> **This discussion paper has been written by officials of the Welsh Government. Ministers have not had an opportunity to comment on the contents. Exemplifications of changes are provided simply to inform discussion by DSG members. They are not Welsh Government proposals or statements of Government policy for or against changes.**

Recalibrating the Nursery and Primary School Services IBA

Summary

1. This paper summarises the methodology and current situation regarding Recalibrating the Nursery and Primary School Services IBA.

2. This paper is for information purposes only. Suggested options for taking this analysis forward are presented in Paper 05 - Recalibrating the Nursery and Primary School Services IBA results and Options.

Section 1: Background and Current Situation

3. The formula for calculating the **'Nursery and Primary School Teaching and Other Services'** IBA was last updated in 2003. Current Formula:

> 0.815 x Primary school pupils and modelled nursery school pupils
>
> 0.098 x Settlement threshold 1,000[1]
>
> 0.087 x Primary school pupils eligible for free school meals

4. The current methodology for the formula is based on a 'relative need to spend' and there are 3 main drivers. Main client group (Pupil and School Numbers), Deprivation (Free School Meal Eligibility) and Sparsity (Rurality) (Population Settlement Thresholds). The formula uses statistical techniques to derive the weights.

5. The independent needs assessment requires the use of statistical techniques such as ordinary least squares regression[2] analysis and hierarchical multilevel regression techniques. Weightings are derived from the regression equation coefficients[3].

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[1]The current **Settlement Threshold data** used to calculate this IBA is taken from the 1991 Census and is the oldest data used in the Settlement.

[2] **Ordinary Least Squares (OLS) Regression** looks at the relationship and correlation between two variables. If the relationship between two variables can be presented with a linear function, the slope (R-Square) will denote the strength of the impact and linear correlation.

[3] **Regression coefficients** represent the average change in the dependent variable for one unit of change in the independent variable while holding all other independent variables in the model constant.

6. A settlement indicator pattern used in the formula is intended as an appropriate way of capturing the effect that lost economies of scale can have on unit costs when a local authority has to provide multiple service points in order to ensure reasonable access. Either the size of the settlement in which the school is located, or the proportion of a local authority's population in settlements below a threshold level are indicators for lost economies of scale.

7. The formula was updated in 2003 using Pupil Level Annual Schools Census (PLASC) and expenditure data. Further analysis was carried out in 2007 to update the PLASC and expenditure data with more recently available data but the new weights were not carried forward.

Expenditure Need Indicators and Regression Methods

Modelled Schools	Dependent Variable - Actual Number of Schools Independent Variables - Number of pupils in Nursery and Primary schools - Population in small settlements (Settlement threshold Indicators)	Unit of Observation Local Authority Regression Method Ordinary Least Squares
Nursery and Primary School Teaching and Other Services	Dependent variable: - Expenditure Independent variables considered: - Number of pupils in nursery and primary schools - Pupils entitled to free school meals - Actual number of schools - Settlement (threshold 1,000)	Unit of Observation School Regression Method Hierarchical Modelling

Section 2: Datasets Overview

Expenditure Data

8. As part of the SSA Review, DSG agreed that the Section 52 individual schools' data should be used for multilevel modelling analysis and that the formula should

be averaged over three years. Section 52 and RO1 returns for the years 2020-21, 2021-22 and 2022-23 have been used in the calculations.

9. Following the review of the revenue outturn forms the RO1 returns are closely aligned with the Section 52 returns. A small number of authorities delegated part of their school meals and milk budget to schools. Expenditure for school meals have been subtracted from the schools using the distribution of free school meals within the authority as part of the calculations.

10. Annex A shows the expenditure per pupil by number of pupils at Nursery and primary schools for the years 2020-21, 2021-22 and 2022-23. It shows that on average expenditure per pupil is £4,612, £4,809 and £5,182 respectively.

11. We have excluded schools where there are anomalies where the average expenditure per pupil is nil. This may be where the school had opened or closed that year and has therefore recorded a nil expenditure.

PLASC Data – pupil numbers and eligibility for Free Schools Meals (FSM) (Main Client and Deprivation data)

12. The PLASC is the most accurate and robust source of data for pupil numbers and free school meal eligibility and using these as a proxy for need to spend on education services ensures that the Settlement remains reactive to real movements in pupil numbers.

13. PLASC Nursery and Primary School pupil numbers for PLASC years 2021, 2022 and 2023 have been used as part of this analysis. The analysis excludes middle schools.

14. Eligibility for Free School Meals (eFSM) is used as a proxy of deprivation in the assessment of relative need to spend on Nursery and Primary School Teaching and Other Services. PLASC years 2021, 2022 and 2023 have been used as part of this analysis. The PLASC year 2023 uses both eFSM or TP numbers as a proxy for deprivation. Annex B shows the share of pupil numbers and FSM by local authority used in the settlement.

Settlement Threshold Data (Sparsity Data)

15. The settlement threshold indicators measure sparsity and are designed to account for costs of delivering services to rural areas. Urban areas (large settlements) can achieve economies of scale in provision of services to large populations that are not available in rural areas due to the need to duplicate provision in providing access.

16. The proportion of the population outside large settlements provides a broad indicator of the extent of economies of scale lost, or the additional cost burden in supplying comparable services in rural areas.

17. Settlement Threshold Indicators using the Census 2021 have been produced to measure the population in an authority living outside settlements above a certain population threshold. Annex C shows the settlement threshold data.

18. The following ONS link allows the user to build a custom Built up Area within the settlement threshold Build a custom area profile - Office for National Statistics (ons.gov.uk).

Modelled Schools

19. To use school numbers that reflect the number **needed** in Wales, we need to model the number of schools for Nursery and Primary using the settlement indicators from 2021 Census. The school numbers and population settlement threshold numbers are divided by the number of pupils for each local authority.

20. The process then involves using ordinary Least Squares (OLS) regression analysis[4]. This will find out the closest relationship between the actual number of schools and the population in small settlements and the number of pupils. We use the actual number of schools as the dependent variable and the settlement indicators as the independent variable. We analyse which settlement threshold is the best fit (highest R square).

21. In 2003 the settlement threshold of 1,000 was used based on the 1991 Census. This implied that the relationship between the number of schools and the population in settlement thresholds of 1,000 and under had the strongest correlation.

22. Similar analysis using the 2021 Census shows that a settlement threshold of 5,000 now provides a stronger positive correlation. Annex D shows the results of the regression analysis for the years 2020-21, 2021-22 and 2022-23.

Section 3: Methodology multi-level modelling (MLM)

23. **Multilevel modelling (MLM)** looks at relationships between variables whilst taking into account differences between hierarchical levels in the data.

24. In the Nursery and Primary School Teaching and Other Services IBA, the model analyses the relationship between expenditure data (dependent variable) and school numbers, FSM and settlement threshold data (independent variables) across all authorities, but also takes into account the differences between schools in each authority.

25. The method considers a dataset for each of the pupil, FSM and Expenditure data at **school level** and then merges the settlement threshold and actual school numbers at **local authority level**. The settlement indicators are divided by the number of pupils and number of schools. The total expenditure, actual number of schools and FSM are divided by the number of pupils.

26. The data is summarised in a single dataset, and we use SAS (Statistical Analytical Software) for the Multi-level Modelling (MLM). The software uses a

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[4] **Ordinary Least Squares (OLS) Regression** looks at the relationship and correlation between two variables. If the relationship between two variables can be presented with a linear function, the slope (R-Square) will denote the strength of the impact and linear correlation.

'PROC MIXED' function which fits a wider class of multiple mixed linear models and considers the **maximum likelihood** for the relationship.

27. The variables tested are actual schools, Free School Meal Eligibility, pupils and the settlement threshold indicators. The results are summarised through a co-efficient (CPI) for each variable. This measures the dependency of each of the variables and the degree of change for every single unit. The settlement threshold indicators usually produce a negative co-efficient, hence are removed. A standard error is also produced, the coefficient should be at least twice as large to ensure more precise results. Annex E summarises the results.

Section 4: Methodology weights calculation

28. The weights used in the formula are calculated using the coefficients from the SAS outputs. The coefficients from both the Ordinary Least squares (OLS) regression analysis used to model schools and the hierarchical modelling are considered.

29. The weighted co-efficient is calculated by multiplying the Wales total for each dataset and the coefficient. The CPI weight is calculated as the percentage of the total weighted coefficient. The total CPI weight is the sum of all weights. The OLS weight is taken from the regression analysis. The complete model weight is calculated by multiplying the schools' weight by the OLS weight. This is done for the pupils and the settlement indicator. The schools CPI weight is then added into the pupil CPI and the settlement CPI. Annex F summarises the results.

Section 5: Results, Next Steps and Proposals

30. For the result a 3-year average of the Nursery and Primary school weights is taken. The exemplification is carried out on the data used in the 2024-25 settlement. Annex G summarises the weights and recalibrated formula.

31. The results and options are outlined in Paper 06 - Recalibrating the Nursery and Primary School Services IBA results and Options.

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Annex A

Chart 1: Expenditure per pupil by number of pupils at Nursery and Primary Schools, 2020-21
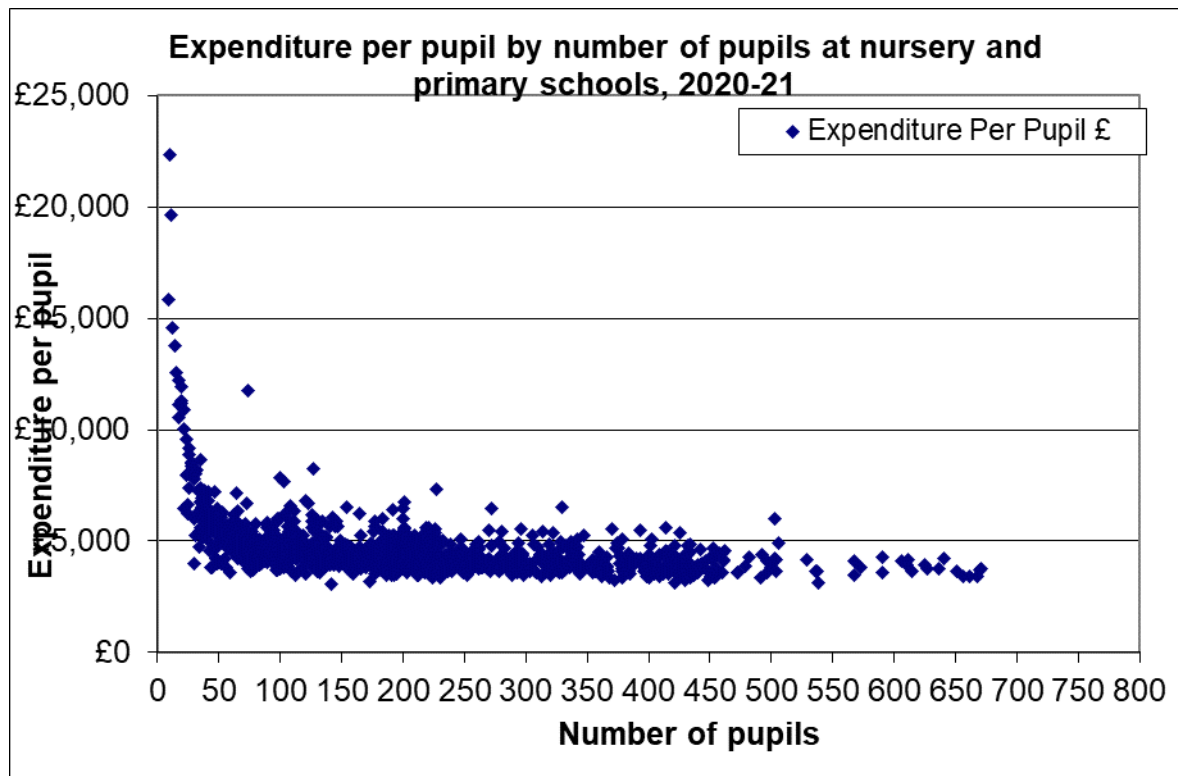
Chart 2: Expenditure per pupil by number of pupils at Nursery and Primary Schools, 2021-22
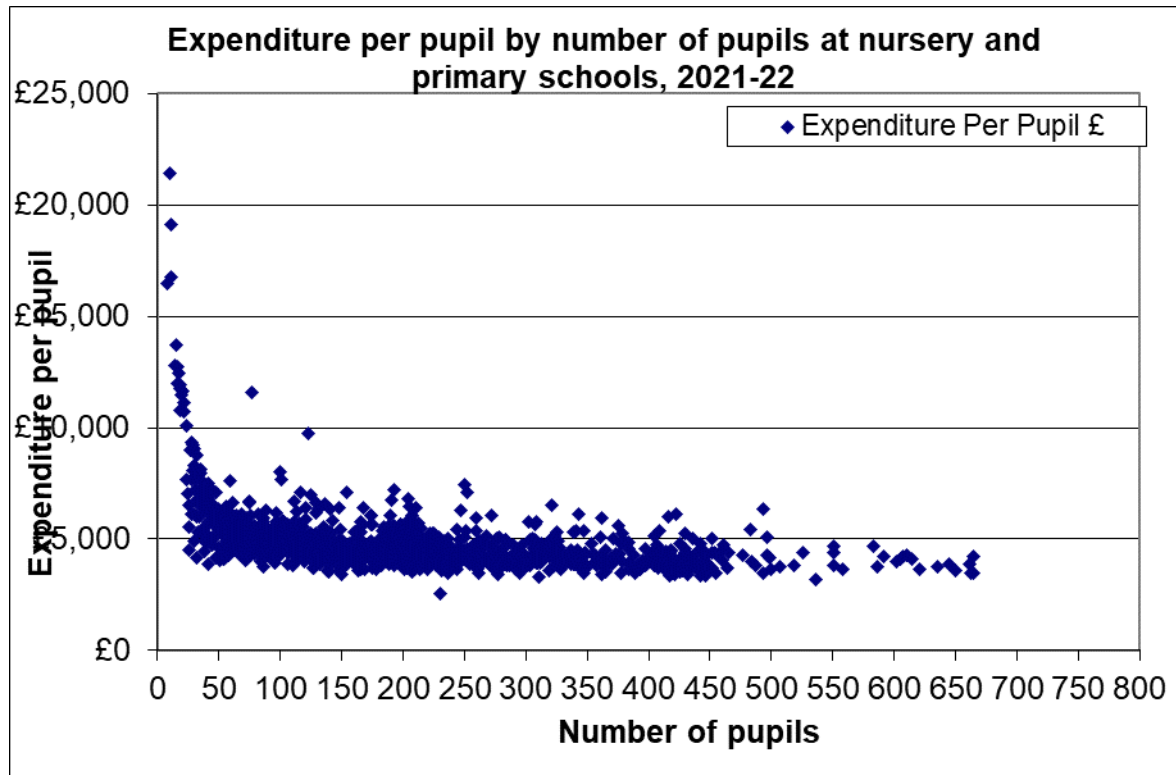
Chart 3: Expenditure per pupil by number of pupils at Nursery and Primary Schools, 2022-23

Expenditure per pupil by number of pupils at nursery and primary schools, 2022-23

Annex B

Chart 4: Nursery and Primary school pupil and FSM share, 2024-25 Settlement

Annex C – Settlement Threshold Sparsity Data

Table 1a: Population living outside built-up areas with 1991 Census population above that given threshold

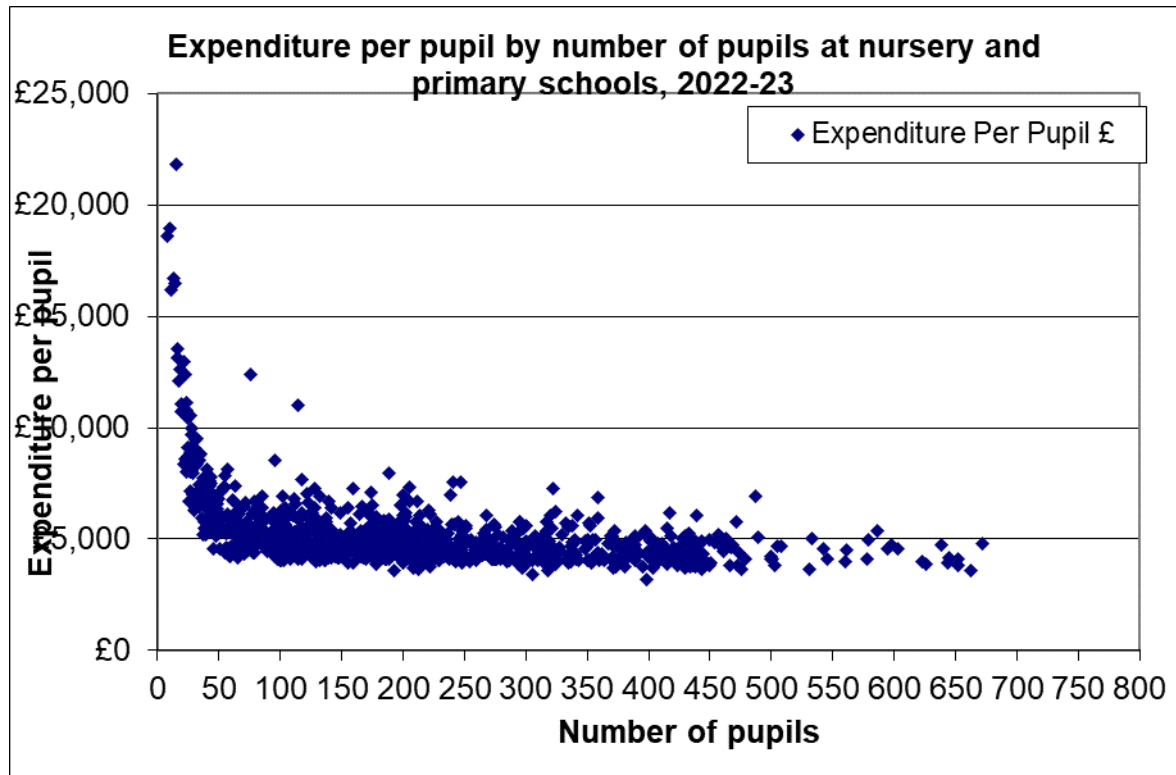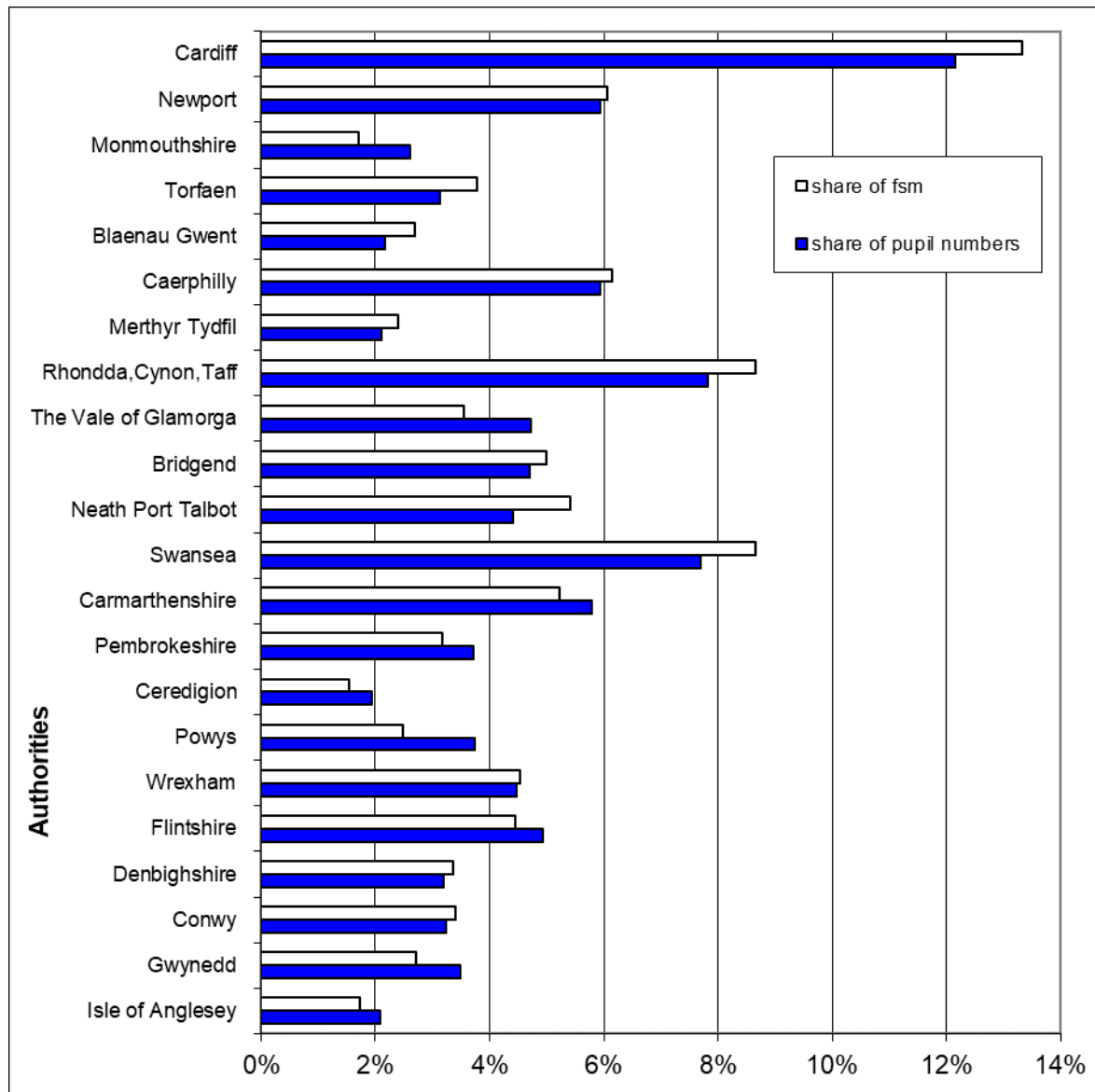| Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	46,822	48,525	50,353	59,452	59,452	59,452	68,854	68,854	68,854	68,854	68,854	68,854	68,854	68,854
Gwynedd	75,636	77,374	83,755	92,882	95,564	95,564	112,619	112,619	112,619	112,619	112,619	112,619	112,619	112,619
Conwy	39,522	40,686	44,876	51,881	58,071	77,994	77,994	90,047	90,047	105,804	105,804	105,804	105,804	105,804
Denbighshire	37,350	37,350	38,810	43,691	50,651	50,651	50,651	50,651	63,690	63,690	88,267	88,267	88,267	88,267
Flintshire	54,020	56,349	59,553	63,570	80,550	87,866	87,866	98,201	98,201	115,340	115,340	141,296	141,296	141,296
Wrexham	35,581	35,581	36,240	48,118	65,739	71,585	71,585	83,023	83,023	83,023	83,023	83,023	83,023	123,132
Powys	85,751	87,094	91,018	99,976	111,018	111,018	118,521	118,521	118,521	118,521	118,521	118,521	118,521	118,521
Ceredigion	49,533	50,377	52,260	54,233	54,233	54,233	62,909	62,909	62,909	62,909	62,909	62,909	62,909	62,909
Pembrokeshire	66,390	67,973	69,575	78,949	83,146	89,960	89,960	111,575	111,575	111,575	111,575	111,575	111,575	111,575
Carmarthenshire	100,954	102,168	109,168	116,732	127,570	127,570	135,717	135,717	135,717	135,717	135,717	135,717	167,832	167,832
Swansea	42,476	42,476	47,135	50,664	53,857	78,455	78,455	78,455	91,673	106,975	106,975	106,975	106,975	106,975
Neath Port Talbot	41,372	43,237	45,593	58,049	68,593	68,593	68,593	68,593	68,593	68,593	68,593	68,593	138,225	138,225
Bridgend	31,374	31,778	34,106	41,452	50,173	50,173	50,173	72,510	86,404	86,404	86,404	86,404	86,404	128,222
Vale of Glamorgan	31,627	32,127	33,798	38,324	40,907	46,998	46,998	46,998	46,998	46,998	46,998	74,156	74,156	115,998
Rhondda Cynon Taf	64,540	64,974	67,607	77,837	111,767	118,138	118,138	139,896	154,674	189,340	232,366	232,366	232,366	232,366
Merthyr Tydfil	10,961	11,392	11,392	13,535	16,612	22,680	22,680	22,680	22,680	22,680	22,680	22,680	59,213	59,213
Caerphilly	48,180	51,041	52,835	67,571	91,447	97,669	114,604	114,604	114,604	114,604	139,205	139,205	169,690	169,690
Blaenau Gwent	17,627	17,627	17,627	21,091	23,850	37,030	46,360	46,360	46,360	46,360	46,360	72,335	72,335	72,335
Torfaen	17,658	17,658	17,658	17,658	21,473	21,473	21,473	33,649	33,649	50,320	50,320	50,320	90,248	90,248
Monmouthshire	41,257	41,667	42,994	49,026	51,615	51,615	69,159	79,629	79,629	79,629	79,629	79,629	79,629	79,629
Newport	17,317	17,317	18,916	21,091	24,272	34,691	34,691	34,691	34,691	34,691	34,691	34,691	34,691	34,691
Cardiff	15,602	15,602	16,850	20,999	23,825	23,825	23,825	23,825	23,825	23,825	23,825	23,825	23,825	23,825
Wales	**971,550**	**990,373**	**1,042,119**	**1,186,781**	**1,364,385**	**1,477,233**	**1,571,825**	**1,694,007**	**1,748,936**	**1,848,471**	**1,940,675**	**2,019,764**	**2,228,457**	**2,352,226**

Table 1b: Percentage shares of population living outside built-up areas with 1991 Census population above that given threshold

Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	4.8%	4.9%	4.8%	5.0%	4.4%	4.0%	4.4%	4.1%	3.9%	3.7%	3.5%	3.4%	3.1%	2.9%
Gwynedd	7.8%	7.8%	8.0%	7.8%	7.0%	6.5%	7.2%	6.6%	6.4%	6.1%	5.8%	5.6%	5.1%	4.8%
Conwy	4.1%	4.1%	4.3%	4.4%	4.3%	5.3%	5.0%	5.3%	5.1%	5.7%	5.5%	5.2%	4.7%	4.5%
Denbighshire	3.8%	3.8%	3.7%	3.7%	3.7%	3.4%	3.2%	3.0%	3.6%	3.4%	4.5%	4.4%	4.0%	3.8%
Flintshire	5.6%	5.7%	5.7%	5.4%	5.9%	5.9%	5.6%	5.8%	5.6%	6.2%	5.9%	7.0%	6.3%	6.0%
Wrexham	3.7%	3.6%	3.5%	4.1%	4.8%	4.8%	4.6%	4.9%	4.7%	4.5%	4.3%	4.1%	3.7%	5.2%
Powys	8.8%	8.8%	8.7%	8.4%	8.1%	7.5%	7.5%	7.0%	6.8%	6.4%	6.1%	5.9%	5.3%	5.0%
Ceredigion	5.1%	5.1%	5.0%	4.6%	4.0%	3.7%	4.0%	3.7%	3.6%	3.4%	3.2%	3.1%	2.8%	2.7%
Pembrokeshire	6.8%	6.9%	6.7%	6.7%	6.1%	6.1%	5.7%	6.6%	6.4%	6.0%	5.7%	5.5%	5.0%	4.7%
Carmarthenshire	10.4%	10.3%	10.5%	9.8%	9.4%	8.6%	8.6%	8.0%	7.8%	7.3%	7.0%	6.7%	7.5%	7.1%
Swansea	4.4%	4.3%	4.5%	4.3%	3.9%	5.3%	5.0%	4.6%	5.2%	5.8%	5.5%	5.3%	4.8%	4.5%
Neath Port Talbot	4.3%	4.4%	4.4%	4.9%	5.0%	4.6%	4.4%	4.0%	3.9%	3.7%	3.5%	3.4%	6.2%	5.9%
Bridgend	3.2%	3.2%	3.3%	3.5%	3.7%	3.4%	3.2%	4.3%	4.9%	4.7%	4.5%	4.3%	3.9%	5.5%
Vale of Glamorgan	3.3%	3.2%	3.2%	3.2%	3.0%	3.2%	3.0%	2.8%	2.7%	2.5%	2.4%	3.7%	3.3%	4.9%
Rhondda Cynon Taf	6.6%	6.6%	6.5%	6.6%	8.2%	8.0%	7.5%	8.3%	8.8%	10.2%	12.0%	11.5%	10.4%	9.9%
Merthyr Tydfil	1.1%	1.2%	1.1%	1.1%	1.2%	1.5%	1.4%	1.3%	1.3%	1.2%	1.2%	1.1%	2.7%	2.5%
Caerphilly	5.0%	5.2%	5.1%	5.7%	6.7%	6.6%	7.3%	6.8%	6.6%	6.2%	7.2%	6.9%	7.6%	7.2%
Blaenau Gwent	1.8%	1.8%	1.7%	1.8%	1.7%	2.5%	2.9%	2.7%	2.7%	2.5%	2.4%	3.6%	3.2%	3.1%
Torfaen	1.8%	1.8%	1.7%	1.5%	1.6%	1.5%	1.4%	2.0%	1.9%	2.7%	2.6%	2.5%	4.0%	3.8%
Monmouthshire	4.2%	4.2%	4.1%	4.1%	3.8%	3.5%	4.4%	4.7%	4.6%	4.3%	4.1%	3.9%	3.6%	3.4%
Newport	1.8%	1.7%	1.8%	1.8%	1.8%	2.3%	2.2%	2.0%	2.0%	1.9%	1.8%	1.7%	1.6%	1.5%
Cardiff	1.6%	1.6%	1.6%	1.8%	1.7%	1.6%	1.5%	1.4%	1.4%	1.3%	1.2%	1.2%	1.1%	1.0%
Wales	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 2a: Population living outside built-up areas with 2011 Census population above that given threshold

Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	19,932	21,467	29,137	42,180	58,320	58,320	58,320	69,751	69,751	69,751	69,751	69,751	69,751	69,751
Gwynedd	35,175	35,560	47,857	74,090	94,393	94,393	103,886	103,886	103,886	121,874	121,874	121,874	121,874	121,874
Conwy	15,264	17,250	17,855	23,289	41,089	41,089	59,794	70,452	70,452	85,823	85,823	115,228	115,228	115,228
Denbighshire	17,241	18,024	21,168	27,297	37,827	43,288	51,802	51,802	51,802	68,585	68,585	93,734	93,734	93,734
Flintshire	12,840	13,578	20,911	38,877	46,715	59,413	69,221	79,279	94,186	147,374	147,374	147,374	147,374	147,374
Wrexham	11,482	12,512	16,957	27,145	41,956	59,740	59,740	59,740	73,241	73,241	73,241	73,241	73,241	73,241
Powys	54,255	57,815	69,572	86,793	95,558	106,815	115,065	132,976	132,976	132,976	132,976	132,976	132,976	132,976
Ceredigion	30,051	31,316	39,610	50,675	57,829	57,829	57,829	57,829	57,829	75,922	75,922	75,922	75,922	75,922
Pembrokeshire	28,990	32,186	50,252	62,366	76,956	76,956	94,261	94,261	122,439	122,439	122,439	122,439	122,439	122,439
Carmarthenshire	43,647	45,200	54,683	77,060	101,435	113,308	124,045	124,045	124,045	139,899	139,899	139,899	139,899	183,777
Swansea	6,440	7,244	10,352	20,993	29,317	29,317	43,781	43,781	43,781	59,538	59,538	59,538	59,538	59,538
Neath Port Talbot	6,105	6,408	9,432	22,563	30,515	35,851	35,851	51,878	51,878	51,878	51,878	51,878	89,154	89,154
Bridgend	4,211	4,682	8,399	16,784	24,189	24,189	33,355	44,160	57,861	92,421	92,421	92,421	92,421	139,178
Vale of Glamorgan	8,960	10,172	13,812	14,967	18,771	37,975	46,402	46,402	46,402	46,402	46,402	71,375	71,375	71,375
Rhondda Cynon Taf	6,876	6,876	8,279	15,518	29,717	64,911	90,158	101,388	156,416	174,205	174,205	203,953	234,410	234,410
Merthyr Tydfil	1,576	1,576	1,576	3,730	7,277	7,277	14,982	14,982	14,982	14,982	14,982	14,982	14,982	58,802
Caerphilly	4,458	4,458	7,302	20,789	33,390	50,397	67,663	79,200	94,158	113,362	137,404	137,404	137,404	178,806
Blaenau Gwent	2,116	2,116	2,116	3,672	18,844	24,374	25,918	36,864	51,719	69,814	69,814	69,814	69,814	69,814
Torfaen	1,246	1,246	1,246	1,246	1,246	6,893	15,826	15,826	15,826	15,826	15,826	44,160	44,160	91,075
Monmouthshire	18,892	21,187	25,046	35,492	38,326	44,240	44,240	77,900	91,323	91,323	91,323	91,323	91,323	91,323
Newport	4,139	4,515	5,994	10,289	10,289	10,289	17,676	17,676	17,676	17,676	17,676	17,676	17,676	17,676
Cardiff	1,246	1,246	1,246	5,913	5,913	8,980	8,980	8,980	8,980	8,980	8,980	11,233	11,233	11,233
Wales	**335,142**	**356,634**	**462,802**	**681,728**	**899,872**	**1,055,844**	**1,238,795**	**1,383,058**	**1,551,609**	**1,794,291**	**1,818,333**	**1,958,195**	**2,025,928**	**2,248,700**

Table 2b: Percentage shares of population living outside built-up areas with 2011 Census population above that given threshold

Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	5.9%	6.0%	6.3%	6.2%	6.5%	5.5%	4.7%	5.0%	4.5%	3.9%	3.8%	3.6%	3.4%	3.1%
Gwynedd	10.5%	10.0%	10.3%	10.9%	10.5%	8.9%	8.4%	7.5%	6.7%	6.8%	6.7%	6.2%	6.0%	5.4%
Conwy	4.6%	4.8%	3.9%	3.4%	4.6%	3.9%	4.8%	5.1%	4.5%	4.8%	4.7%	5.9%	5.7%	5.1%
Denbighshire	5.1%	5.1%	4.6%	4.0%	4.2%	4.1%	4.2%	3.7%	3.3%	3.8%	3.8%	4.8%	4.6%	4.2%
Flintshire	3.8%	3.8%	4.5%	5.7%	5.2%	5.6%	5.6%	5.7%	6.1%	8.2%	8.1%	7.5%	7.3%	6.6%
Wrexham	3.4%	3.5%	3.7%	4.0%	4.7%	5.7%	4.8%	4.3%	4.7%	4.1%	4.0%	3.7%	3.6%	3.3%
Powys	16.2%	16.2%	15.0%	12.7%	10.6%	10.1%	9.3%	9.6%	8.6%	7.4%	7.3%	6.8%	6.6%	5.9%
Ceredigion	9.0%	8.8%	8.6%	7.4%	6.4%	5.5%	4.7%	4.2%	3.7%	4.2%	4.2%	3.9%	3.7%	3.4%
Pembrokeshire	8.7%	9.0%	10.9%	9.1%	8.6%	7.3%	7.6%	6.8%	7.9%	6.8%	6.7%	6.3%	6.0%	5.4%
Carmarthenshire	13.0%	12.7%	11.8%	11.3%	11.3%	10.7%	10.0%	9.0%	8.0%	7.8%	7.7%	7.1%	6.9%	8.2%
Swansea	1.9%	2.0%	2.2%	3.1%	3.3%	2.8%	3.5%	3.2%	2.8%	3.3%	3.3%	3.0%	2.9%	2.6%
Neath Port Talbot	1.8%	1.8%	2.0%	3.3%	3.4%	3.4%	2.9%	3.8%	3.3%	2.9%	2.9%	2.6%	4.4%	4.0%
Bridgend	1.3%	1.3%	1.8%	2.5%	2.7%	2.3%	2.7%	3.2%	3.7%	5.2%	5.1%	4.7%	4.6%	6.2%
Vale of Glamorgan	2.7%	2.9%	3.0%	2.2%	2.1%	3.6%	3.7%	3.4%	3.0%	2.6%	2.6%	3.6%	3.5%	3.2%
Rhondda Cynon Taf	2.1%	1.9%	1.8%	2.3%	3.3%	6.1%	7.3%	7.3%	10.1%	9.7%	9.6%	10.4%	11.6%	10.4%
Merthyr Tydfil	0.5%	0.4%	0.3%	0.5%	0.8%	0.7%	1.2%	1.1%	1.0%	0.8%	0.8%	0.8%	0.7%	2.6%
Caerphilly	1.3%	1.3%	1.6%	3.0%	3.7%	4.8%	5.5%	5.7%	6.1%	6.3%	7.6%	7.0%	6.8%	8.0%
Blaenau Gwent	0.6%	0.6%	0.5%	0.5%	2.1%	2.3%	2.1%	2.7%	3.3%	3.9%	3.8%	3.6%	3.4%	3.1%
Torfaen	0.4%	0.3%	0.3%	0.2%	0.1%	0.7%	1.3%	1.1%	1.0%	0.9%	0.9%	2.3%	2.2%	4.1%
Monmouthshire	5.6%	5.9%	5.4%	5.2%	4.3%	4.2%	3.6%	5.6%	5.9%	5.1%	5.0%	4.7%	4.5%	4.1%
Newport	1.2%	1.3%	1.3%	1.5%	1.1%	1.0%	1.4%	1.3%	1.1%	1.0%	1.0%	0.9%	0.9%	0.8%
Cardiff	0.4%	0.3%	0.3%	0.9%	0.7%	0.9%	0.7%	0.6%	0.6%	0.5%	0.5%	0.6%	0.6%	0.5%
Wales	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 3a: Population living outside built-up areas with 2021 Census population above that given threshold

Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	19,353	21,830	32,905	42,748	51,846	57,110	57,110	68,863	68,863	68,863	68,863	68,863	68,863	68,863
Gwynedd	36,308	40,096	50,476	71,436	90,576	90,576	100,407	100,407	100,407	117,401	117,401	117,401	117,401	117,401
Conwy	15,425	17,678	17,678	26,984	37,494	37,494	55,041	55,041	69,740	85,446	85,446	114,719	114,719	114,719
Denbighshire	18,871	19,302	22,228	28,053	38,375	44,075	52,147	52,147	52,147	68,825	68,825	95,807	95,807	95,807
Flintshire	15,576	17,557	28,675	40,416	55,823	74,798	92,429	92,429	133,051	149,819	149,819	149,819	149,819	149,819
Wrexham	13,308	14,091	18,572	29,427	54,305	68,322	77,551	77,551	90,340	90,340	90,340	90,340	90,340	135,121
Powys	56,998	60,384	72,102	90,421	99,984	110,873	122,303	133,185	133,185	133,185	133,185	133,185	133,185	133,185
Ceredigion	31,783	35,771	40,191	50,557	56,829	56,829	56,829	56,829	71,475	71,475	71,475	71,475	71,475	71,475
Pembrokeshire	33,010	37,611	51,778	66,116	79,395	79,395	97,017	109,105	123,356	123,356	123,356	123,356	123,356	123,356
Carmarthenshire	48,007	49,861	59,713	87,190	114,664	121,003	129,285	129,285	129,285	145,733	145,733	145,733	145,733	187,876
Swansea	10,219	10,631	15,751	23,700	35,443	49,403	56,447	56,447	70,561	70,561	70,561	70,561	70,561	70,561
Neath Port Talbot	9,767	9,767	14,156	25,977	45,750	51,289	57,348	67,864	67,864	67,864	67,864	67,864	99,421	140,159
Bridgend	2,724	3,122	5,893	21,854	24,952	24,952	34,071	45,938	60,013	94,152	94,152	94,152	94,152	94,152
Vale of Glamorgan	9,093	10,775	14,530	18,609	28,298	40,422	48,313	48,313	48,313	48,313	48,313	73,607	73,607	73,607
Rhondda Cynon Taf	9,209	9,209	11,970	16,082	44,950	69,910	85,661	97,104	150,891	168,100	168,100	168,100	237,670	237,670
Merthyr Tydfil	4,941	4,941	4,941	10,492	14,272	19,314	19,314	19,314	19,314	19,314	19,314	19,314	58,856	58,856
Caerphilly	7,589	8,062	9,632	27,260	54,840	78,191	103,170	115,026	127,647	142,841	142,841	142,841	175,945	175,945
Blaenau Gwent	1,763	1,763	1,763	5,650	17,258	22,508	22,508	32,756	47,290	66,925	66,925	66,925	66,925	66,925
Torfaen	1,720	1,720	1,720	2,980	2,980	16,112	16,112	16,112	16,112	16,112	16,112	45,182	45,182	92,257
Monmouthshire	22,123	24,755	26,087	41,443	41,443	47,185	56,998	79,267	92,956	92,956	92,956	92,956	92,956	92,956
Newport	4,112	4,826	6,390	10,910	13,822	21,151	28,697	28,697	28,697	28,697	28,697	28,697	28,697	28,697
Cardiff	3,888	4,278	4,278	10,802	11,996	11,996	11,996	11,996	11,996	11,996	11,996	15,093	15,093	15,093
Wales	**375,787**	**408,030**	**511,429**	**749,107**	**1,015,295**	**1,192,908**	**1,380,754**	**1,493,676**	**1,713,503**	**1,882,274**	**1,882,274**	**1,995,990**	**2,169,763**	**2,344,500**

Table 3b: Percentage shares of population living outside built-up areas with 2021 Census population above that given threshold

Unitary Authority	300	500	1,000	2,500	5,000	7,500	10,000	12,500	15,000	20,000	25,000	30,000	40,000	50,000
Isle of Anglesey	5.1%	5.4%	6.4%	5.7%	5.1%	4.8%	4.1%	4.6%	4.0%	3.7%	3.7%	3.5%	3.2%	2.9%
Gwynedd	9.7%	9.8%	9.9%	9.5%	8.9%	7.6%	7.3%	6.7%	5.9%	6.2%	6.2%	5.9%	5.4%	5.0%
Conwy	4.1%	4.3%	3.5%	3.6%	3.7%	3.1%	4.0%	3.7%	4.1%	4.5%	4.5%	5.7%	5.3%	4.9%
Denbighshire	5.0%	4.7%	4.3%	3.7%	3.8%	3.7%	3.8%	3.5%	3.0%	3.7%	3.7%	4.8%	4.4%	4.1%
Flintshire	4.1%	4.3%	5.6%	5.4%	5.5%	6.3%	6.7%	6.2%	7.8%	8.0%	8.0%	7.5%	6.9%	6.4%
Wrexham	3.5%	3.5%	3.6%	3.9%	5.3%	5.7%	5.6%	5.2%	5.3%	4.8%	4.8%	4.5%	4.2%	5.8%
Powys	15.2%	14.8%	14.1%	12.1%	9.8%	9.3%	8.9%	8.9%	7.8%	7.1%	7.1%	6.7%	6.1%	5.7%
Ceredigion	8.5%	8.8%	7.9%	6.7%	5.6%	4.8%	4.1%	3.8%	4.2%	3.8%	3.8%	3.6%	3.3%	3.0%
Pembrokeshire	8.8%	9.2%	10.1%	8.8%	7.8%	6.7%	7.0%	7.3%	7.2%	6.6%	6.6%	6.2%	5.7%	5.3%
Carmarthenshire	12.8%	12.2%	11.7%	11.6%	11.3%	10.1%	9.4%	8.7%	7.5%	7.7%	7.7%	7.3%	6.7%	8.0%
Swansea	2.7%	2.6%	3.1%	3.2%	3.5%	4.1%	4.1%	3.8%	4.1%	3.7%	3.7%	3.5%	3.3%	3.0%
Neath Port Talbot	2.6%	2.4%	2.8%	3.5%	4.5%	4.3%	4.2%	4.5%	4.0%	3.6%	3.6%	3.4%	4.6%	6.0%
Bridgend	0.7%	0.8%	1.2%	2.9%	2.5%	2.1%	2.5%	3.1%	3.5%	5.0%	5.0%	4.7%	4.3%	4.0%
Vale of Glamorgan	2.4%	2.6%	2.8%	2.5%	2.8%	3.4%	3.5%	3.2%	2.8%	2.6%	2.6%	3.7%	3.4%	3.1%
Rhondda Cynon Taf	2.5%	2.3%	2.3%	2.1%	4.4%	5.9%	6.2%	6.5%	8.8%	8.9%	8.9%	8.4%	11.0%	10.1%
Merthyr Tydfil	1.3%	1.2%	1.0%	1.4%	1.4%	1.6%	1.4%	1.3%	1.1%	1.0%	1.0%	1.0%	2.7%	2.5%
Caerphilly	2.0%	2.0%	1.9%	3.6%	5.4%	6.6%	7.5%	7.7%	7.4%	7.6%	7.6%	7.2%	8.1%	7.5%
Blaenau Gwent	0.5%	0.4%	0.3%	0.8%	1.7%	1.9%	1.6%	2.2%	2.8%	3.6%	3.6%	3.4%	3.1%	2.9%
Torfaen	0.5%	0.4%	0.3%	0.4%	0.3%	1.4%	1.2%	1.1%	0.9%	0.9%	0.9%	2.3%	2.1%	3.9%
Monmouthshire	5.9%	6.1%	5.1%	5.5%	4.1%	4.0%	4.1%	5.3%	5.4%	4.9%	4.9%	4.7%	4.3%	4.0%
Newport	1.1%	1.2%	1.2%	1.5%	1.4%	1.8%	2.1%	1.9%	1.7%	1.5%	1.5%	1.4%	1.3%	1.2%
Cardiff	1.0%	1.0%	0.8%	1.4%	1.2%	1.0%	0.9%	0.8%	0.7%	0.6%	0.6%	0.8%	0.7%	0.6%
Wales	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Annex D

Nursery and Primary Education – Number of Schools Index (OLS Regression)

Dependent variable:
- Number of schools

Independent variables:
- Number of pupils in Nursery and Primary schools
- Settlement indicators (threshold 5,000)

2020-21

Ordinary Least Squares Regression analysis results:

Estimated schools = 0.00291 (number of pupils) + 0.00045909 (settlement 5,000)

R^2 = 0.8679

CPI weights = 0.00291 x number of pupils
0.00045909 x settlement 5,000

2021-22

Ordinary Least Squares Regression analysis results:

Estimated schools = 0.00295 (number of pupils) + 0.00045795 (settlement 5,000)

R^2 = 0.8796

CPI weights = 0.00295 x number of pupils
0.00045795 x settlement 5,000

2022-23

Ordinary Least Squares Regression analysis results:

Estimated schools = 0.00296 (number of pupils) + 0.00045663 (settlement 5,000)

R^2 = 0.8746

CPI weights = 0.00296 x number of pupils
0.00045663x settlement 5,000

Annex E

Primary school teaching and other services (Multilevel Modelling)

Dependent variable:
- Expenditure

Independent variables considered:
- Number of pupils in nursery and primary schools
- Pupils entitled to free school meals
- Actual number of schools
- Settlement (threshold 5,000)

2020-21

Multilevel Modelling results:

Expenditure = 3,148.51443108 (number of pupils)
+ 1,990.30691171 (free school meals)
+ 12,7912.97688453 (actual schools)

CPI weights = 0.746 x number of pupils
0.108 x free school meals
0.146 x actual schools

With modelled school index multiplied out:

CPI weights = 0.835 x number of pupils
0.108 x free school meals
0.056 x settlement 5,000

2021-22

Multilevel Modelling results:

Expenditure = 3362.86782909 (number of pupils)
+ 1744.98983899 (free school meals)
+ 123589.38734128 (actual schools)

CPI weights = 0.761 x number of pupils
0.103 x free school meals
0.136 x actual schools

With modelled school index multiplied out:

CPI weights = 0.845 x number of pupils
0.103 x free school meals
0.053 x settlement 5,000

2022-23

<u>Multilevel Modelling results:</u>

Expenditure = 3534.0129463 (number of pupils)
                + 1905.31040996 (free school meals)
                + 137267.09249739 (actual schools)

CPI weights = 0.748 x number of pupils
              0.109 x free school meals
              0.142 x actual schools

With modelled school index multiplied out:

CPI weights = 0.835 x number of pupils
              0.109 x free school meals
              0.055 x settlement 5,000

Annex F

Primary school teaching and other services (Weights Calculation)

2020-21

	Pupils	Schools	FSM	Sett 5000
Wales Total	253,369	1,217	58,177	1,015,295

MLM	Pupils	Schools	FSM	Sett 5000	Total
Coeff	3,148.51	127,912.98	1,990.31	-	
CPI	797,734,379	155,670,093	115,789,090	-	1,069,193,562
Weights %	**74.6%**	14.6%	**10.8%**		

Schools weight from above		14.56%		
OLS	Pupils	Schools	FSM	Sett 5000
Pupils	0.612675491			0.387324509
Sett Area	**8.9%**			**5.6%**

Pupils	FSM	Sett 5000	
83.5%	**10.8%**	**5.6%**	**100.0%**

2021-22

	Pupils	Schools	FSM	Sett 5000
Wales Total	250,233	1,216	65,083	1,015,295

MLM	Pupils	Schools	FSM	Sett 5000	Total
Coeff	3,362.87	123,589.39	1,744.99	-	
CPI	841,498,824	150,284,695	113,568,301	-	1,105,351,820
Weights %	**76.1%**	13.6%	**10.3%**		

Schools weight from above		13.60%		
OLS	Pupils	Schools	FSM	Sett 5000
Pupils	0.613549329			0.386450671
Sett Area	**8.34%**			**5.25%**

Pupils	FSM	Sett 5000	
84.5%	**10.3%**	**5.3%**	**100.0%**

2022-23

	Pupils	Schools	FSM	Sett 5000
Wales Total	247,316	1,212	67,006	1,015,295

MLM	Pupils	Schools	FSM	Sett 5000	Total
Coeff	3,534.01	137,267.09	1,905.31	-	
CPI	874,017,946	166,367,716	127,667,229	-	1,168,052,891
Weights %	**74.8%**	14.2%	**10.9%**		

Schools weight from above			14.24%	
OLS	Pupils	Schools	FSM	Sett 5000
Pupils	0.612255603			0.387744397
Sett Area	8.7%			5.5%

Pupils	FSM	Sett 5000		
83.5%	**10.9%**	**5.5%**	**100.0%**	

Distribution Sub-Group (2024) Paper 04 - Recalibrating the Nursery and Primary School Services IBA Methodology

Table 4: Average (2020-21 to 2022-23) of CPI weights

	Primary school pupils and modelled nursery school pupils	Primary school pupils eligible for free school meals	Settlement threshold 1,000
Old	81.50%	8.70%	9.80%

	Primary school pupils and modelled nursery school pupils	Primary school pupils eligible for free school meals	Settlement threshold 5,000
New			
2021	83.53%	10.83%	5.64%
2022	84.47%	10.27%	5.25%
2023	83.55%	10.93%	5.52%
Latest 3 Year Average	**83.8%**	**10.7%**	**5.5%**

Table 5: Nursery and Primary Education Indicator Data

	Primary school pupils and modelled nursery school pupils	Proportion %	Primary school pupils eligible for free school meals	Proportion %	Settlement threshold 5,000 (Census 2021)	Proportion %	Settlement threshold 1,000 (Census 1991)	Proportion %
Isle of Anglesey	5,341	2.1%	1,137	1.7%	51,846	5.1%	50,353	4.8%
Gwynedd	8,879	3.5%	1,786	2.7%	90,576	8.9%	83,755	8.0%
Conwy	8,252	3.2%	2,253	3.4%	37,494	3.7%	44,876	4.3%
Denbighshire	8,128	3.2%	2,214	3.4%	38,375	3.8%	38,810	3.7%
Flintshire	12,579	4.9%	2,945	4.5%	55,823	5.5%	59,553	5.7%
Wrexham	11,388	4.5%	2,997	4.5%	54,305	5.3%	36,240	3.5%
Powys	9,554	3.7%	1,637	2.5%	99,984	9.8%	91,018	8.7%
Ceredigion	4,929	1.9%	1,019	1.5%	56,829	5.6%	52,260	5.0%
Pembrokeshire	9,512	3.7%	2,101	3.2%	79,395	7.8%	69,575	6.7%
Carmarthenshire	14,771	5.8%	3,443	5.2%	114,664	11.3%	109,168	10.5%
Swansea	19,633	7.7%	5,715	8.7%	35,443	3.5%	47,135	4.5%
Neath Port Talbot	11,237	4.4%	3,578	5.4%	45,750	4.5%	45,593	4.4%
Bridgend	11,973	4.7%	3,296	5.0%	24,952	2.5%	34,106	3.3%
The Vale of Glamorgan	12,041	4.7%	2,345	3.6%	28,298	2.8%	33,798	3.2%
Rhondda Cynon Taff	19,952	7.8%	5,712	8.7%	44,950	4.4%	67,607	6.5%
Merthyr Tydfil	5,399	2.1%	1,582	2.4%	14,272	1.4%	11,392	1.1%
Caerphilly	15,128	5.9%	4,063	6.2%	54,840	5.4%	52,835	5.1%
Blaenau Gwent	5,551	2.2%	1,784	2.7%	17,258	1.7%	17,627	1.7%
Torfaen	7,992	3.1%	2,493	3.8%	2,980	0.3%	17,658	1.7%
Monmouthshire	6,670	2.6%	1,125	1.7%	41,443	4.1%	42,994	4.1%
Newport	15,153	5.9%	3,998	6.1%	13,822	1.4%	18,916	1.8%
Cardiff	31,017	12.2%	8,796	13.3%	11,996	1.2%	16,850	1.6%
Total Unitary Authorities	**255,079**	**100.0%**	**66,019**	**100.0%**	**1,015,295**	**100.0%**	**1,042,119**	**100.0%**

Table 6: Nursery and Primary school teaching and other services IBA, (recalibrated)

	Existing Formula £000s	Option 2: Recalibrated (Settlement Threshold 5,000) £000s	Difference Option 2: £000s	Difference Option 2: %
Isle of Anglesey	30,733	29,271	-1,462	-4.8%
Gwynedd	50,916	48,751	-2,165	-4.3%
Conwy	44,263	43,255	-1,008	-2.3%
Denbighshire	42,920	42,696	-223	-0.5%
Flintshire	65,523	64,797	-726	-1.1%
Wrexham	57,702	59,635	1,934	3.4%
Powys	54,410	52,029	-2,382	-4.4%
Ceredigion	29,028	27,587	-1,441	-5.0%
Pembrokeshire	52,373	51,373	-1,000	-1.9%
Carmarthenshire	81,782	79,547	-2,234	-2.7%
Swansea	98,528	99,845	1,317	1.3%
Neath Port Talbot	59,228	59,612	384	0.6%
Bridgend	60,422	60,723	301	0.5%
The Vale of Glamorgan	59,018	59,227	209	0.4%
Rhondda Cynon Taff	102,407	101,898	-509	-0.5%
Merthyr Tydfil	26,918	27,801	883	3.3%
Caerphilly	77,376	78,165	789	1.0%
Blaenau Gwent	28,683	29,103	420	1.5%
Torfaen	40,208	40,186	-22	-0.1%
Monmouthshire	35,401	34,269	-1,132	-3.2%
Newport	73,161	75,219	2,058	2.8%
Cardiff	148,106	154,115	6,008	4.1%
Total Unitary Authorities	**1,319,104**	**1,319,104**		

Table 7: Nursery and Primary school teaching and other services IBA breakdown, (recalibrated)

	Main Client			Deprivation			Sparsity			
	Primary school pupils and modelled nursery school pupils (% Share)	Weight %	Total	Primary school pupils eligible for free school meals (%Share)	Weight %	Total	Settlement threshold 5,000 (Census 2021) (%Share)	Weight %	Total	Grand Total
Isle of Anglesey	2.1%	83.85%	23,160	1.7%	10.68%	2,426	5.1%	5.47%	3,686	29,271
Gwynedd	3.5%	83.85%	38,501	2.7%	10.68%	3,810	8.9%	5.47%	6,439	48,751
Conwy	3.2%	83.85%	35,782	3.4%	10.68%	4,807	3.7%	5.47%	2,666	43,255
Denbighshire	3.2%	83.85%	35,244	3.4%	10.68%	4,724	3.8%	5.47%	2,728	42,696
Flintshire	4.9%	83.85%	54,545	4.5%	10.68%	6,283	5.5%	5.47%	3,969	64,797
Wrexham	4.5%	83.85%	49,380	4.5%	10.68%	6,394	5.3%	5.47%	3,861	59,635
Powys	3.7%	83.85%	41,428	2.5%	10.68%	3,493	9.8%	5.47%	7,108	52,029
Ceredigion	1.9%	83.85%	21,373	1.5%	10.68%	2,174	5.6%	5.47%	4,040	27,587
Pembrokeshire	3.7%	83.85%	41,246	3.2%	10.68%	4,483	7.8%	5.47%	5,645	51,373
Carmarthenshire	5.8%	83.85%	64,050	5.2%	10.68%	7,346	11.3%	5.47%	8,152	79,547
Swansea	7.7%	83.85%	85,132	8.7%	10.68%	12,193	3.5%	5.47%	2,520	99,845
Neath Port Talbot	4.4%	83.85%	48,726	5.4%	10.68%	7,634	4.5%	5.47%	3,253	59,612
Bridgend	4.7%	83.85%	51,917	5.0%	10.68%	7,032	2.5%	5.47%	1,774	60,723
The Vale of Glamorgan	4.7%	83.85%	52,212	3.6%	10.68%	5,003	2.8%	5.47%	2,012	59,227
Rhondda Cynon Taff	7.8%	83.85%	86,515	8.7%	10.68%	12,187	4.4%	5.47%	3,196	101,898
Merthyr Tydfil	2.1%	83.85%	23,411	2.4%	10.68%	3,375	1.4%	5.47%	1,015	27,801
Caerphilly	5.9%	83.85%	65,598	6.2%	10.68%	8,669	5.4%	5.47%	3,899	78,165
Blaenau Gwent	2.2%	83.85%	24,070	2.7%	10.68%	3,806	1.7%	5.47%	1,227	29,103
Torfaen	3.1%	83.85%	34,655	3.8%	10.68%	5,319	0.3%	5.47%	212	40,186
Monmouthshire	2.6%	83.85%	28,922	1.7%	10.68%	2,400	4.1%	5.47%	2,946	34,269
Newport	5.9%	83.85%	65,706	6.1%	10.68%	8,530	1.4%	5.47%	983	75,219
Cardiff	12.2%	83.85%	134,495	13.3%	10.68%	18,767	1.2%	5.47%	853	154,115
Total Unitary Authorities	**100.0%**		**1,106,069**	**100.0%**		**140,854**	**100.0%**		**72,182**	**1,319,104**