

# Location and size loadings for independent schools

A submission by Australian Projections Pty Ltd

*This report has been written by actuaries Dr Richard Cumpston and Hugh Sarjeant, as directors of Australian Projections Pty Ltd.*

## Summary

This submission is made to assist the National School Resourcing Board's review of the regional Schooling Resource Standard loadings. It updates our submission of 6 November 2020, using data that have since become available.

We obtained financial data for 171 independent schools from the website of the Australian Charities and Not-for-profits Commission. Data for individual Catholic schools are not generally available from this source. Accounting presentations differ between schools, so that it has not always been possible to exclude capital grants from ordinary revenue.

Our analyses of the data from the 171 independent schools show that regional schools have lower profits as a percentage of revenues, and lower returns on equity, with the shortfalls increasing with remoteness. The data also show that schools with between 100 and 999 students have profit margins well below those of the smallest and largest schools.

We used linear programming to find extra location and size loadings that gave profit margins for each combination of remoteness and size, approximately equal to the present profit margins of the largest schools. These extra loadings, which are additional to the present loadings, are

Remoteness	Extra loading as % of base funding	Size	Extra loading \$m per school
Major cities	0%	0-99	0.000
Inner regional	7%	100-249	0.120
Outer regional	9%	250-999	0.175
Remote & very remote	13%	1000-1249	0.072
		1250+	0.000

More reliable results could be obtained using data from all independent schools, rather than sample data. The NSR should have access to such data. Another problem is that the profits of each school depend on its base funding and up to six loadings, so that profit anomalies may reflect problems with the base funding or the other loadings.

Data from all independent schools would allow analyses of location loadings for alternative remoteness measures, including the ARIA+ values currently used.

## 1. Introduction

### 1.1 Terms of reference for NSRB review of regional Schooling Resource Standard loadings

*“The Board will consider funding provided to regional and remote schools, provide findings and make recommendations relating to the current settings for the school location and school size loadings and the data informing the loadings ...*

*In undertaking its review, the Board will consult with stakeholders from both the government and non-government sector, and invite submissions from relevant parties ...*

*The Board will provide states and territories with the opportunity to provide feedback on draft findings of the review.” [1]*

### 1.2 NSRB review of the socio-economic status score methodology

The establishment of the NSRB was announced on 1 November 2017. The review was initiated on 3 November 2017, and the final report received in June 2018 [3]. The report lists a secretariat of 6, a research team of 10, an expert panel of 5 and 3 commissioned research papers. It drew upon personal income taxation records made available through the Commonwealth’s Multi-Agency Data Integration Project.

The report recommended that capacity to contribute for a school be based on a direct measure of median income of parents and guardians at the school. On 27 February 2020 the Senate referred the provisions of the Australian Education Amendment (Direct Measure of Income) Bill 2020 to the Education and Employment Legislation Committee. The Committee tabled its report on 23 March 2020, recommending that the bill be passed.

### 1.3 Base funding and loadings projected for non-government schools in 2020

Type of federal recurrent payment	Payments \$m	Percent of total
Base funding	10277.1	78.6%
Indigenous students loading	152.5	1.2%
Students with disability loading	1133.3	8.7%
Socio-educational disadvantage loading	1017.5	7.8%
English language proficiency loading	32.5	0.2%
Location loading	247.7	1.9%
Size loading	214.6	1.6%
<b>Total</b>	<b>13075.2</b>	<b>100.0%</b>

The above data were supplied by DESE by administrative release on 20 October 2020, in response to a request under the Freedom of Information Act 1982 [4]. They were based on DESE’s school funding model as at 12 January 2020.

The location and size loadings, which are the subject of the NSRB’s current review, made up 3.5% of projected federal recurrent payments to non-government schools in 2020.

## 2. Analyses of financial data by region for sample schools

### 2.1 Selection of stratified sample of 171 independent schools

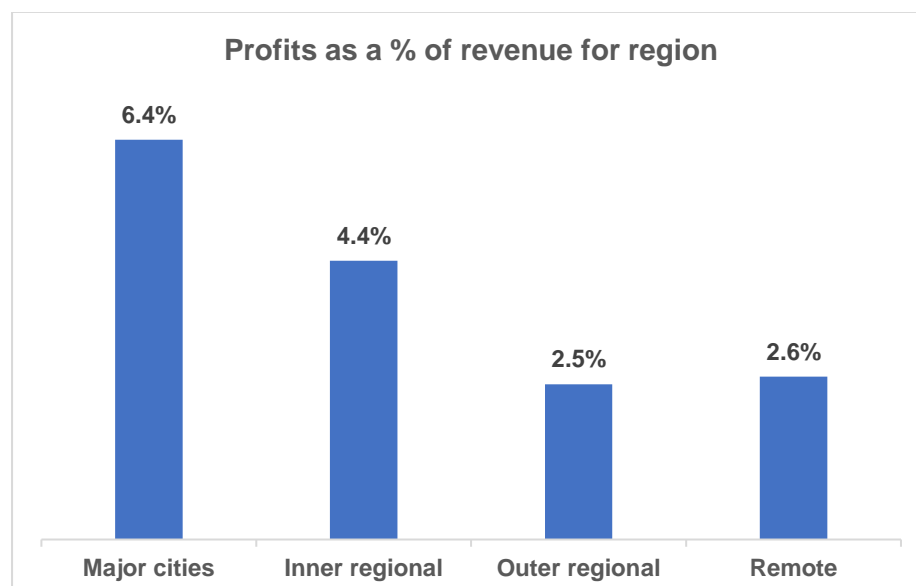
We obtained financial data about a stratified sample of individual schools from the Australian Charities and Not-for-profits Commission website ([www.acnc.gov.au](http://www.acnc.gov.au)). Our Aim was to have a similar number of schools from each of the first three region types (major cities, inner regional, outer regional) and as many as possible from remote and very remote regions.

In all, the sample data provided 990 years of data from 171 independent schools (see 2.2). The earliest data were for 2012, and the latest for 2019. The mean number of years of data per school was 5.8.

### 2.2 Profits as a % of revenue for sample data

Remoteness	Number schools in sample	Number years of data	Mean years of data	Revenue \$m	Profits \$m	Profits as % of revenue
Major cities	57	336	5.9	6082.3	386.4	6.4%
Inner regional	49	281	5.7	3204.3	141.9	4.4%
Outer regional	49	281	5.7	2177.6	53.7	2.5%
Remote	16	92	5.8	446.9	11.6	2.6%
<b>Total</b>	<b>171</b>	<b>990</b>	<b>5.8</b>	<b>11911.0</b>	<b>593.6</b>	

“Revenue” and “profit” exclude capital grants identified in the accounts or the notes to the accounts. “Remote” include “Very remote” schools.



We tried to exclude capital grants from both revenue and profits, but some schools may have included capital grants in their revenue from ordinary activities. Profit margins in inner regions are lower than those in major cities, and profits in outer regional and remote areas are much lower than those in major cities.

### 2.3 Capital grants as % of revenue for sample data

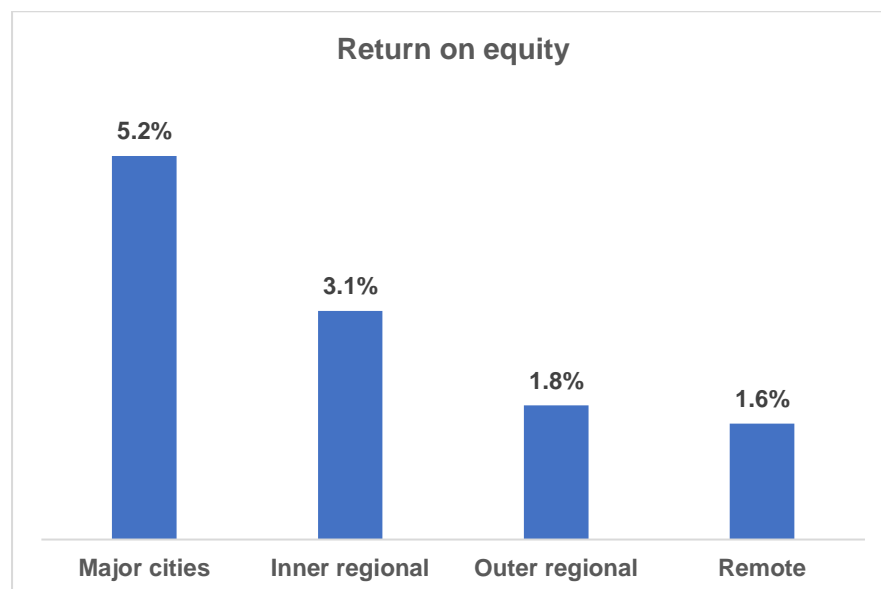
Remote-ness	Number years of data	Revenue \$m	Capital grants \$m	Capital grants as % of revenue
Major cities	336	6082.3	23.2	0.4%
Inner regional	281	3204.3	15.4	0.5%
Outer regional	281	2177.6	37.6	1.7%
Remote	92	446.9	9.4	2.1%
<b>Total</b>	<b>990</b>	<b>11911.0</b>	<b>85.5</b>	

Capital grants appear to be more important in outer regional and remote areas.

### 2.4 Return on equity for sample data

Remote-ness	Number years of data	Average equity in year \$m	Profits \$m	Return on equity
Major cities	329	7481	390.3	5.2%
Inner regional	275	4523	140.6	3.1%
Outer regional	279	2891	52.7	1.8%
Remote	92	733	11.6	1.6%
<b>Total</b>	<b>975</b>	<b>15629</b>	<b>595.2</b>	

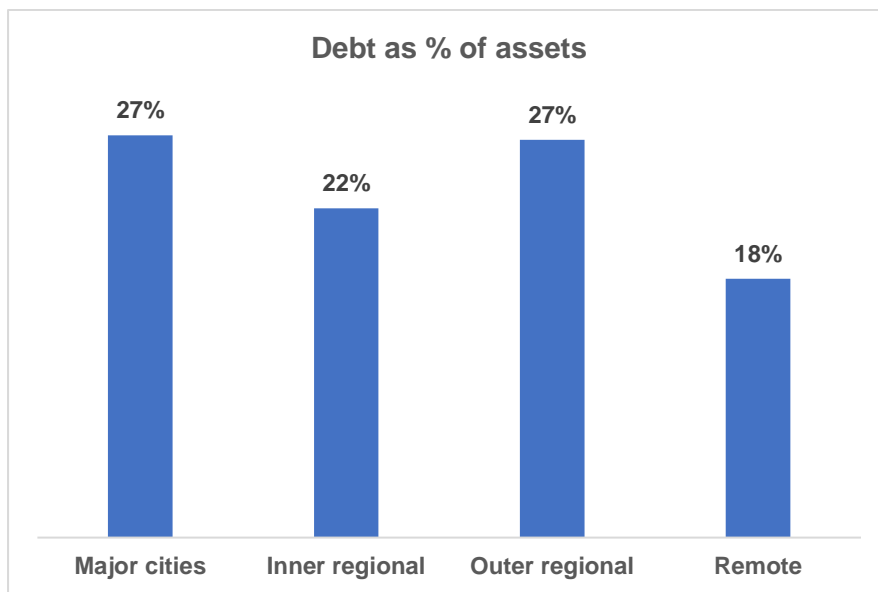
Return on equity was calculated as the profit before capital grants for the year, divided by the average equity at the start and end of the year. 15 cases with negative equity were ignored.



Returns on equity for the sample schools in each region are about 1% pa lower than their profit margins (see 2.2). This suggests that if location loadings are changed to equalise profit margins across regions, then returns on equity will also be approximately equalised.

## 2.5 Debt as % of assets for sample data

Remote-ness	Number years of data	Assets at end of year \$m	Equity at end of year \$m	Debt at end of year \$m	Debt as % of assets at end
Major cities	329	10637	7723	2914	27%
Inner regional	275	5965	4628	1337	22%
Outer regional	280	4052	2954	1098	27%
Remote	91	924	762	163	18%
<b>Total</b>	<b>975</b>	<b>21578</b>	<b>16067</b>	<b>5512</b>	

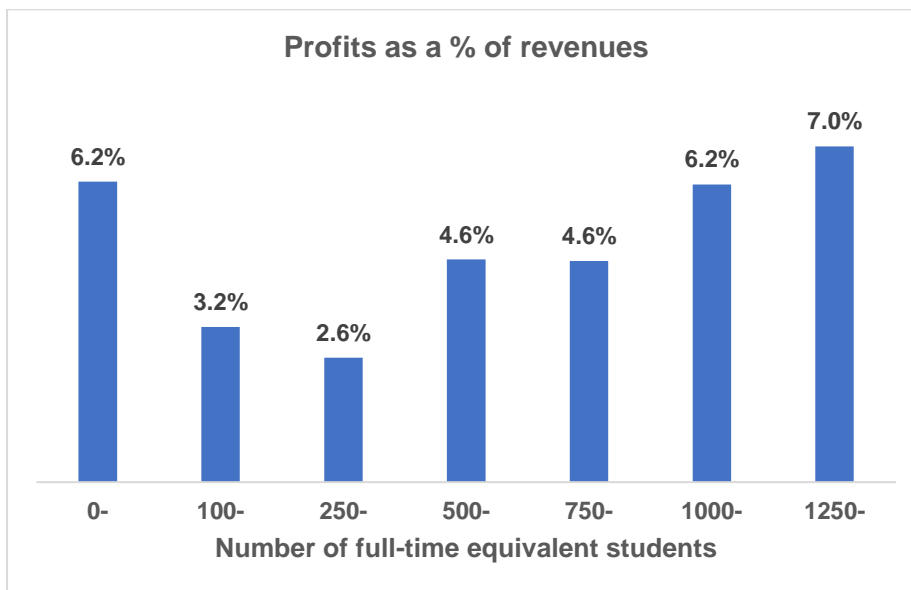


Debt as a percentage of assets reduces from about 27% in major cities to about 18% in remote areas. This may reflect lower land values in regional areas, as institutional lenders may rely largely on land values as security for loans to schools.

### 3. Analyses of financial data by region for sample schools

#### 3.1 Profit margins as percentages of revenue from sample data

School size (ftes)	Number years of date in sample	Number of ftes in sample (all years)	Sample revenue \$m	Sample revenue \$m	Sample profit as % of revenue
0-	54	4143	132	8.3	6.2%
100-	324	53951	1250	40.3	3.2%
250-	212	74193	1518	39.2	2.6%
500-	142	90254	2294	105.9	4.6%
750-	114	99575	2215	101.5	4.6%
1000-	72	79198	1883	116.2	6.2%
1250-	72	105675	2619	182.4	7.0%
<b>Total</b>	<b>990</b>	<b>506989</b>	<b>11911</b>	<b>593.6</b>	



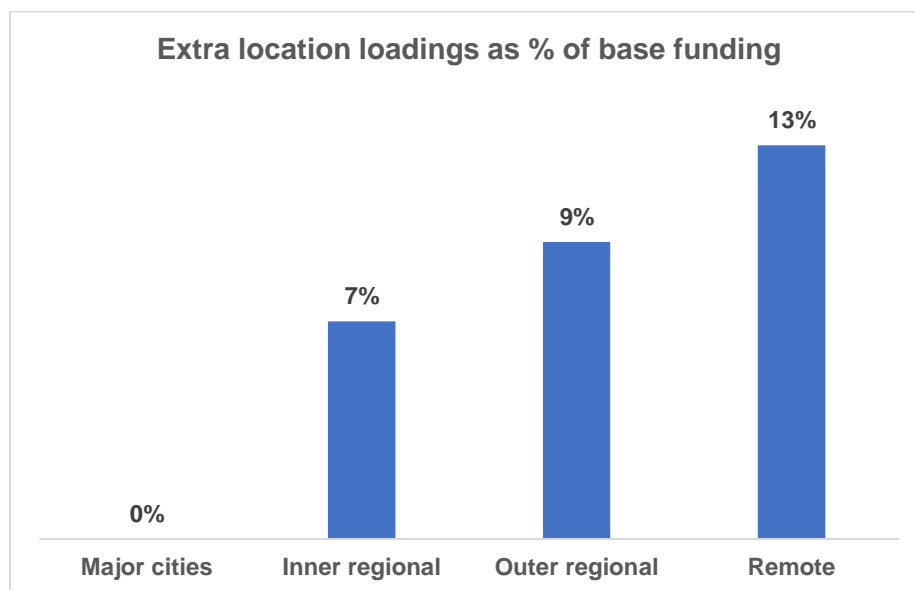
These sample results suggest that schools with between 100 and 999 full-time equivalent students have lower profit margins than schools with less than 100 or at least 1000.

## 4. Proposed extra location and size loadings

### 4.1 Method used to derive proposed extra loadings

Linear programming is a method used to obtain the best outcome in a mathematical model with linear relationships. In this case, we measured the outcome as the sum, for each combination of remoteness and size, of the absolute magnitude of the deviation from the target profits. The program looked for the extra location and size loadings so as to give the lowest possible deviation from target profits. We used Excel's Solver within this report to implement the linear programming.

### 4.2 Fitted extra location loadings, as percentages of base funding



The fitted location loadings are from C1.

### 4.2 Fitted and smoothed extra size loadings, as \$m per school

Size	Loading fitted \$m	Loading smoothed \$m
0-	0.004	0.000
100-	0.119	0.120
250-	0.159	0.175
500-	0.158	0.175
750-	0.209	0.175
1000-	0.072	0.072
1250-	0.000	0.000

The fitted size loadings are from C1. The smoothed loadings for schools of size 250-999 are the average of the three fitted values. The smoothed value for schools below 250 and above 999 are close to the fitted values.

#### Glossary

ACARA	Australian Curriculum, Assessment and Reporting Authority
DESE	Department of Education, Skills and Employment
Ftes	full-time equivalent students
NSRB	National School Resourcing Board

## References

- [1] NSRB. 11 September 2020. *Terms of reference - review of Regional Schooling Resource Standard loadings*. Downloaded 20 September 2020 from <https://docs.education.gov.au/node/53463>
- [2] NSRB. 11 September 2020. *Review of Regional Schooling Resource Standard loadings – Issues paper*. Downloaded 22 September 2020 from <https://docs.education.gov.au/node/55076>
- [3] NSRB June 2018. *Review of the socio-economic status score methodology - final report*. Downloaded 16 September 2020 from <https://www.education.gov.au/review-socio-economic-status-score-methodology>
- [4] DESE. *Enrolment projections and base and loading estimates.xlsx*. Spreadsheet provided by administrative release on 20 October 2020, in response to a FOI request.
- [5] DESE. *Capacity to contribute scores for non-government schools for 2020*. Downloaded on 7 July 2020 from <https://www.dese.gov.au/uncategorised/resources/capacity-contribute-scores-non-government-schools-2020>.
- [6] ACARA. *School Profile 2008-2019.xlsx*. Downloaded on 9 October 2020 from <https://www.cara.edu.au/contact-us/acara-data-access>.



## Appendix A: Data for all independent schools

### A1 Number of independent schools

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	75	48	29	3	155
100	85	49	27	5	166
250	104	54	16	2	176
500	77	33	8	1	119
750	106	23	6		135
1000	80	11	1		92
1250	119	5			124
<b>Total</b>	<b>646</b>	<b>223</b>	<b>87</b>	<b>11</b>	<b>967</b>

The above estimates are from "Capacity to contribute scores for non-government schools 2020" [5], omitting schools for which 2016 SES values were not available.

### A2 Full-time equivalent students

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	3878	2763	1731	184	8556
100	14460	7947	4711	743	27861
250	37123	19301	5344	819	62587
500	46884	20027	4608	664	72183
750	89332	19176	4967		113475
1000	89360	12325	1098		102782
1250	199692	7069			206760
<b>Total</b>	<b>480728</b>	<b>88608</b>	<b>22460</b>	<b>2410</b>	<b>594206</b>

The above estimates are from "2019 school projections new" [5].

### A3 Base funding (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	23.2	22.9	14.4	1.5	62.0
100	98.5	65.2	41.3	5.8	210.7
250	262.5	162.9	47.1	6.7	479.2
500	347.7	170.2	39.1	4.8	561.8
750	581.9	160.9	41.0		783.8
1000	533.2	101.6	7.8		642.6
1250	1126.7	58.8			1185.5
<b>Total</b>	<b>2973.6</b>	<b>742.6</b>	<b>190.6</b>	<b>18.8</b>	<b>3925.6</b>

The above estimates are from [5], using the 2016 SES scores, the capacity to contribute percentages for each SES score in section 54(4), the SRS amounts for primary and secondary students in 2019, the numbers of full-time equivalent primary and secondary students, and an assumed 80% federal share.

#### A4 Base Funding per ftes

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	5977	8301	8330	8171	7251
100	6810	8209	8756	7740	7563
250	7071	8439	8812	8162	7656
500	7416	8497	8482	7270	7783
750	6514	8393	8253		6907
1000	5967	8245	7077		6252
1250	5642	8324			5734
<b>Total</b>	<b>6186</b>	<b>8381</b>	<b>8487</b>	<b>7787</b>	<b>6606</b>

From A3 divided by A2

#### A5 Estimated revenues in 2019 (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	77.7	61.5	31.8	7.2	178.3
100	422.9	188.9	84.1	19.4	715.3
250	743.6	426.5	105.3	14.1	1289.6
500	1494.7	481.9	88.0	15.2	2079.8
750	2078.0	440.8	85.6		2604.5
1000	2129.3	300.7	25.1		2455.1
1250	5191.3	162.8			5354.1
<b>Total</b>	<b>12137</b>	<b>2063</b>	<b>420</b>	<b>56</b>	<b>14677</b>

From the ftes in A.2, times the sample revenues per ftes in B2.

#### A6 Estimated profits in 2019 (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	-8.7	2.6	3.0	0.5	-2.6
100	20.2	9.7	0.9	0.0	30.8
250	36.7	11.0	0.9	0.4	49.0
500	93.3	15.6	3.0	0.4	112.3
750	124.8	16.0	0.7	0.0	141.6
1000	143.7	21.3	0.7	0.0	165.7
1250	364.1	10.7	0.0	0.0	374.8
<b>Total</b>	<b>774.2</b>	<b>87.0</b>	<b>9.2</b>	<b>1.3</b>	<b>871.6</b>

From the estimated revenues in A5, times the sample profit margins in B5.

## Appendix B: Data from sample

### B4 Profit of sample (\$000)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0-	-432	620	1298	6768	8254
100-	17581	18422	3902	347	40252
250-	18821	14197	4312	1856	39186
500-	65984	20017	17267	2600	105868
750-	71512	27717	2300		101529
1000-	81800	26410	7993		116203
1250-	131128	34565	16662		182355
<b>Total</b>	<b>386394</b>	<b>141948</b>	<b>53734</b>	<b>11571</b>	<b>593647</b>

From the stratified sample

### B5 Profit margin of sample

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0-	-0.112	0.043	0.093	0.068	0.062
100-	0.048	0.051	0.011	0.002	0.032
250-	0.049	0.026	0.008	0.028	0.026
500-	0.062	0.032	0.034	0.023	0.046
750-	0.060	0.036	0.009		0.046
1000-	0.067	0.071	0.027		0.062
1250-	0.070	0.066	0.075		0.070
<b>Total</b>	<b>0.064</b>	<b>0.044</b>	<b>0.025</b>	<b>0.026</b>	<b>0.050</b>

B4 divided by B3.

## Appendix C: Location and size loadings to give target profits

### C1 Fitted extra location and size loadings

Type of loading	Category	Basis for loading	Fitted loadings
Region	Major cities	% of base funding	0.0%
Region	Inner regional	% of base funding	6.9%
Region	Outer regional	% of base funding	9.4%
Region	Remote	% of base funding	12.5%
Size	0-	\$m per school	0.004
Size	100-	\$m per school	0.119
Size	250-	\$m per school	0.159
Size	500-	\$m per school	0.158
Size	750-	\$m per school	0.209
Size	1000-	\$m per school	0.072
Size	1250-	\$m per school	0.000
Sum of absolute deviations from target profits (\$m)			40.8

We had 4 location loadings, and 7 size loadings, to fit to the data. We used Solver to find values for the 11 loadings, by minimising the sum of the absolute deviations of the fitted profits from target profits (See C8). We used a constraint that no fitted value could be negative. This constraint had very little effect on the fitted values.

### C2 Fitted extra location loadings for all schools (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	0.0	1.6	1.4	0.2	3.1
100	0.0	4.5	3.9	0.7	9.1
250	0.0	11.3	4.4	0.8	16.5
500	0.0	11.8	3.7	0.6	16.1
750	0.0	11.1	3.9	0.0	15.0
1000	0.0	7.0	0.7	0.0	7.8
1250	0.0	4.1	0.0	0.0	4.1
<b>Total</b>	<b>0.0</b>	<b>51.4</b>	<b>18.0</b>	<b>2.3</b>	<b>71.7</b>

From the base fundings in A3, times the assumed location loadings in C1.

### C3 Fitted extra size loadings for all schools (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	0.3	0.2	0.1	0.0	0.7
100	10.1	5.8	3.2	0.6	19.8
250	16.5	8.6	2.5	0.3	27.9
500	12.1	5.2	1.3	0.2	18.8
750	22.2	4.8	1.3	0.0	28.2
1000	5.8	0.8	0.1	0.0	6.6
1250	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>67.0</b>	<b>25.4</b>	<b>8.5</b>	<b>1.1</b>	<b>102.0</b>

From the numbers of schools in A1, times the assumed size loadings in C1.

#### C4 Revenues including extra loadings (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	78.0	63.3	33.3	7.4	182.1
100	433.0	199.3	91.2	20.7	744.2
250	760.1	446.4	112.3	15.3	1334.0
500	1506.8	498.9	93.0	16.0	2114.7
750	2100.2	456.8	90.7	0.0	2647.7
1000	2135.1	308.6	25.9	0.0	2469.5
1250	5191.3	166.9	0.0	0.0	5358.1
<b>Total</b>	<b>12204.5</b>	<b>2140.0</b>	<b>446.4</b>	<b>59.4</b>	<b>14850.3</b>

From the estimated revenues in B5, plus the extra location loadings in C2 and the extra size loadings in C3.

#### C5 Profits including extra loadings (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	-8.4	4.4	4.5	0.7	1.2
100	30.3	20.0	8.0	1.4	59.8
250	53.2	30.8	7.9	1.5	93.4
500	105.5	32.6	7.9	1.1	147.1
750	147.0	32.0	5.9		184.9
1000	149.5	29.1	1.5		180.1
1250	364.1	14.8			378.8
<b>Total</b>	<b>841.2</b>	<b>163.7</b>	<b>35.7</b>	<b>4.7</b>	<b>1045.3</b>

From the estimated profits in A6, plus the extra location loadings in C2 and the extra size loadings in C3.

#### C6 Target profit margin for all schools

From B5, the current profit margin for all schools with 1250 or more full-time equivalent students is 7.0%, and this is approximately true across the three regions which have such schools.

Target profit margin as % of revenue                      7%

#### C7 Target profits (\$m)

Size	Cities	Inner Reg	Outer Reg	Remote	Total
0	5.5	4.4	2.3	0.5	12.7
100	30.3	13.9	6.4	1.5	52.1
250	53.2	31.2	7.9	1.1	93.4
500	105.5	34.9	6.5	1.1	148.0
750	147.0	32.0	6.3	0.0	185.3
1000	149.5	21.6	1.8	0.0	172.9
1250	363.4	11.7	0.0	0.0	375.1
<b>Total</b>	<b>854.3</b>	<b>149.8</b>	<b>31.2</b>	<b>4.2</b>	<b>1039.5</b>

### C8 Sums of absolute deviances from target profits

<b>Size</b>	<b>Cities</b>	<b>Inner Reg</b>	<b>Outer Reg</b>	<b>Remote</b>	<b>Total</b>
0	13.8	0.0	2.1	0.2	16.1
100	0.0	6.1	1.7	0.1	7.8
250	0.0	0.4	0.0	0.5	0.9
500	0.0	2.3	1.4	0.0	3.8
750	0.0	0.0	0.5	0.0	0.5
1000	0.0	7.5	0.3	0.0	7.9
1250	0.7	3.1	0.0	0.0	3.8
<b>Total</b>	<b>14.5</b>	<b>19.5</b>	<b>6.0</b>	<b>0.7</b>	<b>40.8</b>