

# HEADING FOR THE OPEN ROAD: COSTS AND BENEFITS FOR TRANSITIONS IN SCHOLARLY COMMUNICATIONS

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APRIL 2011

## Report Annexes



## ANNEX A: INCREASED ACCESS

The increases in standardised and useful access derived by the model in the central cases for each scenario are shown in Table A1. Apart from Transactional, each scenario represents a substantial overall increase in access of a broadly similar scale. It is important to remember, however, that the differences in increased access *between* scenarios are arbitrary, reflecting the input assumptions (although as shown in Table A1 our choice of input assumptions has meant that the changes in access for each scenario are of a similar magnitude.)

There are differences between user groups within each scenario. For the open and delayed access models, HEIs typically experience a smaller gain in access, whether measured as standardised or useful access, reflecting their relatively high (compared to other groups) levels of baseline access. Conversely, groups with lower baseline access experience larger gains. SMEs and Corporations have similar levels of baseline access and experience similar levels of increase in standardised access. In the model, however, this translates into larger gains in access value for SMEs than for Corporations. This is a consequence of the different (lower) level of satisfaction reported in survey responses by SMEs to their levels of access – which means that (given diminishing marginal returns) a given increase in standardised access converts into a larger change in the useful access. We interpret as implying that while neither SMEs or Corporations have high levels of subscribed access, researchers in large Corporations have easier baseline access through alternative routes (document delivery, full-text databases, in-house information services, PPV, etc.).

There are also some variations between users due to subject area differences; these are primarily to do with the assumptions in the Gold and Green scenarios regarding differential take-up by the biomedical research community.

Table A1: Comparison of user group access in each scenario

	Green	Green zero	Delayed	Gold (higher APC)	Gold (lower APC)	Licence extension	
						Academic Institutions	NHS
Standardised Unit of Access (percentage point increase)							
Academic Institutions	6.8%	9.8%	5.2%	5.5%	5.5%	7.4%	-
Government	17.4%	25.1%	13.4%	14.0%	14.0%	-	-
NHS	19.1%	36.9%	11.0%	21.1%	21.1%	-	16.9%
Corporations/ Professional groups	17.5%	25.3%	13.5%	14.1%	14.1%	-	-
SMEs/Independents	17.6%	25.4%	13.6%	14.2%	14.2%	-	-
<b>Weighted average</b>	<b>9.1%</b>	<b>13.7%</b>	<b>6.8%</b>	<b>7.7%</b>	<b>7.7%</b>	<b>5.9%</b>	<b>1.0%</b>
Useful access (percentage change)							
Academic Institutions	3.6%	5.0%	2.8%	2.9%	2.9%	3.8%	-
Government	8.6%	13.9%	7.1%	7.3%	7.3%	-	-
NHS	14.5%	16.3%	9.2%	15.6%	15.6%	-	13.2%
Large corporations/ Professional groups	10.3%	16.4%	8.5%	8.8%	8.8%	-	-
SMEs/Independents	19.0%	25.2%	15.6%	16.1%	16.1%	-	-
<b>Weighted average</b>	<b>5.0%</b>	<b>8.3%</b>	<b>3.9%</b>	<b>4.3%</b>	<b>4.3%</b>	<b>3.1%</b>	<b>0.7%</b>

Table A2: Comparison of scenarios' access gains and annual net costs - cash costs only

		Green	Green zero	Delayed	Gold (higher APC)	Gold (lower APC)	Licence extension	
							Academic Institutions	NHS
Access								
Access change	Standardised Unit of Access (Percentage points)	9.1%	13.7%	6.8%	7.7%	7.7%	5.9%	1.0%
	Useful Access (Percentage increase)	5.0%	8.3%	3.9%	4.3%	4.3%	3.1%	0.7%
Costs								
Transitional costs	Average annual costs to academic institutions	£1.3m	£1.3m	-	£0.2m	£0.2m	£0.2m	-
	Average annual costs to others	£0.9m	£0.9m	-	£0.8m	£0.8m	-	£0.1m
Steady state cash cost of scholarly communication system	Average annual cash cost to academic institutions	£1.0m	£7.9m	-	£8.1m	-£2.8m	£8.0m	-
	Average annual cash cost to other users	£0.1m	£1.2m	-	-£3.3m	-£6.7m	-	£1.0m
<b>Total average annual net cash costs<sup>1</sup></b> (sum of distributional cost and system costs)		<b>£3.3m</b>	<b>£11.2m</b>	<b>£0.0m</b>	<b>£5.8m</b>	<b>-£8.5m</b>	<b>£8.2m</b>	<b>£1.1m</b>
<b>'One-off' transaction costs incurred 2010-15</b>		£2.3m	£10.9m	£2.0m	£7.1m	£7.1m	£4.6m	£1.7m

<sup>1</sup> Please note that all numbers are rounded, which may result in the numbers not exactly adding.

Table A3: Comparison of benefit-cost ratios and access cost-effectiveness measures

	Green	Green zero	Delayed	Gold (higher APC)	Gold (lower APC)	Licence extension	
						Academic Institutions	NHS
Costs/ Savings							
Costs: Cash and non-cash (20 year NPV) (i.e. publishing/distribution)	£45.0m	£144.9m	£2.0m	£152.9m	£28.3m	£99.4m	£14.4m
Savings: Cash and non-cash (20 year NPV) (i.e. access provision)	-	-	-	£80.5m	£121.0m	-	-
<b>Total net cash and non-cash costs (20 yr NPV)</b>	<b>£45.0m</b>	<b>£144.9m</b>	<b>£2.0m</b>	<b>£72.4m</b>	<b>-£92.6m</b>	<b>£99.4m</b>	<b>£14.4m</b>
Benefits							
Economic Benefits	£211.6m - £385.8m	£353.2m - £580.4m	£164.5m - £288.3m	£184.1m - £325.1m	£184.1m - £325.1m	£132.7m - £250.5m	£29.3m - £42.9m
Summary							
Benefit-Cost Ratio (BCR = ([benefits + savings]/costs)	4.7 - 8.6	2.4 - 4.0	82.2 - 144.1	1.7 - 2.7	10.8 - 15.7	1.3 - 2.5	2.0 - 3.0
Average net cash cost per additional SUoA (£)	£22.5	£54.1	£0.9	£50.8	n/a <sup>2</sup>	£67.3 <sup>3</sup>	£9.5 <sup>4</sup>
Average net cash cost per % increase in useful access (£m)	£0.7m	£1.4m	<£0.1m	£1.4m	n/a	£2.7m	£1.7m

<sup>2</sup> Average cost per additional SUoA and average cost per 1% increase in access value are both negative

<sup>3</sup> Average cost per additional SUoA and average cost per 1% increase in access value only relate to academic researchers.

<sup>4</sup> Average cost per additional SUoA and average cost per 1% increase in access value only relate to NHS researchers.

## ANNEX B: SENSITIVITY TABLES

- Costs, Savings and Benefits are in £m, and are shown as net present values (NPV) over 20 years (2015-2034).
- The Benefit figures presented are the midpoint of the range discussed in the report. The lower bound is based on applying diminishing marginal returns to increases in access, whereas the upper bound does *not* apply diminishing returns. Therefore, the BCR figure is also a midpoint of the potential range.
- The "£ per SUoA" metric is based on cash costs only
- The 10% user efficiency sensitivity (shown for each scenario) applies the efficiency saving to the increases in SUoA only. For example, if the weighted average increase in SUoA is 12%, then user efficiency saving =  $10\% \times 12\% = 1.2\%$  saving.

## Green Scenario

Table B1 - Green scenario sensitivity analysis (20 year NPV)

Input	Variation	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	£m per % access
<b>Central case</b>		<b>£45.0</b>	<b>£0.0</b>	<b>£298.7</b>	<b>6.6</b>	<b>£22.5</b>	<b>£0.7</b>
% of total 'Green' articles deposited	-10%	£44.1 (-0.9)	-	£258.8 (-39.9)	5.9 (-0.8)	£25.7 (+3.2)	£0.8 (+0.1)
	+10%	£45.9 (+0.9)	-	£337.9 (+39.2)	7.4 (+0.7)	£20.2 (-2.4)	£0.6 (-0.1)
Embargo length	-50%	£45.0 (-)	-	£331.5 (+32.8)	7.4 (+0.7)	£20.1 (-2.5)	£0.6 (-0.1)
	+50%	£45.0 (-)	-	£268.2 (-30.4)	6.0 (-0.7)	£25.4 (+2.9)	£0.8 (+0.1)
Discount on version of record	-50%	£45.0 (-)	-	£317.6 (+18.9)	7.1 (+0.4)	£21.1 (-1.5)	£0.6 (-)
	+50%	£45.0 (-)	-	£281.3 (-17.3)	6.3 (-0.4)	£24.1 (+1.5)	£0.7 (-)
Discount on functionality	-50%	£45.0 (-)	-	£308.4 (+9.7)	6.9 (+0.2)	£21.8 (-0.8)	£0.7 (-)
	+50%	£45.0 (-)	-	£289.4 (-9.3)	6.4 (-0.2)	£23.3 (+0.8)	£0.7 (-)
Publisher deposit of biomed articles	25% to 50%	£44.2 (-0.8)	-	£298.7 (-)	6.8 (+0.1)	£22.1 (-0.4)	£0.7 (-)
10% subscription loss	Offsetting price increases	£45.0 (-)	£27.7 (+27.7)	£195.9 (-102.8)	5.0 (-1.7)	£10.3 (-12.3)	£0.3 (-0.4)
	Cost savings to protect margin	£44.9 (-0.1)	£140.2 (+140.2)	£195.9 (-102.8)	7.5 (+0.9)	n/a	n/a
Non-UK lower Green uptake	-50%	£45.0 (-)	-	£163.1 (-135.6)	3.6 (-3.0)	£42.5 (+20.0)	£1.2 (+0.5)
User efficiency gains in search and access time	+ 10% efficiency	£45.0 (-)	£54.8 (+54.8)	£298.7 (-)	7.9 (+1.2)	£22.5 (-)	£0.7 (-)

**Green Scenario Sensitivity BCR Range: 3.6 - 7.9**

## Green 'Zero' Scenario

Table B2 - Green 'Zero' scenario sensitivity analysis (20 year NPV)

Input	Variation	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	£m per % access
<b>Central case</b>		<b>£144.9</b>	<b>£0.0</b>	<b>£466.8</b>	<b>3.2</b>	<b>£54.1</b>	<b>£1.4</b>
% of total 'Green' articles deposited	-10%	£143.9 (-1.0)	-	£426.5 (-40.3)	3.0 (-0.3)	£59.7 (+5.6)	£1.5 (+0.1)
	+10%	£145.8 (+1.0)	-	£506.4 (+39.6)	3.5 (+0.3)	£49.6 (-4.6)	£1.3 (-0.1)
Embargo length	-50%	£144.9 (-)	-	£499.9 (+33.2)	3.5 (+0.2)	£49.9 (-4.3)	£1.3 (-0.1)
	+50%	£144.9 (-)	-	£436.1 (-30.7)	3.0 (-0.2)	£58.7 (+4.6)	£1.5 (+0.1)
Discount on version of record	-50%	£144.9 (-)	-	£485.9 (+19.1)	3.4 (+0.1)	£51.6 (-2.5)	£1.4 (-)
	+50%	£144.9 (-)	-	£449.3 (-17.5)	3.1 (-0.1)	£56.6 (+2.5)	£1.5 (-)
Discount on functionality	-50%	£144.9 (-)	-	£476.6 (+9.8)	3.3 (+0.1)	£52.8 (-1.3)	£1.4 (-)
	+50%	£144.9 (-)	-	£457.4 (-9.4)	3.2 (-0.1)	£55.4 (+1.3)	£1.4 (-)
Publisher deposit of biomed articles	25% to 50%	£144.2 (-0.7)	-	£466.8 (-)	3.2 (-)	£53.9 (-0.2)	£1.4 (-)
10% subscription loss	Offsetting price increases	£144.9 (-)	£27.7 (+27.7)	£362.9 (-103.9)	2.7 (-0.5)	£29.2 (-24.9)	£1.6 (+0.1)
	Cost savings to protect margin	£144.9 (-)	£140.2 (+140.2)	£362.9 (-103.9)	3.5 (+0.3)	£8.3 (-45.8)	£0.2 (-1.2)
Non-UK lower Green uptake	-50%	£144.9 (-)	-	£329.7 (-137.0)	2.3 (-0.9)	£80.2 (+26.0)	£1.9 (+0.5)
User efficiency gains in search and access time	+ 10% efficiency	£144.9 (-)	£54.8 (+54.8)	£466.8 (-)	3.6 (+0.4)	£54.1 (-)	£1.4 (-)

**Green 'Zero' Scenario Sensitivity BCR Range: 2.3 - 3.6**

## Delayed Scenario

Table B3 - Delayed scenario sensitivity analysis (20 year NPV)

Input	Variant	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	Per % access (£m)
<b>Central case</b>	<b>n/a</b>	<b>£2.0</b>	<b>£0.0</b>	<b>£226.4</b>	<b>113.2</b>	<b>£0.9</b>	<b>&lt;£0.1</b>
% 'Delayed' articles available via publishers' websites	- 10%	£2.0 (-)	-	£203.7 (-22.6)	101.9 (-11.3)	£1.0 (+0.1)	<£0.1 (-)
	+ 10%	£2.0 (-)	-	£248.8 (+22.4)	124.4 (+11.2)	£0.8 (-0.1)	<£0.1 (-)
Length of Delay	- 50%	£2.0 (-)	-	£268.5 (+42.1)	134.3 (+21.1)	£0.7 (-0.1)	<£0.1 (-)
	+ 50%	£2.0 (-)	-	£193.6 (-32.8)	96.8 (-16.4)	£1.0 (+0.2)	<£0.1 (-)
Revenue loss	Cost savings to protect margin	£2.0 (-)	£18.3 (+18.3)	£226.4 (-)	122.3 (+9.2)	n/a	n/a
User efficiency gains in search and access time	+ 10% efficiency	£2.0 (-)	£44.6 (+44.6)	£226.4 (-)	135.5 (+22.3)	£0.9 (-)	<£0.1 (-)

**Delayed Scenario Sensitivity BCR Range: 96.8 - 135.5**

## Gold (higher APC) Scenario

Table B4 - Gold (higher APC) scenario sensitivity analysis (20 year NPV)

Input	Variation	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	£m per % access
<b>Central case</b>	<b>n/a</b>	<b>£152.5</b>	<b>£80.6</b>	<b>£254.6</b>	<b>2.2</b>	<b>£50.8</b>	<b>£1.4</b>
% of total 'Gold' author-side payments articles	- 10%	£132.4 (-20.1)	£68.6 (-12.1)	£218.4 (-36.2)	2.2 (-)	£52.8 (+1.9)	£1.4 (-)
	+ 10%	£172.7 (+20.1)	£92.7 (+12.1)	£290.2 (+35.6)	2.2 (-)	£49.4 (-1.4)	£1.4 (-)
Subscription journal size reduction	~16% fall in the size of subscription journals <sup>5</sup>	£174.0 (+21.5)	£0.6 (-80.0)	£254.6 (-)	1.5 (-0.7)	£123.4 (+72.5)	£3.5 (+2.0)
Reduction in author-side publishing costs	- 10%	£97.1 (-55.5)	£98.6 (+18.0)	£254.6 (-)	3.6 (+1.4)	n/a	n/a
Non-UK lower Gold uptake	-50%	£273.7 (+121.2)	£36.4 (-44.2)	£138.6 (-116.0)	0.6 (-1.6)	£318.4 (+267.6)	£8.3 (+6.8)
User efficiency gains in search and access time	+ 10% efficiency gain	£152.3 (-0.2)	£126.6 (+46.0)	£254.6 (-)	2.5 (+0.3)	£50.8 (-)	£1.4 (-)

**Gold (higher APC) Scenario Sensitivity BCR Range: 0.6 - 3.6**

<sup>5</sup> Under the Gold Scenario there is a reduction in subscription journals. In order to maintain the same number of subscription journals as under the 2015 baseline case, the average number of articles per subscription journal would need to decline by just under 16%, as modelled by this sensitivity.

## Gold (lower APC) Scenario

Table B5 - Gold (lower APC) scenario sensitivity analysis (20 year NPV)

Input	Variation	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	£m per % access
<b>Central case</b>	<b>n/a</b>	<b>£28.3</b>	<b>£121.0</b>	<b>£254.6</b>	<b>13.3</b>	<b>n/a</b>	<b>n/a</b>
% of total 'Gold' author-side payments articles	- 10%	£26.9 (-1.5)	£102.8 (-18.1)	£218.4 (-36.2)	12.0 (-1.3)	<b>n/a</b>	<b>n/a</b>
	+ 10%	£29.8 (+1.5)	£139.1 (+18.1)	£290.2 (+35.6)	14.4 (+1.1)	<b>n/a</b>	<b>n/a</b>
Subscription journal size reduction	~16% fall in the size of subscription journals <sup>6</sup>	£48.9 (+20.6)	£37.9 (-83.1)	£254.6 (-)	6.0 (-7.3)	£7.0 (+74.1)	£0.2 (+2.1)
Reduction in author-side publishing costs	- 10%	£18.8 (-9.5)	£151.3 (+30.3)	£254.6 (-)	21.6 (+8.3)	<b>n/a</b>	<b>n/a</b>
Non-UK lower Gold uptake	-50%	£117.7 (+89.3)	£40.5 (-80.5)	£138.6 (-116.0)	1.5 (-11.7)	£101.6 (+168.6)	£2.6 (+4.5)
User efficiency gains in search and access time	+ 10% efficiency gain	£28.1 (-0.2)	£167.0 (+46.0)	£254.6 (-)	15.0 (+1.7)	<b>n/a</b>	<b>n/a</b>

### Gold (lower APC) Scenario Sensitivity BCR Range: 1.5 - 21.6

<sup>6</sup> Under the Gold Scenario there is a reduction in subscription journals. In order to maintain the same number of subscription journals as under the 2015 baseline case, the average number of articles per subscription journal would need to decline by just under 16%, as modelled by this sensitivity.

## HE Licence extension

Table B6 – HE Licence extension sensitivity analysis (20 year NPV)

Input	Variant	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	Per % access (£m)
<b>Central case - HE</b>	<b>n/a</b>	<b>£99.4</b>	<b>£0.0</b>	<b>£191.6</b>	<b>1.9</b>	<b>£67.3</b>	<b>£2.7</b>
Licence extension price – HE	5% (-2.5%)	£71.2 (-28.2)	-	£191.6 (-)	2.7 (+0.8)	£47.8 (-19.5)	£1.9 (-0.8)
	10% (+2.5%)	£127.7 (+28.2)	-	£191.6 (-)	1.5 (-0.4)	£86.8 (+19.5)	£3.5 (+0.8)
User efficiency gains in search and access time	+ 10% efficiency	£99.4 (-)	£12.7 (+12.7)	£191.6 (-)	2.1 (+0.1)	£67.3 (-)	£2.7 (-)

**HE Licence extension Sensitivity BCR Range: 1.5 - 2.7**

## NHS Licence extension

Table B7 – NHS Licence extension sensitivity analysis (20 year NPV)

Input	Variant	Cost (£m)	Savings (£m)	Benefit (£m)	BCR	£ per SUoA	Per % access (£m)
<b>Central case – NHS</b>	<b>n/a</b>	<b>£14.4</b>	<b>£0.0</b>	<b>£36.1</b>	<b>2.5</b>	<b>£9.5</b>	<b>£1.7</b>
Licence extension price – NHS	10% (-5.0%)	£11.8 (-2.6)	-	£36.1 (-)	3.1 (+0.6)	£7.6 (-1.9)	£1.4 (-0.3)
	20% (+5%)	£17.1 (+2.6)	-	£36.1 (-)	2.1 (-0.4)	£11.3 (+1.9)	£2.0 (+0.3)
User efficiency gains in search and access time	+ 10% efficiency	£14.2 (-0.2)	-	£36.1 (-)	2.5 (-)	£9.5 (-)	£1.7 (-)

**NHS Licence extension Sensitivity BCR Range: 2.1 - 3.1**

## Transactional

Table B8 – Transactional sensitivity analysis (20 year NPV)

Input	Variant	Cost to users (£m)	Total quantity demanded by UK researchers	Additional publisher revenue	Benefit-cost ratio
Central case	n/a	£3.0m	301,000	£1.3m	2.0
PPV Price	- \$5 (to \$5)	£4.3m (+1.3)	851,000 (+550,000)	£2.5m (+1.2)	2.0 (-)
	-\$9 (to \$1)	£9.5 (+6.5)	9,516,000 (+9,215,000)	£7.8m (+6.5)	2.0 (-)
Price elasticity of demand	-0.2 (to 1.3)	£2.4m (-0.6)	242,000 (-59,000)	£0.7m (-0.6)	3.2 (+1.2)
	+0.2 (to 1.7)	£3.7m (+0.7)	375,000 (+74,000)	£2.0m (+0.7)	1.8 (-0.2)

**Transactional Sensitivity BCR Range: 1.8 - 3.2**

## ANNEX C: PROFILES OF NET COSTS TO THE UK

The following figures present the UK's annual net costs under each scenario. Each figure is split into two panels:

- Panel A presents the total UK annual net costs, as well as a breakdown by cost type. The three net cost types are: Publication and Distribution steady state net costs; Access Provision steady state net costs; and Transitional Costs (including one-off transaction costs and ongoing system costs).
- Panel B presents the total UK annual net costs, as well as a breakdown by contributor. The two contributors are: Academic Institutions; and Other contributors (including the government, publishers, and other funding groups).

Figure C1: UK Annual Net Costs under the Green Scenario

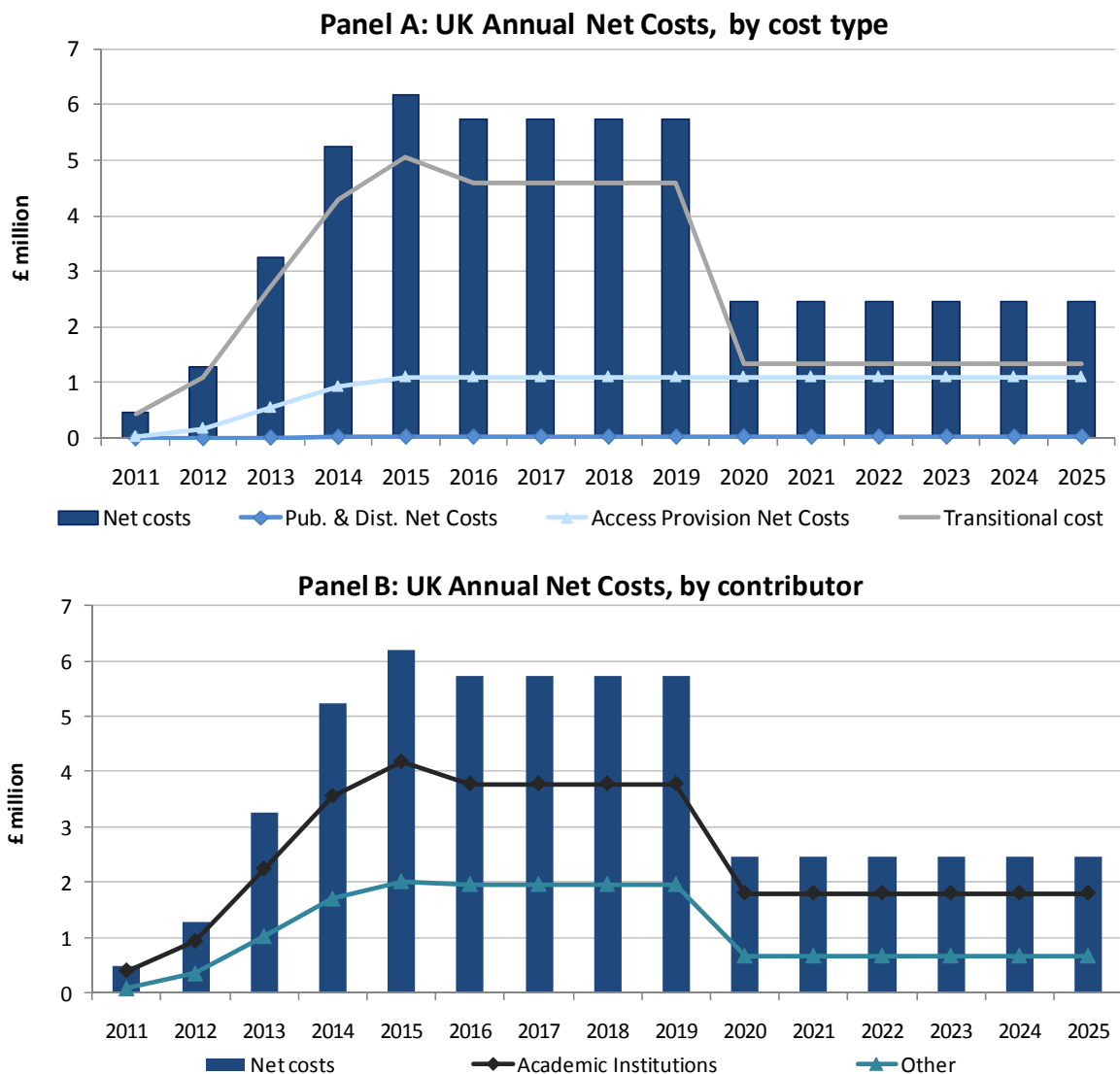


Figure C2: UK Annual Net Costs under the Delayed Scenario

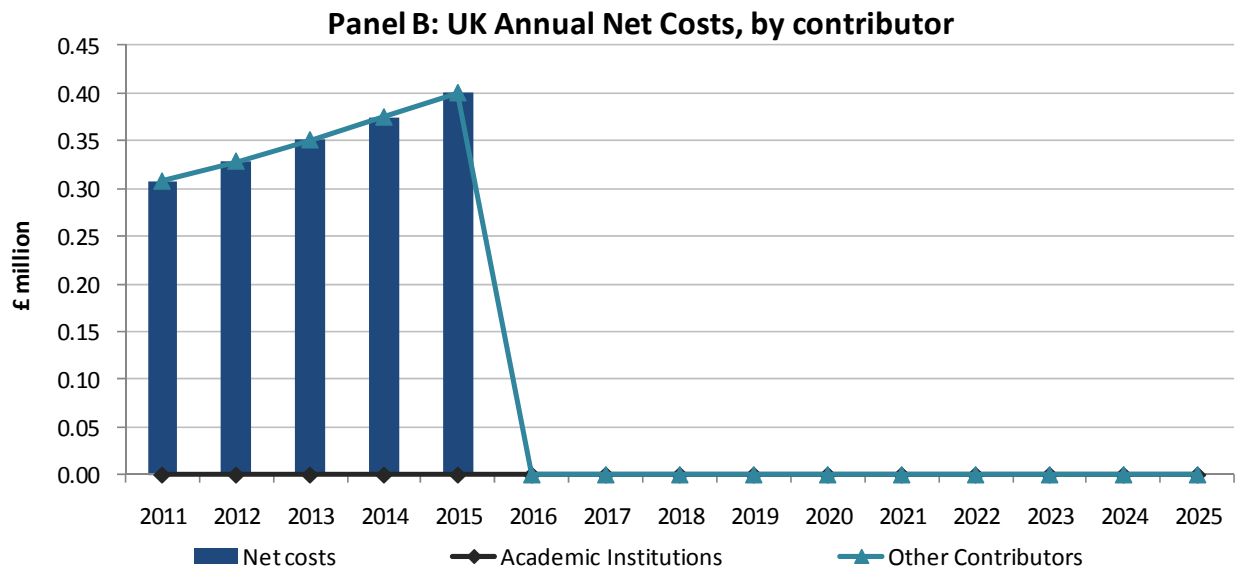
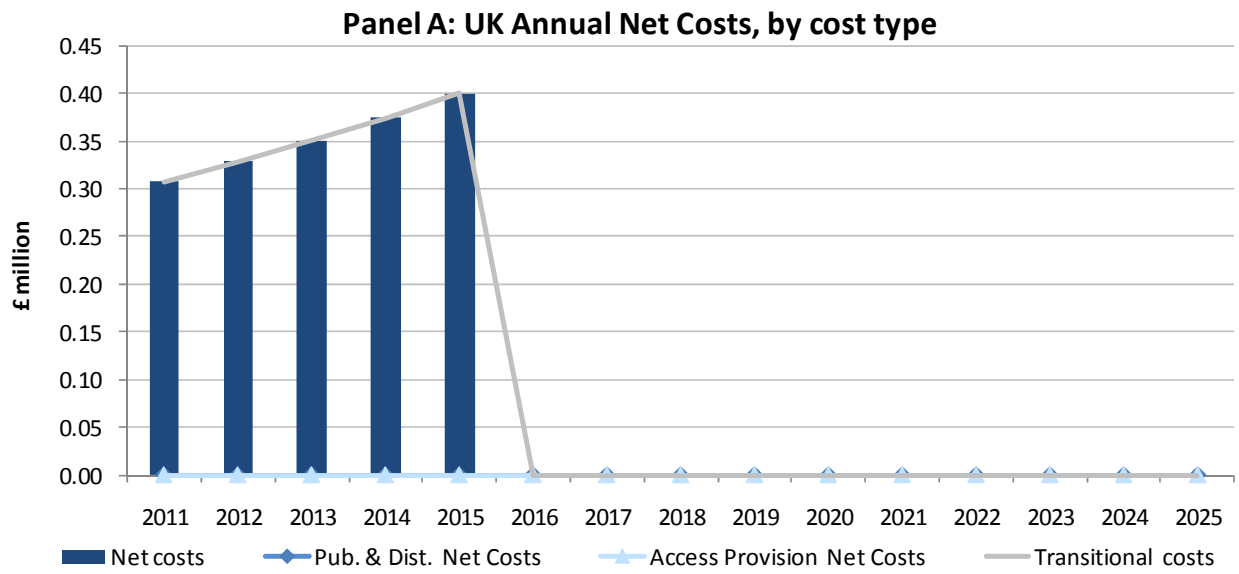


Figure C3: UK Annual Net Costs under the Gold (higher APC case) Scenario

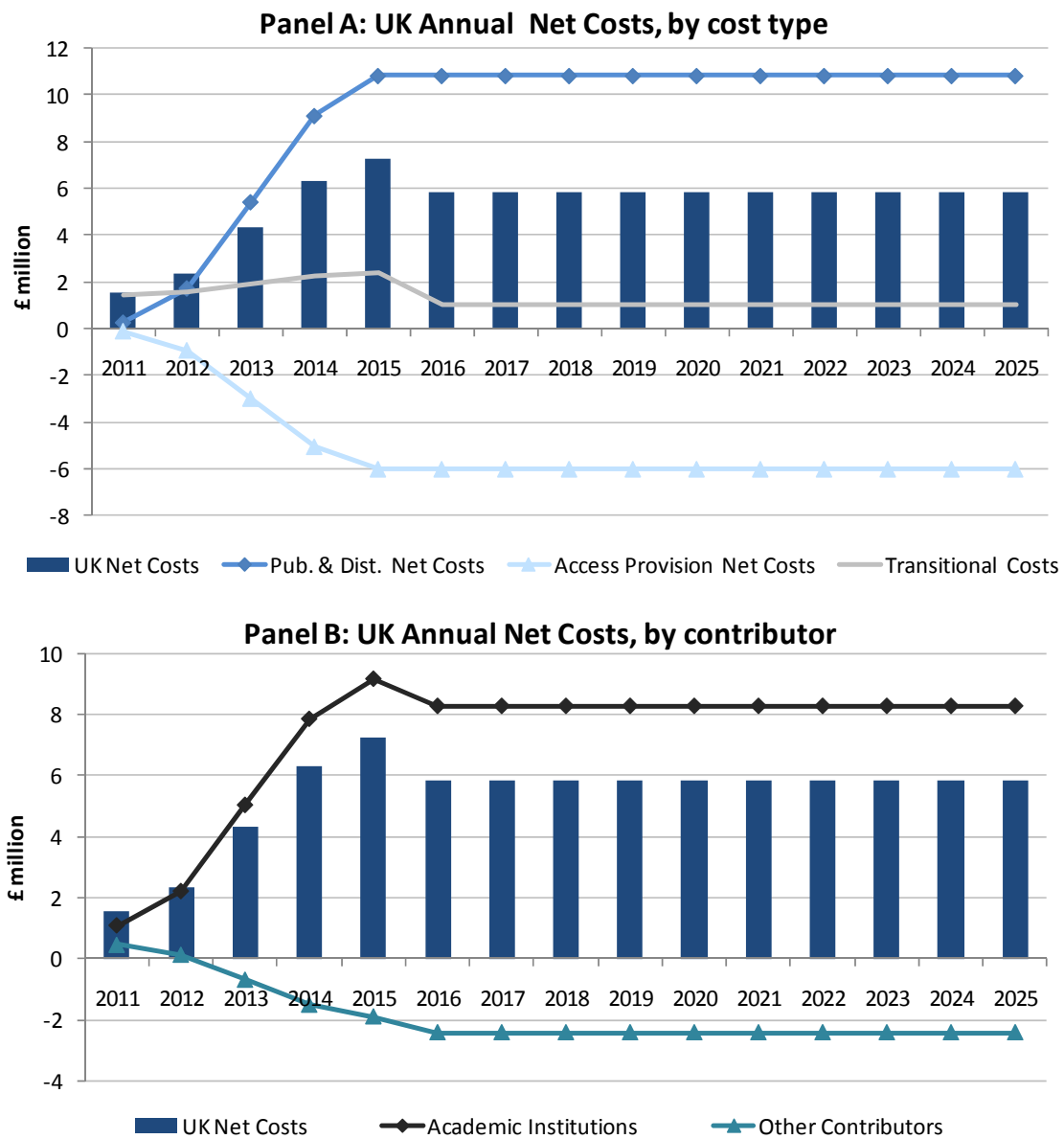


Figure C4: UK Annual Net Costs under the Gold (lower APC case) Scenario

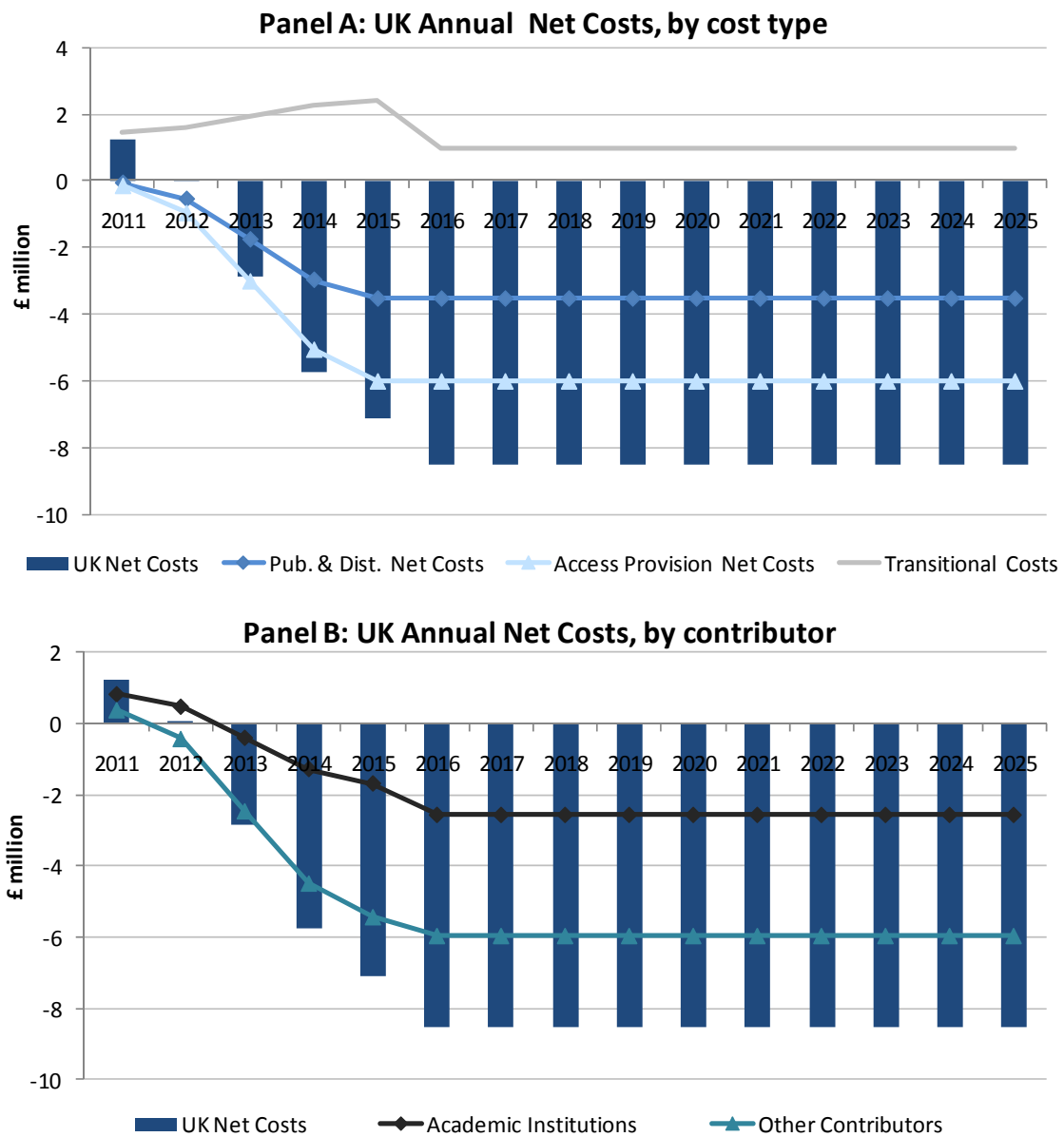


Figure C5: UK Annual Net Costs under the HEI Licensing Extension

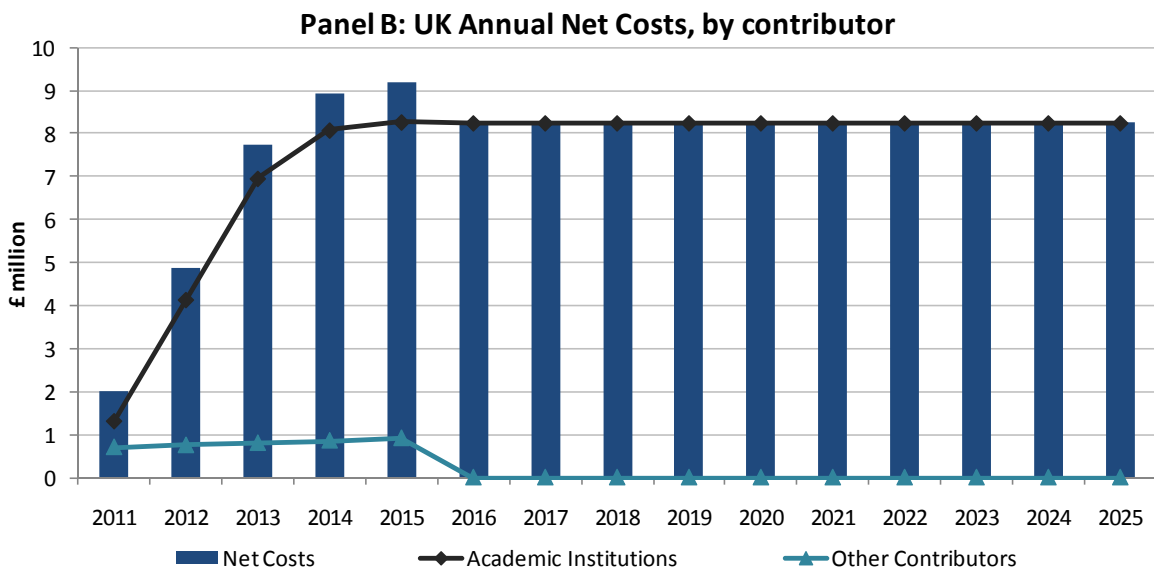
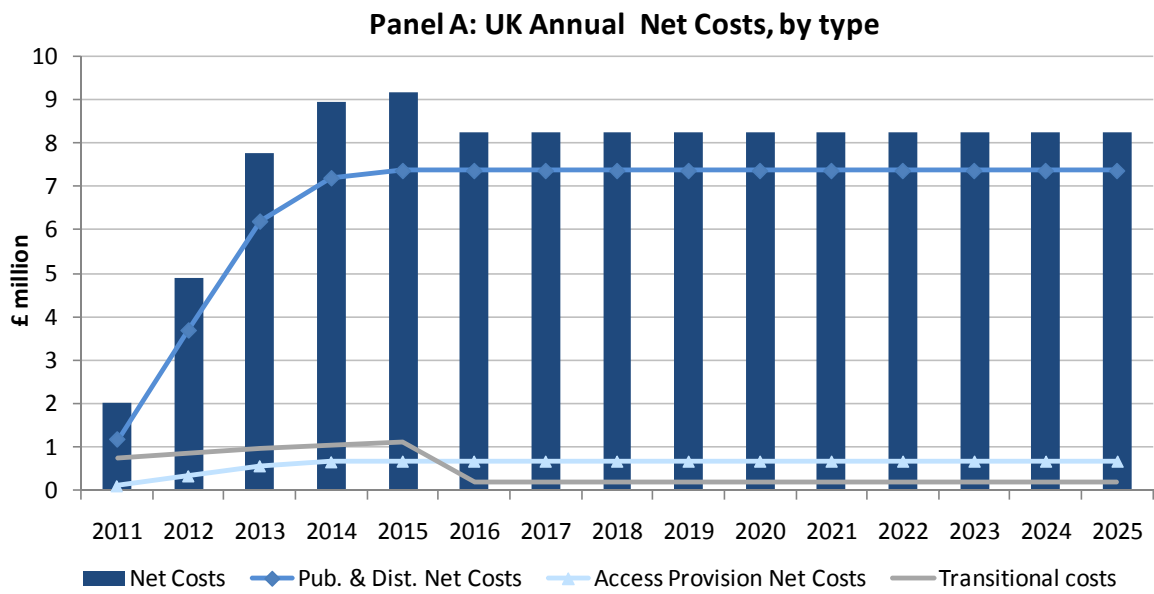


Figure C6: UK Annual Net Costs under the NHS Licensing Extension

