

## Adverse impact on the benchmark

### Introduction

- Section 5 of our provisional findings discusses whether the merger might be expected to remove a potential benchmark company and hence adversely shift Ofwat's statistically estimated technical efficiency benchmark in one or more of Ofwat's econometric models for operating or capital maintenance expenditure. This appendix presents the results of some relevant analysis.

### Operating expenditure

- We looked at changes in the water services operating efficiency rank of 22 WoCs and WaSCs from 2001/02 to 2005/06. Our results are shown in Table 1.

TABLE 1 **Transition probabilities (and number of transitions) for changes in operating expenditure efficiency rank, 2000/01 to 2005/06**

<i>Change in rank in current year</i>	<i>Change in rank in next year</i>		
	<i>per cent</i>		
	<i>Rank worsens</i>	<i>Rank remains the same</i>	<i>Rank improves</i>
Rank worsens	21 (7)	15 (5)	64 (21)
Rank remains the same	35 (6)	12 (2)	53 (9)
Rank improves	61 (23)	13 (5)	26 (10)

Source: Ofwat and CC calculations.

*Notes:*

- Transition probabilities estimated for 10 WaSCs and 12 WoCs from 5 Ofwat annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 88 transitions in total.
- Number of transitions in parentheses.

- Table 1 compares three years' ranks and is interpreted as follows. Consider row 1 for operating expenditure: this shows what happened, on average, to companies that suffered a worsening in operating expenditure efficiency ranking from year 0 (the base year) to year 1 (the current year).<sup>1</sup> Of these companies, 21 per cent suffered a

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<sup>1</sup>Here, year 0 is 2000/01, 2001/02, 2002/03 and 2003/04. Year 1 is 2001/02, 2002/03, 2003/04 and 2004/05.

continuing worsening in rank from year 1 to year 2 (column 1), the rank of 15 per cent remained unchanged from year 1 to year 2 (column 2) and nearly 64 per cent improved their rank from year 1 to year 2 (column 3).<sup>2</sup> (And 21 per cent + 15 per cent + 64 per cent = 100 per cent.)

4. Row 2 in the table shows what happened, on average, to companies whose operating expenditure efficiency rank remained the same from year 0 to year 1: the rank of 35 per cent worsened in year 2 (column 1), the rank of 12 per cent stayed the same in year 2 (column 2) and the rank of 53 per cent improved in year 2 (column 3). (And 35 per cent + 12 per cent + 53 per cent = 100 per cent.) Lastly, row 3 in the table shows what happened, on average, to companies whose operating expenditure efficiency rank improved from year 0 to year 1: the rank of 61 per cent worsened in year 2 (column 1), the rank of 13 per cent was unchanged (column 2) and the rank of 26 per cent improved again (column 3). (And 61 per cent + 13 per cent + 26 per cent = 100 per cent.)
5. We looked at the operating efficiency band (from A to E) of 22 WoCs and WaSCs from 2000/01 to 2005/06. From this, we estimated the probability of a company moving from operating expenditure efficiency band B (where it was not likely to form the benchmark, regardless of its precise rank) to band A (where it was more likely to, again regardless of its precise rank). Our results are given in Table 2.

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<sup>2</sup>Here, year 2 can be 2002/03, 2003/04, 2004/05 and 2005/06.

TABLE 2 Transition probabilities (and number of transitions) between operating expenditure efficiency bands 2000/01 to 2005/06

Opex band in current year*	Opex band in next year*				
	A	B	C	D	E
A	81 (21)	19 (5)	0 (0)	0 (0)	0 (0)
B	20 (8)	66 (27)	12 (5)	2 (1)	0 (0)
C	3 (1)	50 (16)	44 (14)	3 (1)	0 (0)
D	0 (0)	0 (0)	67 (6)	33 (3)	0 (0)
E	0 (0)	0 (0)	50 (1)	0 (0)	50 (1)

Source: Ofwat and CC calculations.

\*A is best, E is worst.

Notes:

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from 6 Ofwat annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 110 transitions in total.

2. Number of transitions in parentheses.

6. To interpret Table 2, consider row 1: this shows what happened, on average, to companies in band A in the base year.<sup>3</sup> Of these companies, 81 per cent also were in band A the following year (column A) and 19 per cent dropped to band B (column 2).<sup>4</sup> Row 2 in the table shows what happened, on average, to companies in band B in the base year: 20 per cent moved up to band A the following year (column 1), 66 per cent remained in band B (column 2), 12 per cent dropped to band C (column 3) and 2 per cent dropped to band D (column 4). Row 3 in the table shows what happened, on average, to companies in band C in the base year: 3 per cent moved up to band A (column 1), 50 per cent moved up to band B (column 2), 44 per cent stayed in band C (column 3) and 3 per cent fell to band D (column 4). Row 4 in the table shows what happened, on average, to companies in band D in the base year: two-thirds stayed in band D (column 3) and one-third fell to band D (column 4). And row 5 in the table shows what happened, on average, to companies in band E in the base year: half improved to band C (column 3) and half stayed in band E (column 5).

<sup>3</sup>Here, the base year can be 2000/01, 2001/02, 2002/03, 2003/04 and 2004/05.

<sup>4</sup>Here, the following year can be 2001/02, 2002/03, 2003/04, 2004/05 and 2005/06.

7. We looked at changes in the operating efficiency band (not rank, because of data limitations) of 22 WoCs and WaSCs from 2001/02 to 2005/06 for the four sub-categories of operating expenditure (ie resources and treatment, distribution, power, and business activities).<sup>5</sup> Our results are given in Tables 3 to 6.

TABLE 3 **Transition probabilities (and number of transitions) for changes in resources and treatment operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	15 (2)	23 (3)	62 (8)
Band remains the same	26 (10)	64 (25)	10 (4)
Band improves	57 (8)	43 (6)	0 (0)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 66 transitions in total.
2. Number of transitions in parentheses.

TABLE 4 **Transition probabilities (and number of transitions) for changes in distribution operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	20 (2)	20 (2)	60 (6)
Band remains the same	24 (8)	50 (17)	26 (9)
Band improves	18 (4)	36 (8)	45 (10)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 66 transitions in total.
2. Number of transitions in parentheses.

<sup>5</sup>Historical data on companies' relative performance within sub-categories of operating expenditure was only available from Ofwat in bands, not ranks, and only from 2001/02 for all 22 companies.

TABLE 5 **Transition probabilities (and number of transitions) for changes in power operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	26 (6)	35 (8)	39 (9)
Band remains the same	36 (11)	52 (16)	13 (4)
Band improves	67 (8)	25 (3)	8 (1)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 66 transitions in total.
2. Number of transitions in parentheses.

TABLE 6 **Transition probabilities (and number of transitions) for changes in business activities operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	11 (2)	67 (12)	22 (4)
Band remains the same	15 (6)	72 (28)	13 (5)
Band improves	67 (6)	33 (3)	0 (0)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 66 transitions in total.
2. Number of transitions in parentheses.

8. Because there are fewer bands (5) than ranks (22), we considered that it may take longer than one year to move band. We therefore checked that our estimated transition probabilities were robust to looking at changes in band over two years and not over one year (as given in the tables above).<sup>6</sup> Our results are consistent with those reported above and are given in Tables 7 to 10.

<sup>6</sup>We did not have enough data to check longer transitions (eg 3- or 4-year).

TABLE 7 **Two-year transition probabilities (and number of transitions) for changes in resources and treatment operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	60 (6)	40 (4)	0 (0)
Band remains the same	16 (4)	76 (19)	8 (2)
Band improves	44 (4)	33 (3)	22 (2)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 44 2-year transitions in total.
2. Number of 2-year transitions in parentheses.

TABLE 8 **Two-year transition probabilities (and number of transitions) for changes in distribution operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	13 (1)	63 (5)	25 (2)
Band remains the same	12 (2)	53 (9)	35 (6)
Band improves	21 (4)	16 (3)	63 (12)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 44 2-year transitions in total.
2. Number of 2-year transitions in parentheses.

TABLE 9 **Two-year transition probabilities (and number of transitions) for changes in power operating expenditure efficiency band 2001/02 to 2005/06**

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	88 (15)	12 (2)	0 (0)
Band remains the same	37 (7)	42 (8)	21 (4)
Band improves	62 (5)	38 (3)	0 (0)

Source: Ofwat and CC calculations.

*Notes:*

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 44 2-year transitions in total.
2. Number of 2-year transitions in parentheses.

TABLE 10 Two-year transition probabilities (and number of transitions) for changes in business activities operating expenditure efficiency band 2001/02 to 2005/06

*per cent*

*Change in band in next year*

<i>Change in band in current year</i>	<i>Band worsens</i>	<i>Band remains the same</i>	<i>Band improves</i>
Band worsens	58 (7)	25 (3)	17 (2)
Band remains the same	17 (4)	75 (18)	8 (2)
Band improves	25 (2)	50 (4)	25 (2)

Source: Ofwat and CC calculations.

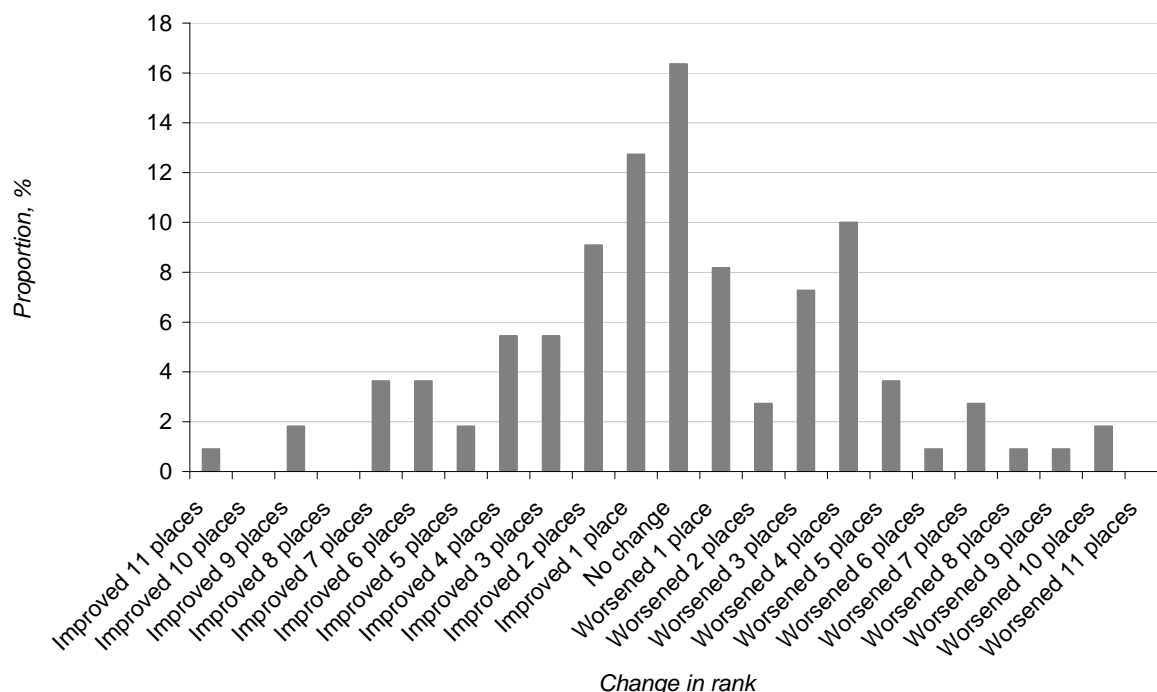
**Notes:**

1. Transition probabilities estimated for 10 WaSCs and 12 WoCs from underlying data supplied by Ofwat to 5 annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 44 2-year transitions in total.
2. Number of 2-year transitions in parentheses.

9. We looked at the frequency and magnitude of changes in the operating efficiency rank of 22 WoCs and WaSCs from 2000/01 to 2005/06. Our results are given in Figure 1 and Table 11.

FIGURE 1

**Frequency and magnitude of changes in operating expenditure efficiency rank for 22 companies, 2000/01 to 2005/06**



Source: Ofwat and CC calculations.

TABLE 11 Frequency and magnitude of changes of operating expenditure efficiency rank 2000/01 to 2005/06

Change in rank*	Frequency†	per cent	
		Individual	Cumulative
Improved 11 places	1	0.91	0.91
Improved 10 places	0	0.00	0.91
Improved 9 places	2	1.82	2.73
Improved 8 places	0	0.00	2.73
Improved 7 places	4	3.64	6.36
Improved 6 places	4	3.64	10.00
Improved 5 places	2	1.82	11.82
Improved 4 places	6	5.45	17.27
Improved 3 places	6	5.45	22.73
Improved 2 places	10	9.09	31.82
Improved 1 place	14	12.73	44.55
No change	18	16.36	60.91
Worsened 1 place	9	8.18	69.09
Worsened 2 places	3	2.73	71.82
Worsened 3 places	8	7.27	79.09
Worsened 4 places	11	10.00	89.09
Worsened 5 places	4	3.64	92.73
Worsened 6 places	1	0.91	93.64
Worsened 7 places	3	2.73	96.36
Worsened 8 places	1	0.91	97.27
Worsened 9 places	1	0.91	98.18
Worsened 10 places	2	1.82	100.00
Worsened 11 places	0	0.00	100.00

Source: Ofwat and CC calculations.

*Notes:*

\*Difference in rank between two review periods.

†Giving 110 changes of rank in total, ie for 22 companies over five changes in review period (2000/01 to 2001/02, 2001/02 to 2002/03, 2002/03 to 2003/04, 2003/04 to 2004/05 and 2004/05 to 2005/06).

10. Using the individual percentages in Table 11, we estimated the probability of moving a given number of places up the operating expenditure efficiency ranking in two years. To do this, we added together the probabilities associated with all permutations of changes in observed ranks that result in a given net improvement in places. The results of our analysis are given in section 5 of our provisional findings, Table 7.

### Capital maintenance expenditure

11. We looked at changes in the capital maintenance efficiency rank of 22 WoCs and WaSCs from 2000/01 to 2005/06. We estimated transition probabilities for the changes in rank of 22 WoCs and WaSCs from 2000/01 to 2005/06.<sup>7</sup> The results of our analysis are given in Table 12.

<sup>7</sup>Data limitations prevented us looking at changes over time in companies' efficiency rank for sub-categories of capital maintenance expenditure.

TABLE 12 Transition probabilities (and number of transitions) for changes in capital maintenance expenditure efficiency 2000/01 to 2005/06

Change in rank in current year	Change in rank in next year		
	per cent		
	Rank worsens	Rank remains the same	Rank improves
Rank worsens	32 (18)	16 (9)	53 (30)
Rank remains the same	64 (7)	0 (0)	36 (4)
Rank improves	48 (20)	12 (5)	41 (17)

Source: Ofwat and CC calculations.

Notes:

Transition probabilities estimated for 10 WaSCs and 12 WoCs from 6 Ofwat annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 110 transitions in total.

12. Table 12 compares three years' ranks and is interpreted as follows. Consider row 1 for capital maintenance expenditure: this shows what happened, on average, to companies that suffered a worsening in capital maintenance expenditure efficiency ranking from year 0 (the base year) to year 1 (the current year).<sup>8</sup> Of these companies, 32 per cent suffered a continuing worsening in rank from year 1 to year 2 (column 1), the rank of 16 per cent remained unchanged from year 1 to year 2 (column 2) and nearly 53 per cent improved their rank from year 1 to year 2 (column 3).<sup>9</sup>
13. Row 2 in Table 12 shows what happened, on average, to companies whose capital maintenance expenditure efficiency rank remained the same from year 0 to year 1: the rank of 64 per cent worsened in year 2 (column 1), and the rank of 36 per cent improved in year 2 (column 3).
14. Lastly, row 3 in Table 12 shows what happened, on average, to companies whose capital maintenance expenditure efficiency rank improved from year 0 to year 1: the

<sup>8</sup>Here, year 0 is 2000/01, 2001/02, 2002/03 and 2003/04. Year 1 is 2001/02, 2002/03, 2003/04 and 2004/05.

<sup>9</sup>Here, year 2 can be 2002/03, 2003/04, 2004/05 and 2005/06.

rank of 48 per cent worsened in year 2 (column 1), the rank of 12 per cent was unchanged (column 2) and the rank of 41 per cent improved again (column 3).

15. We looked at the capital maintenance efficiency band (from A to E) of 22 WoCs and WaSCs from 2002/03 to 2005/06. From this, we estimated the probability of a company moving from capital maintenance expenditure efficiency band B (where it was not likely to form the benchmark, regardless of its precise rank) to band A (where it was more likely to, again regardless of its precise rank). Our results are given in Table 13, which shows that there is a 50 per cent probability of a firm moving up from rank B to rank A.

TABLE 13 **Transition probabilities (and number of transitions) between capital maintenance expenditure efficiency bands 2002/03 to 2005/06**

		<i>per cent</i>				
		<i>Capital maintenance expenditure band in next year (columns)*</i>				
<i>Capital maintenance expenditure band in current year (rows)*</i>		A	B	C	D	E
A		79 (23)	17 (5)	4 (1)	0 (0)	0 (0)
B		50 (11)	23 (5)	18 (4)	9 (2)	0 (0)
C		23 (5)	36 (8)	23 (5)	18 (4)	0 (0)
D		20 (2)	30 (3)	30 (3)	10 (1)	10 (1)
E		0 (0)	20 (1)	40 (2)	20 (1)	20 (1)

Source: Ofwat and CC calculations.

\*A is best, E is worst.

Note: Transition probabilities estimated for 10 WaSCs and 12 WoCs from 6 Ofwat annual 'Water and sewerage service unit costs and relative efficiency' reports, giving 110 transitions in total.

16. To interpret Table 13, consider row 1: this shows what happened, on average, to companies in band A in the base year.<sup>10</sup> Of these companies, 79 per cent also were in band A the following year (column A), 17 per cent dropped to band B (column 2), and 4 per cent dropped to band C (column 3).<sup>11</sup>

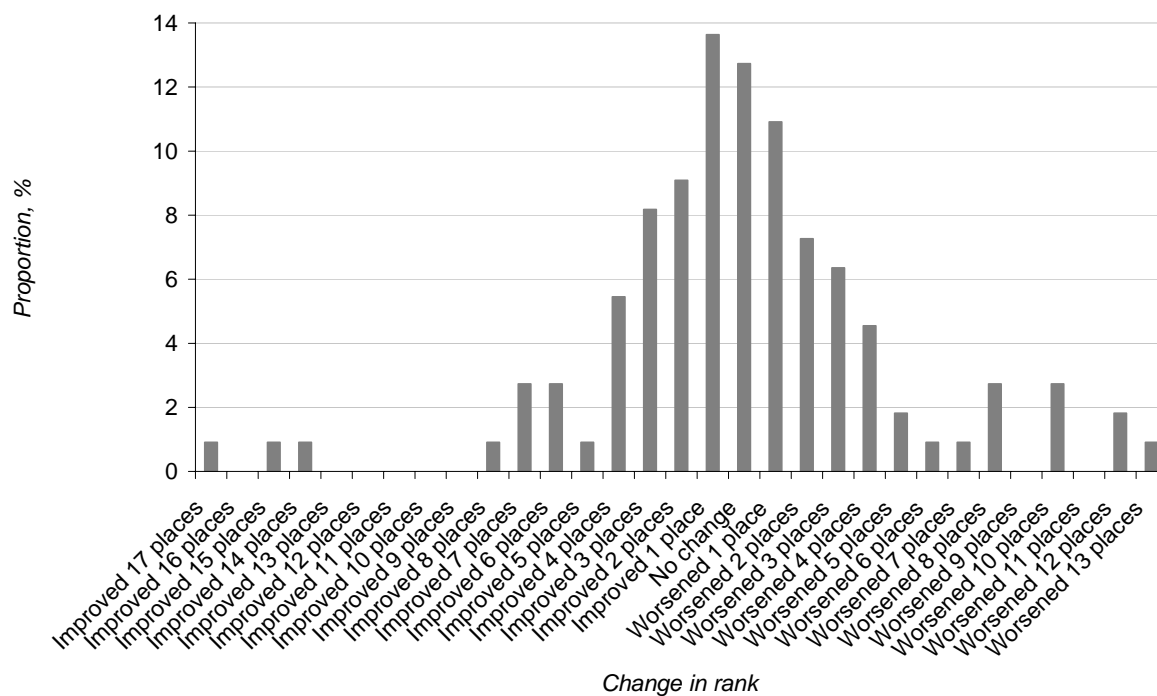
<sup>10</sup>Here, the base year can be 2000/01, 2001/02, 2002/03, 2003/04 and 2004/05.

<sup>11</sup>Here, the following year can be 2001/02, 2002/03, 2003/04, 2004/05 and 2005/06.

17. Row 2 in Table 13 shows what happened, on average, to companies in band B in the base year: 50 per cent moved up to band A the following year (column 1), 23 per cent remained in band B (column 2), 18 per cent dropped to band C (column 3) and 9 per cent dropped to band D (column 4).
18. Row 3 in Table 13 shows what happened, on average, to companies in band C in the base year: 23 per cent moved up to band A (column 1), 36 per cent moved up to band B (column 2), 23 per cent stayed in band C (column 2), and 18 per cent fell to band D (column 3).
19. Row 4 in Table 13 shows what happened, on average, to companies in band D in the base year: 20 per cent moved up to band A (column 1), 30 per cent moved up to band B and C (column 2 and 3), 10 per cent stayed in band D (column 4) and 10 per cent fell to band E (column 5).
20. Lastly, row 5 in the table shows what happened, on average, to companies in band E in the base year: 20 per cent moved up to band B (column 2), 40 per cent moved up to band C (column 3), 20 per cent moved up to band D (column 4), and 20 per cent stayed in band E (column 5).
21. Finally, we looked at the frequency and magnitude of changes in the capital maintenance efficiency rank of 22 WoCs and WaSCs from 2000/01 to 2005/06. Our results are given in Figure 2 and Table 14.

FIGURE 2

**Frequency and magnitude of changes in capital maintenance expenditure efficiency rank for 22 companies, 2000–01 to 2005–06**



Source: Ofwat and CC calculations.

TABLE 14 **Frequency and magnitude of changes of capital maintenance expenditure efficiency rank 2000-01 to 2005-06**

Change in rank*	Frequency†	per cent	
		Individual	Cumulative
Improved 17 places	1	0.91	0.91
Improved 16 places	0	0.00	0.91
Improved 15 places	1	0.91	1.82
Improved 14 places	1	0.91	2.73
Improved 13 places	0	0.00	2.73
Improved 12 places	0	0.00	2.73
Improved 11 places	0	0.00	2.73
Improved 10 places	0	0.00	2.73
Improved 9 places	0	0.00	2.73
Improved 8 places	1	0.91	3.64
Improved 7 places	3	2.73	6.36
Improved 6 places	3	2.73	9.09
Improved 5 places	1	0.91	10.00
Improved 4 places	6	5.45	15.45
Improved 3 places	9	8.18	23.64
Improved 2 places	10	9.09	32.73
Improved 1 place	15	13.64	46.36
No change	14	12.73	59.09
Worsened 1 place	12	10.91	70.00
Worsened 2 places	8	7.27	77.27
Worsened 3 places	7	6.36	83.64
Worsened 4 places	5	4.55	88.18
Worsened 5 places	2	1.82	90.00
Worsened 6 places	1	0.91	90.91
Worsened 7 places	1	0.91	91.82
Worsened 8 places	3	2.73	94.55
Worsened 9 places	0	0.00	94.55
Worsened 10 places	3	2.73	97.27
Worsened 11 places	0	0.00	97.27
Worsened 12 places	2	1.82	99.09
Worsened 13 places	1	0.91	100.00

Source: Ofwat and CC calculations.

*Notes:*

\*Difference in rank between two review periods.

†Giving 110 changes of rank in total, ie for 22 companies over five changes in review period (2000/01 to 2001/02, 2001/02 to 2002/03, 2002/03 to 2003/04, 2003/04 to 2004/05 and 2004/05 to 2005/06).

22. Using the individual percentages in Table 14, we estimated the probability of moving a given number of places up the capital maintenance expenditure efficiency ranking in two years. To do this, we added together the probabilities associated with all permutations of changes in observed ranks that result in a given net improvement in places. The results of our analysis are given in section 5 of our provisional findings, Table 7.