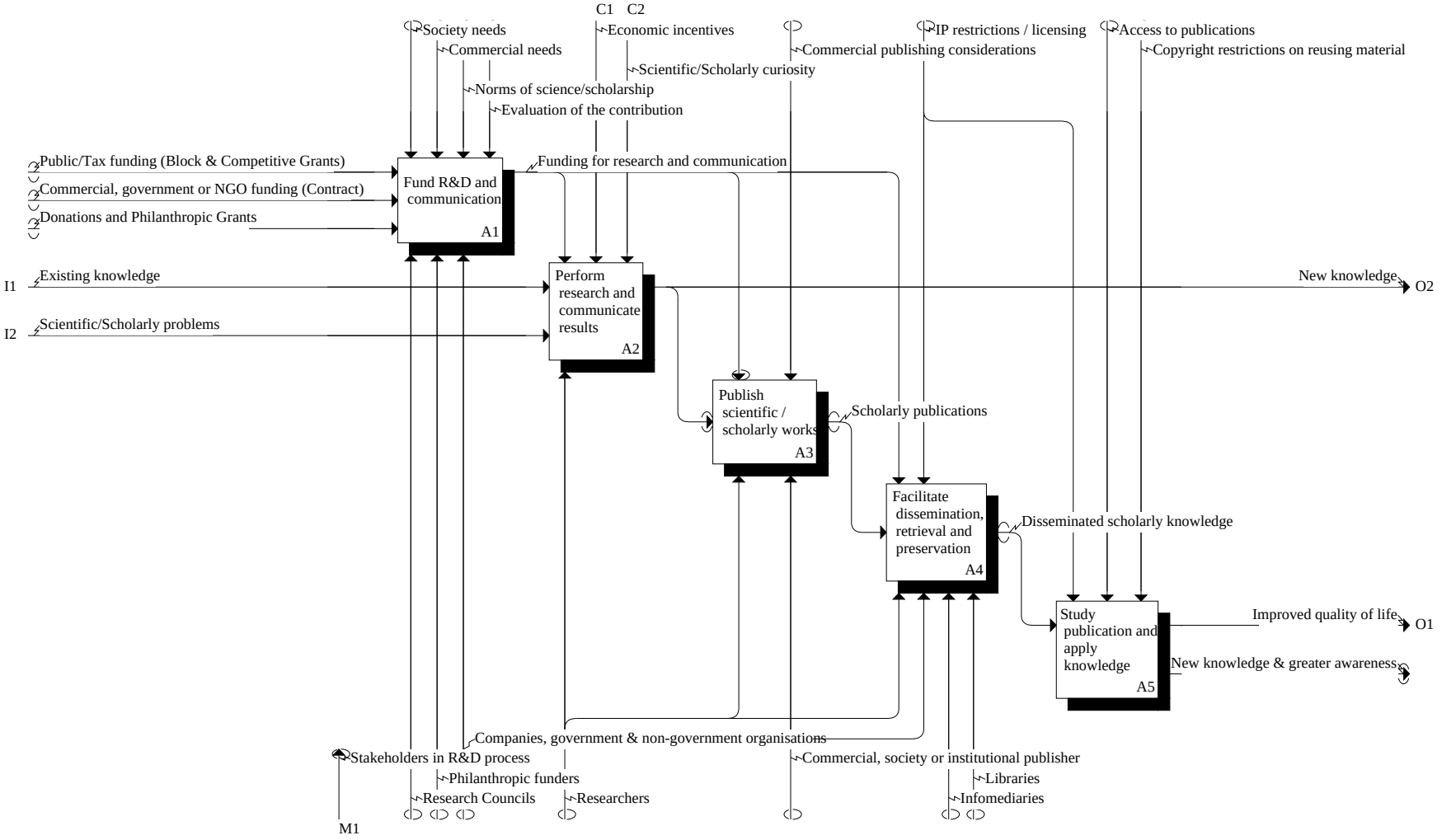
Alternative publishing models

(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;
  - An *overlay services* model of self-archiving with overlay production and peer review services.

1. The lifecycle process model

(http://www.cfses.com/EI-ASPM/SCLCM-V7/)



2. The activity cost model

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

- We created a series of spreadsheets containing each of the elements identified in the process model, then sought to populate the model with data.
  - The research funding activities worksheet has more than 350 items;
  - The perform research worksheet has around 565 items;
  - The publisher activities worksheet has around 670 items; and
  - The dissemination activities worksheet, mainly research library activities, has around 730 items.
- There are more than 2,300 activity and data items that are costed, and another 500 to 600 basic data items (*e.g.* the number of researchers and publications, R&D spending, etc.).

3. 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 all knowledge is equally accessible to anyone who could use 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.

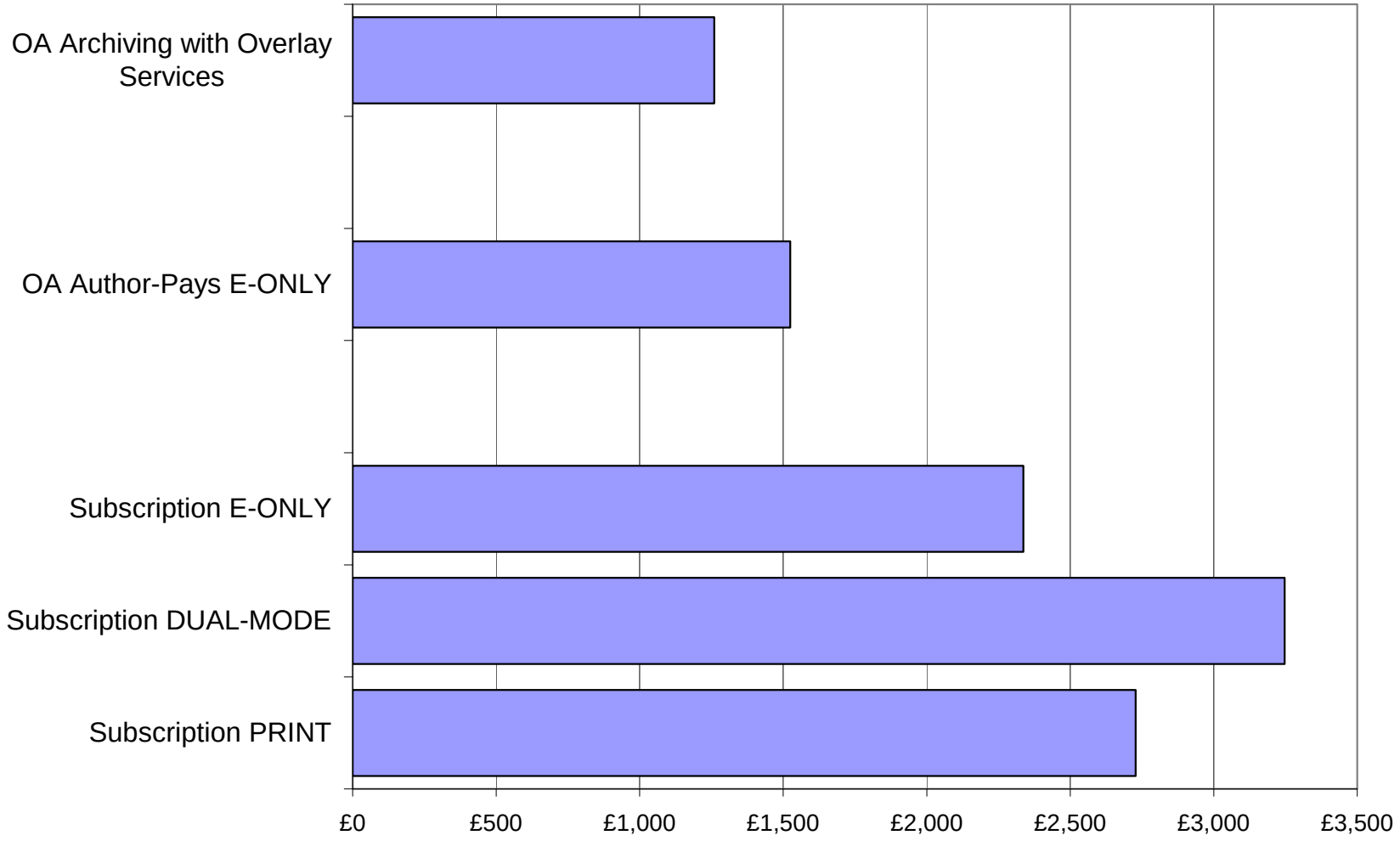
A stepwise approach

(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.
- We compared costs and benefits over a 20 year transitional period, using these three elements.

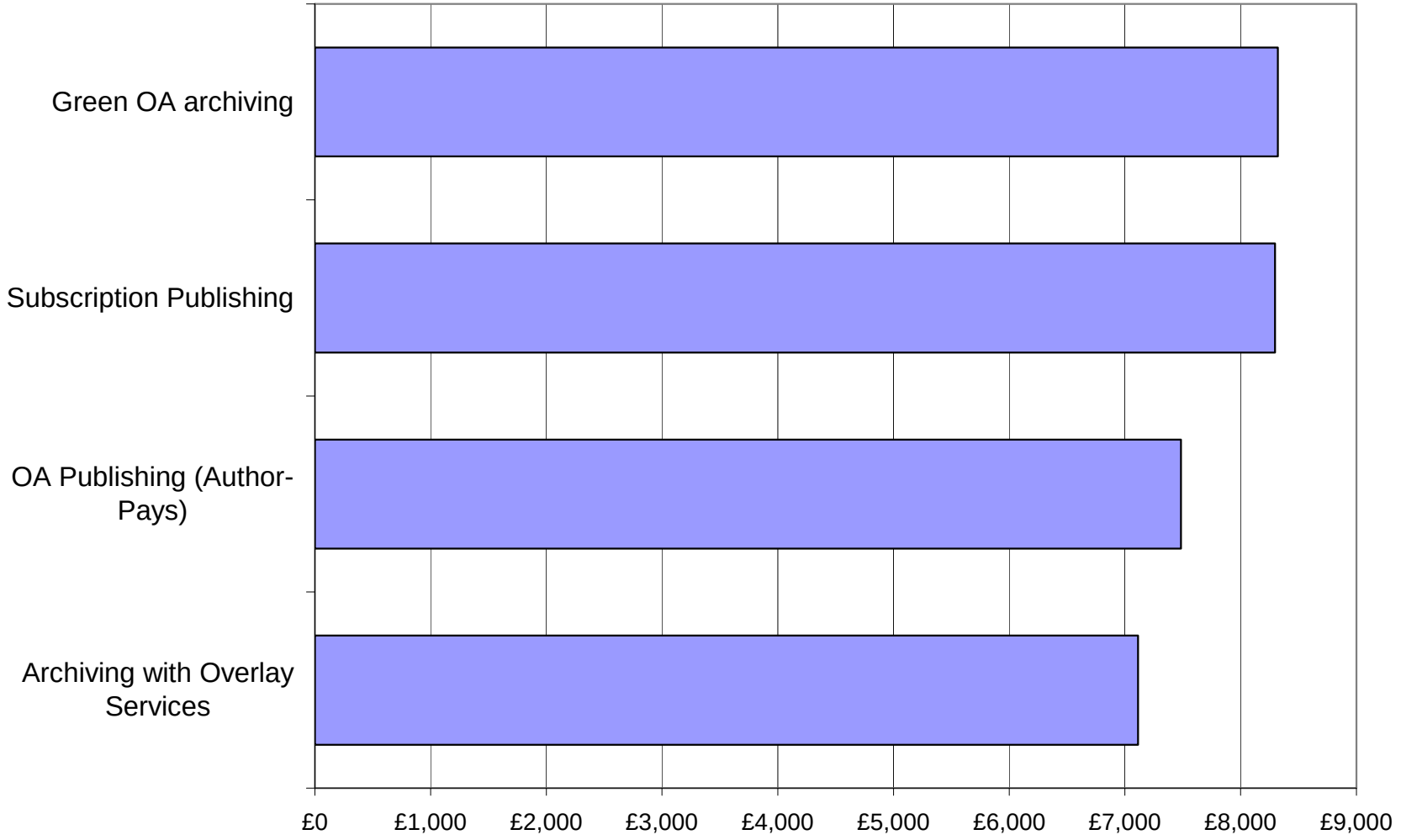
1. Publisher activity costs

(GBP per article, 2007)



2. Estimated UK system costs

(Electronic-only format in GBP per article, 2007)



3. Impact on returns to R&D

(Returns to UK public R&D spending in GBP millions)

Public Sector R&D £8,380 million	Rate of return to R&D				
	20%	30%	40%	50%	60%
Percentage change in accessibility and efficiency	Recurring annual gain from increased accessibility & efficiency (million)				
1%	34	51	67	84	101
2%	68	102	135	169	203
5%	***172***	258	344	429	515
10%	352	528	704	880	1,056

Higher Education R&D £6,062 million	Rate of return to R&D				
	20%	30%	40%	50%	60%
Percentage change in accessibility and efficiency	Recurring annual gain from increased accessibility & efficiency (million)				
1%	24	37	49	61	73
2%	49	73	98	122	147
5%	***124***	186	249	311	373
10%	255	382	509	637	764

4. Benefit/Cost comparisons for UK

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

Transitional Model	Costs	Benefits		Benefit / Cost Ratio
		Savings	Increased returns	
Scenario (UK Unilateral OA)				
OA Publishing in HE	1,787	2,990	615	2.0
OA Repositories in HE (Green OA)	189	67	615	3.6
OA Repositories in HE (Overlay Services)	1,558	2,990	615	2.3
OA Publishing Nationally	2,079	3,479	850	2.1
OA Repositories Nationally (Green OA)	237	96	850	4.0
OA Repositories Nationally (Overlay Services)	1,831	3,479	850	2.4
Scenario (Worldwide OA)				
OA Publishing in HE	1,787	5,198	615	3.3
OA Repositories in HE (Green OA)	189	786	615	7.4
OA Repositories in HE (Overlay Services)	1,558	5,198	615	3.7
OA Publishing Nationally	2,079	6,054	850	3.3
OA Repositories Nationally (Green OA)	237	1,132	850	8.3
OA Repositories Nationally (Overlay Services)	1,831	6,054	850	3.8

Note: Compares Open Access alternatives against subscription publishing of national outputs, with costs, savings and increased returns expressed in Net Present Value over 20 years (GBP millions). Returns are to public sector and higher education R&D spending. HE = Higher Education.

Conclusions and recommendations
(Create a level playing field to enable innovation)

- Given the potential benefits, we recommended focusing on creating a level playing field by reducing the barriers to innovation and raising awareness of the opportunities:
  - Ensuring that research evaluation is not a barrier to innovation, by developing metrics that support innovation in scholarly publishing, rather than relying on traditional evaluation metrics that reinforce traditional publishing models;
  - Ensuring that there is funding for author-side fees by encouraging funders to make provision for publication charges;
  - Encouraging and, perhaps, funding OA repositories to enable self-archiving; and
  - Supporting advocacy initiatives to inform stakeholders about the costs and impacts of alternative publishing models.

Three-country comparison

(The UK, Netherlands and Denmark)

- The cost-benefits of OA publishing are similar across the three countries: unilaterally author-pays publishing all articles produced in universities brings benefits around double the costs, but doing so in an OA world brings benefits of 3 times the costs.
- Self-archiving models do not look as good in the Netherlands as they do in the UK, and nothing like as good as in Denmark (Reason: implied number of articles per repository).
- OA alternatives are likely to be more cost effective in a range of countries, large and small.

Three-country comparison

(Benefit / Cost ratios)

TRANSITIONAL MODEL	DENMARK	NETHERLANDS	UNITED KINGDOM
Scenario (Unilateral National Open Access)			
OA Publishing in HE	2.0	2.0	2.0
OA Self-archiving in HE (Green OA)	11.5	2.6	3.6
OA Self-archiving in HE (Overlay Services)	2.6	2.2	2.3
OA Publishing Nationally	2.1	2.1	2.1
OA Self-archiving Nationally (Green OA)	9.6	3.0	4.0
OA Self-archiving Nationally (Overlay Services)	2.6	2.3	2.4
Scenario (Worldwide Open Access)			
OA Publishing in HE	2.9	3.3	3.3
OA Self-archiving in HE (Green OA)	27.3	6.7	7.4
OA Self-archiving in HE (Overlay Services)	3.8	3.7	3.7
OA Publishing Nationally	3.6	3.7	3.3
OA Self-archiving Nationally (Green OA)	26.5	8.0	8.3
OA Self-archiving Nationally (Overlay Services)	4.5	3.9	3.8

Note: Compares OA alternatives against subscription, with costs, savings and benefits expressed in Net Present Value over the first 20 years. Increased returns relate to higher education and public sector R&D spending. HE = Higher Education.

Coverage of national studies

(Included electronic versus print AND book costs)

- The cost-benefit comparisons were of alternative journal/article publishing models, and compared them as if they were all electronic only (e-only).
- But the national studies also included costings for print and for books, e-books and OA e-books.
- In the UK, we estimated average:
  - Toll access print book publishing costs at £ 15,750 per title;
  - E-only book publishing costs at £ 11,320 per title; and
  - OA e-book publishing costs at £ 7,380 per title.

DK scholarly publishing system costs
(Annual costs in Danish Kroner, circa 2007)

	Universities	*National*
Reading (Academic / Research Staff)	*8,261,200,000*	*16,346,400,000*
Reading (Published Staff)	5,020,200,000	6,590,200,000
Writing (WoK based estimate)	2,509,900,000	2,741,600,000
Peer Review (Scaled to publication counts)	356,300,000	390,800,000
Editorial activities (Scaled to published staff)	112,700,000	154,200,000
Editorial board activities (Scaled to published staff)	12,500,000	17,100,000
Preparing Grant Applications (DCIR & DCSR)	181,200,000	235,300,000
Reviewing Grant Applications (DCIR & DCSR)	5,700,000	7,400,000
Publisher Costs (Scaled to publication counts)	717,500,000	779,600,000
Total System	8,915,900,000	10,916,300,000

Note: Excludes funder, research and research management, library and user costs.

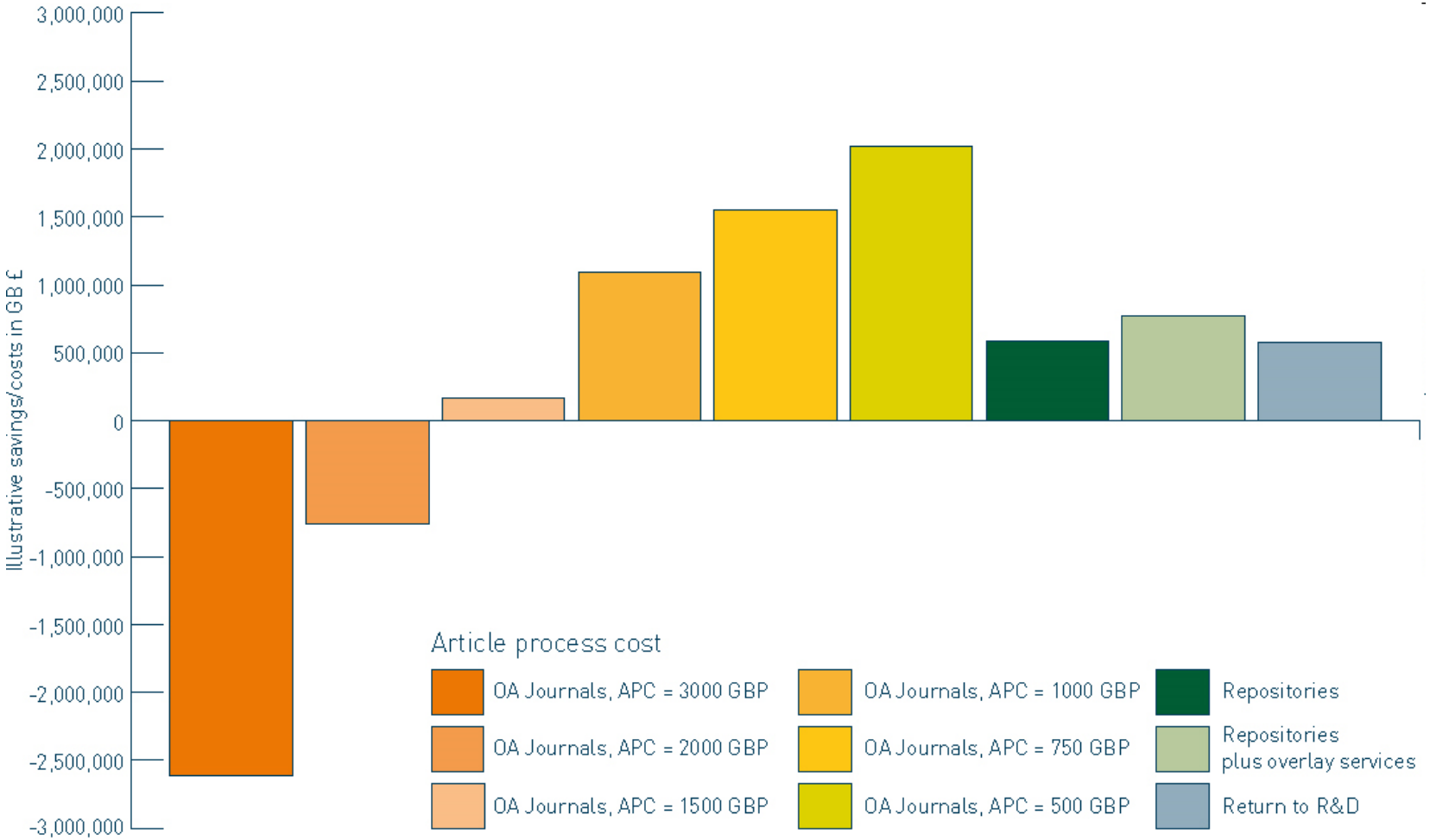
German National Licensing Program
(DfG project in collaboration with Goethe Universität)

- 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.
- The JISC study compared the costs of publishing UK output under alternative models, but the German study compares the costs of operating within alternative models.
- In preliminary analysis, the German NLP returned the 2nd highest benefit/cost ratio during a transitional period.
- The current focus of the project is the impact of the NLP on the take-up of OA, download and usage patterns.

Impacts on UK universities

(Report by Alma Swan of Key Perspectives)

Figure: Likely savings or costs of different Open Access routes

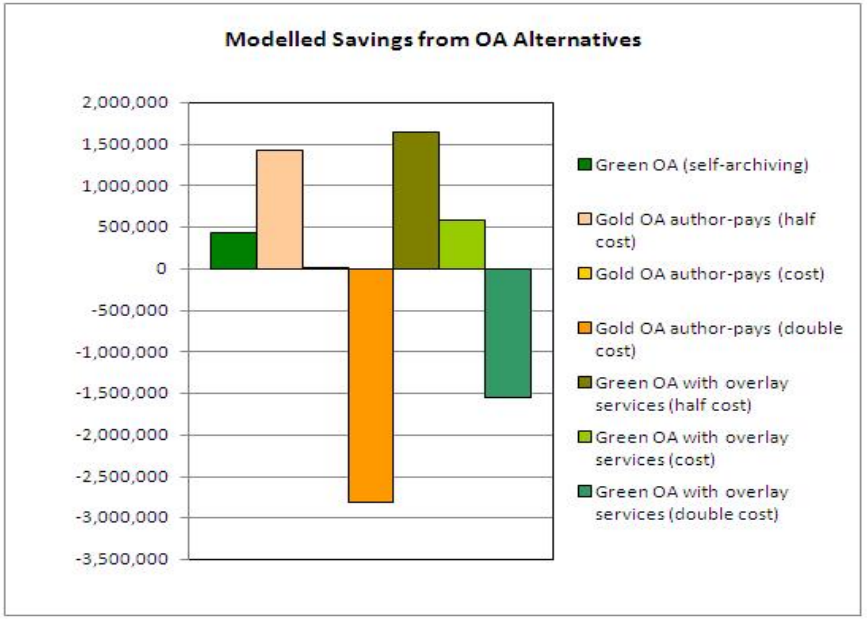


UK Institutional Costs and Benefits

INSTRUCTIONS

RESET

Institutional Research	Variables	Base Case
Number of researchers (FTE)	764	764
Average annual salary of researchers	43,881	43,881
Articles published per annum	1,854	1,854
R&D spending per annum	37,816,442	37,816,442
Percentage of researchers acting as editors	9%	9%
Percentage of researchers on editorial boards	26%	26%
Institutional Library		
Subscriptions expenditure per annum	1,568,148	1,568,148
Number of journal subscriptions	11,249	11,249
Library journal handling time minutes per title (Toll, print)	160	160
Library journal handling time minutes per title (Toll, e-only)	72	72
Library journal handling time minutes per title (OA, e-only)	6	6
Current share of print only in library subscriptions	14%	14%
Current share of dual mode in library subscriptions	13%	13%
Current share of e-only in library subscriptions	73%	73%
Average annual salary of library staff	28,631	28,631
ILL cost (journal articles)	22,161	22,161
Instituional Repository		
Institutional repository operational costs per annum	107,926	107,926
Time taken to deposit in minutes (per item)	13	13
Average annual salary of person depositing (gross salary)	32,786	32,786
Per Article Publisher Costs		
Author pays fees ('Gold OA')	1,500	1,500
Overlay services fees (peer review and production)	1,125	1,125
Institutional payment handling cost	25	25



Modelled Costs	Modelled	Base case
Repository deposit cost	17,959	17,959
Total IR costs per annum	125,885	125,885
Library handling cost current mix	758,651	758,651
Library handling cost per title (toll, e-only)	54	54
Library handling cost for all-electronic	606,077	606,077
Library handling cost per title (OA, e-only)	4	4
Library handling cost from all-OA	50,506	50,506
Reading articles	6,615,109	6,615,109
Writing articles	10,539,219	10,539,219
Peer review activities	2,745,744	2,745,744
Editorial/editorial board activities	684,026	684,026
Green OA with overlay services	2,827,350	2,827,350
Gold OA (author-pays)	2,132,100	2,132,100
Green OA (self-archiving)	125,885	125,885

Modelled Savings Estimates	Per Article	Modelled	Base case
Green OA (self-archiving)		437,323	437,323
Gold OA author-pays (half cost)	763	1,425,826	1,425,826
Gold OA author-pays (cost)	1,525	12,151	12,151
Gold OA author-pays (double cost)	3,050	-2,815,199	-2,815,199
Green OA with overlay services (half cost)	575	1,647,566	1,647,566
Green OA with overlay services (cost)	1,150	581,516	581,516
Green OA with overlay services (double cost)	2,300	-1,550,584	-1,550,584
Library handling saving from all-electronic		152,573	152,573
Library handling saving from OA		708,144	708,144
Research saving		541,048	541,048
Increase in return to R&D (society)		574,565	574,565

Impacts of the US FRPAA

(RoI impact of a US federal R&D archiving mandate)

- SPARC funded feasibility study on measuring the impact of an OA archiving mandate on returns to investment in federally funded R&D.
- Shifts focus to modeling returns to R&D and further development of the modified Solow-Swan model.
- Requires sensitive operationalization and data collection, particularly in relation to archiving costs.
- Preliminary modeling suggests that the *incremental* benefits from OA to all US federally funded research might be around 5 times the costs.

Summary and conclusion

- Given their capacity to enhance access at very little cost, OA-archiving alternatives appear to be cost-effective.
- The evidence from all of these studies suggests that archiving policies and mandates can enhance accessibility and improve efficiency at relatively little cost and with no immediate disruptive change to scholarly publishing practices and traditions.
- As such, archiving mandates provide an obvious focus for policy and implementation activities while more fundamental changes evolve.

Links and references

Links to the studies and models

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

http://www.cfses.com/FRPAA/

How to build a case for university policies and practices in support of Open Access

http://www.jisc.ac.uk/publications/programmerelated/2010/howtoopenaccess.aspx

Publishing research papers: Which policy will deliver best value for your university?

http://www.jisc.ac.uk/publications/briefingpapers/2010/publishingresearchpapersbpv1.aspx