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Evaluation of Schools Challenge Cymru

A quantitative analysis of pupil-level data

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Evaluation of SCC

A QUANTITATIVE ANALYSIS OF PUPIL-LEVEL DATA

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Views expressed in this report are those of the researcher and not necessarily those of the Welsh Government

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Glossary

SCC	Schools Challenge Cymru
PtS	Pathways to Success
KS3, KS4	Key Stage 3, Key Stage 4
NPD	National Pupil Database
L2I	Level 2 inclusive
CPS	Capped Points Scores
FSM	Free School Meals
SEN	Special Educational Needs

1. Introduction

1.1 This paper uses an extract (2009/10 to 2015/16) from the National Pupil Database to assess progress made by Pathways to Success (PtS) schools in improving pupil outcomes following their inclusion in SCC. The analysis was conducted in three parts. First, a descriptive overview of the data was carried out, focussing on the four years of data prior to the introduction of SCC in 2014 and comparing this to the following academic years (i.e. 2014/2015 and 2015/2016). Second, a hierarchical (multilevel) process of modelling took place in order to analyse the principal factors shaping performance at the level of the pupil and the school. Finally, a forecasting model (using econometric techniques) was developed, in order to predict how PtS schools might have performed without the SCC intervention. These forecasts were then compared with the recorded performance of the PtS schools.

1.2 Analysis was performed on a range of pupil outcomes, including attainment, attendance, and unauthorised absence rates. Three measures of attainment were analysed: English, Maths and Level 2 Inclusive (L2I[1]). Although data on attainment in Welsh and Capped Points Scores (CPS) are presented in the descriptive statistics section, longitudinal analysis was not undertaken, because:

- insufficient data on attainment in Welsh were available to undertake econometric analysis, as too few pupils in the 39 PtS schools studied the language to develop outcome models for this subject
- CPS is a Key Stage 4 (KS4) measure of academic outcome and no similar measure exists at Key Stage 3 (KS3) against which to draw a comparison and track pupil progress[2]. Since the econometric models relied on past attainment scores for pupils, longitudinal analysis with CPS as the outcome could not be carried out.

1.3 For all measures of attainment, the outcome variable is binary and measures whether or not a pupil achieved the expected level of attainment at a given Key Stage[3].

[1] This is a composite measure of five GCSEs at grade A*-C, including English or Welsh first language and mathematics. As this is a KS4 measure of attainment, and we are interested in progress over time, we use a proxy for L2I at KS3, which indicates whether a pupil attains the expected level of achievement in English/Welsh and Maths.
[2] This is also the case for L2, but, in this case, a proxy measure (described above) represents a good match. It is for this reason that we limit the analysis to attainment in L2I.
[3] For example, the outcome variable for KS3 Maths would be “1” is a pupil achieved a Level 5 or above, and a “0” if the pupil fell below this level.

1.4 The analysis of learning outcomes, attendance, and unauthorised absence rates included a range of pupil-level characteristics in order to understand the extent to which SCC intervention may have affected specific sub-populations of pupils. These sub-groups included analysis by gender, ethnicity, Free School Meal (FSM) eligibility, and Special Educational Need (SEN) status.

1.5 Finally, the analysis was expanded to consider how patterns of pupil outcomes varied across three different groups of schools, as defined in Table 1-1. These groups were identified by the research team based on each school's performance trajectory and quality of provision immediately prior to engaging with SCC.

Table 1-1: Overview of school groups

Group A (8 schools)	Group B (16 schools)	Group C (14 schools)
Schools in which the quality of provision **appeared to have been diminishing** prior to engagement with SCC	Schools in which the quality of provision **appeared to be stable** prior to engagement with SCC but was, nonetheless, considered in need of improvement.	Schools in which the quality of provision **had started to improve** prior to engagement with SCC, but which needed additional support to enhance the process.

Source: SQW, please see Carr, Brown and Morris (2017) for more information

1.6 The remainder of this paper is structured as follows. The following section (**Section 2**) provides an overview of the data extract from the National Pupil Database. This analysis explores trends in pupil outcomes over an extended time period, prior to and following the introduction of SCC, to inform subsequent econometric analyses.

1.7 **Section 3** tests the factors associated with pupil outcomes using hierarchical (multilevel) statistical modelling. The model specification includes both **pupil-level** (gender, FSM eligibility, SEN status, attendance rate, ethnicity, prior attainment, etc.) and **school-level** variables (proportion of pupils living in areas of multiple deprivation, primary language medium, etc.) and uses data from 2009/2010 to 2015/2016. The models were designed to establish, from administrative data, the principal determinants of pupil outcomes in PtS schools. They also served to determine which groups (by gender, ethnicity, FSM status, etc.) have seen the largest changes in their performance over time, with an emphasis on the period before and after the introduction of SCC.

1.8 The final section (**Section 4**) provides evidence on the extent to which school-level outcomes have changed (and whether these changes are positive or negative), since the introduction of SCC in 2013/2014. An important challenge to evaluating SCC was that there was no counterfactual scenario against which to measure its success. The nature of SCC, as well as the broader collection of policies targeting education in Wales, meant that a valid comparison group of schools was not available against which to perform any

tests for evidence of convergence, or otherwise. Therefore, we adopted an 'experimental' approach that used a forecasting model to develop a 'synthetic' counterfactual scenario.

1.9 The objective of the approach was to make, for each school, a prediction about how it would have performed in each year after the introduction of SCC *if the intervention had not taken place*. We explored a range of forecasting models to contrast their effectiveness. These included simple projections using time-series attainment data and more complex 'conditional' forecasts using known data about pupils to inform the predictions made (see **Section 4**).

1.10 We then used the outputs from these models to compare the recorded performance since the introduction of SCC. It is important to emphasise the experimental nature of this approach, which due to the volatility of attainment data at the school-level, means that particular attention needs to be paid to the statistical significance and confidence intervals presented around any of the results.

2. Overview of pupil-level data

2.1 The purpose of this section is to provide an overview of the pupil-level data and present broad trends (over time and by cohort groups) in terms of attainment, attendance and absence. Particular emphasis was placed on pre- and post-SCC years to understand the extent to which improvements in pupil-level outcomes could be observed. It is important to note that, due to the nature of the intervention (which was focused on school improvement), the level of 'treatment' received by pupils taking examinations from 2014/2015 onwards (the year SCC was introduced) varies considerably. For example, a pupil sitting a GCSE (KS4) examination in the 2014/2015 academic year would have very limited exposure to SCC-related change in schools. A pupil sitting a KS4 examination in the 2015/2016 academic year, however, would have been in an SCC-supported school for most of their KS4 studies (Years 10 and 11). Because schools focused on different aspects of school improvement[4], we do not distinguish by intensity of 'treatment' in any of the analysis that follows. Finally, as part of the data preparation process, and for simplicity of analysis, the examined dataset only comprises pupils who completed Key Stage teacher assessments and/or public examinations at the expected time intervals (three years between KS2 and KS3, two years between KS3 and KS4)[5].

Structure of the data

2.2 The extract of the National Pupil Database provided by the Welsh Government comprises 78,966 unique pupils enrolled in the 39 SCC-engaged schools. The data covers the period 2006/2007 to 2015/2016, as presented in Table 2-1 (intervention years are demarcated by the shaded rows). The table is structured by year (rows) and Key Stage (columns).

[4] See Carr, C, Brown S and Morris M, 2017

[5] As a result, 88 pupils (who either sat public examinations a year early or were not entered into their GCSEs with their cohort) were removed from the dataset.

Table 2-1: Pupil numbers by academic year and Key Stage

SCC status	Year	KS2	KS3	KS4	Total
Pre-intervention	**2006/07**	6,574	6,974	7,138	20,686
	2007/08	6,869	6,778	7,217	20,864
	2008/09	6,391	6,664	7,167	20,222
	2009/10	5,983	6,795	6,929	19,707
	2010/11	5,605	7,019	6,751	19,375
	2011/12	5,630	6,530	6,909	19,069
	2012/13	5,168	6,110	7,113	18,391
	2013/14		5,741	6,637	12,378
Post-intervention	**2014/15**		5,787	6,208	11,995
	2015/16		5,314	5,831	11,145
	Total	**42,220**	**63,712**	**67,900**	**173,832**

Source: SQW

2.3 Table 2-2 illustrates the structure of the data by cohort (columns) and years (rows), indicating the year in which a particular Key Stage was completed by a particular cohort. The intervention years are, again, demarcated by shading. In terms of support intensity, the table illustrates how Cohorts 11 and 13 (two years of SCC support, post KS3) would have had a greater exposure to PtS interventions than Cohort 10 (one year post-KS3), and Cohort 12 (one year pre-KS3). The red highlighting shows the data extracts that are used in the multilevel and forecasting models.

Table 2-2: The structure of the data by cohort, year and Key Stage

Cohort	2	3	4	5	6	7	8	9	10	11	12	13
2006/07	KS4		KS3			KS2						
2007/08		KS4		KS3			KS2					
2008/09			KS4		KS3			KS2				
2009/10				KS4		KS3			KS2			
2010/11					KS4		KS3			KS2		
2011/12						KS4		KS3			KS2	
2012/13							KS4		KS3			KS2
2013/14								KS4		KS3		
2014/15									KS4		KS3	
2015/16										KS4		KS3

Source: SQW

School Groups by pupil characteristics

2.4 The analysis reviews the overall performance of PtS schools across three groupings (Groups A, B and C as set out in Table 1-1: Overview of school groups above). Before looking at how these groups of schools performed across a range of outcomes measures, we first established how they differed in terms of the socio-economic structure of their cohort, including gender balance, levels of deprivation, FSM eligibility, SEN status, and ethnic composition. The data presented for schools in Groups A, B and C are based on an average of all Key Stage 4 pupils (Years 10 and 11) over two time-periods, 2010/11-2013/14 (**pre-SCC**) and 2014/15-2015/16 (**post-SCC**).

2.5 As Table 2-3 shows, Group B schools tended to have, on average, marginally lower numbers of pupils either living in deprived areas, from a black and minority ethnic background, and fewer pupils eligible for FSM, or with SEN status, compared to Group A or Group C schools. Group C schools tended to have marginally greater gender parity than schools in the other two groups.

Table 2-3: School characteristics by Group (average of Year 10 and 11 pupils), pre- and post-SCC

Key Stage	Group	% female	% living in deprived areas	% FSM eligible	% SEN Action (Plus)	% SEN Statement	% non-white
Pre-SCC (2010/2011-2013/14)	**A**	42%	30%	26%	20%	4%	5%
	B	48%	18%	21%	19%	3%	4%
	C	49%	21%	22%	21%	3%	6%
Post-SCC (2014/15-2015/16)	**A**	42%	29%	27%	25%	4%	6%
	B	48%	18%	23%	24%	3%	4%
	C	49%	22%	24%	24%	3%	7%

Source: SQW

Learning Outcomes

2.6 The first step was to consider the learning outcomes to be incorporated into the analysis. These are set out in Table 2-4. They include English and Maths from KS2 to KS4, but exclude Welsh (as noted above) due to an insufficient number of observations. The more comprehensive Level 2 Inclusive (L2I) measure was also analysed. As no direct comparator exists for L2I at KS3, a simple proxy measure was created in order to examine progress from KS3 to KS4. More details are set out in the following Table (Table 2-4).

Table 2-4: A summary of learning outcomes at each Key Stage

	KS2	KS3	KS4
English and Maths	Level 4	Level 5	Grade C at GCSE
Level 2 Inclusive (L2I)	-	Level 5 achieved in both English and Maths (a proxy measure)	5 GCSEs at grade A*-C, including English or Welsh first language and mathematics.

Source: SQW

2.7 The headline data in Table 2-5, Table 2-6 and Table 2-7 provides information on each of the key outcome measures for PtS schools over the period 2010/11 to 2015/2016. In addition to year-on-year changes, averages for the pre-intervention (2010/11 to 2013/14) and post-intervention (2014/15 to 2015/16) periods are also included.

2.8 In addition, an all-Wales average has been provided for comparison purposes for each outcome. **It is important to note that in all cases the Welsh average refers to all pupils in all of the schools in Wales.** While it would be preferable to provide a more fine-grained Welsh average for each specific

group we analysed (for example, for FSM eligible, SEN status pupils, etc.), complete sub-group data (at pupil level) for all of the schools in Wales were not available to the team at the time of the analysis. Therefore, where we make comparisons of FSM eligible pupils in PtS schools to the Welsh average, for example, we are not comparing this group to all FSM pupils in Wales, but rather to all pupils in Wales.

2.9 In the remainder of this section, a detailed descriptive overview of the learning outcomes (English, Maths and L2I), attendance and unauthorised absence data are provided. It is important to note that differences discussed in this section are descriptive and not based on any statistical tests or analyses of variance. Such statistical comparisons are reserved for subsequent sections using hierarchical and econometric modelling.

Table 2-5: Maths and English outcomes at KS3 and KS4 in PtS and all Welsh schools from 2010/11 to 2015/16

		English				Maths			
		KS3		**KS4**		**KS3**		**KS4**	
		PtS	**Wales**	**PtS**	**Wales**	**PtS**	**Wales**	**PtS**	**Wales**
2010/11	value	69%	76%	53%	63%	73%	78%	46%	57%
	N	6,885	-	6,115	-	6,885	-	6,112	-
2011/12	value	73%	79%	55%	62%	77%	81%	48%	58%
	N	6,406	-	6,273	-	6,406	-	6,331	-
2012/13	value	78%	83%	53%	63%	81%	84%	49%	60%
	N	5,989	-	6,552	-	5,989	-	6,656	-
2013/14	value	82%	86%	59%	66%	84%	87%	54%	62%
	N	5,630	-	6,267	-	5,630	-	6,259	-
2014/15	value	83%	88%	61%	69%	86%	89%	56%	64%
	N	5,701	-	5,898	-	5,701	-	5,902	-
2015/16	value	86%	89%	63%	69%	88%	90%	61%	67%
	N	5,220	-	5,604	-	5,220	-	5,620	-

Source: SQW and StatsWales

Table 2-6: Welsh, L2I and CPS outcomes at KS3 and KS4 in PtS and all Welsh schools from 2010/11 to 2015/16

		Welsh				**L2I**		**Capped Points Score**	
		KS4		**KS4**		**KS3**		**KS4**	
		PtS	**Wales**	**PtS**	**Wales**	**PtS**	**Wales**	**PtS**	**Wales**
2010/11	value	55%	81%	60%	75%	35%	50%	286	312
	N	6,748	-	109	-	6,640	-	6,640	-
2011/12	value	63%	84%	73%	74%	37%	51%	301	324
	N	6,246	-	132	-	6,787	-	6,787	-
2012/13	value	68%	88%	53%	74%	38%	53%	307	333
	N	5,860	-	110	-	6,984	-	6,984	-
2013/14	value	74%	90%	56%	74%	45%	55%	323	341
	N	5,514	-	142	-	6,503	-	6,503	-
2014/15	value	77%	91%	55%	75%	48%	58%	329	344
	N	5,548	-	111	-	6,079	-	6,079	-
2015/16	value	78%	92%	68%	75%	52%	60%	334	345
	N	5,067	-	107	-	5,718	-	5,718	-

Source: SQW and StatsWales

Table 2-7: Attendance and unauthorised absence outcomes at KS3 and KS4 in PtS and all Welsh schools from 2010/11 to 2015/16

		Attendance			Unauthorised absence		
		KS3*	**KS4***	**All**	**KS3***	**KS4***	**All**
		PtS	**PtS**	**Wales**	**PtS**	**PtS**	**Wales**
2010/11	value	91%	90%	91%	1.6%	2.8%	1.5%
	N	18,879	6,427	-	18,879	6,427	-
2011/12	value	92%	90%	92%	1.5%	3.2%	1.4%
	N	17,699	13,124	-	17,699	13,124	-
2012/13	value	92%	91%	93%	1.4%	2.8%	1.3%
	N	16,973	12,930	-	16,973	12,930	-
2013/14	value	93%	92%	94%	1.5%	2.6%	1.3%
	N	16,171	12,073	-	16,171	12,073	-
2014/15	value	93%	92%	94%	1.8%	2.8%	1.3%
	N	10,662	11,330	-	10,662	11,330	-
2015/16	value	93%	93%	94%	2.1%	2.5%	1.3%
	N	5,093	11,020	-	5,093	11,020	-

Source: SQW and StatsWales

Learning outcomes

Attainment in English

2.10 As illustrated in **Error! Reference source not found.** and Figure 2-2, the percentage of pupils achieving the expected level in English rose consistently over the period 2010/11 to 2015/16, at both KS3 and KS4. There were, however, marked differences between school groups. While attainment levels in all three groups increased, and the attainment gap between PtS schools and all schools was reduced, the trajectories of change were different. Group A schools, for example, showed a high degree of volatility at KS4 than Group B and Group C schools.

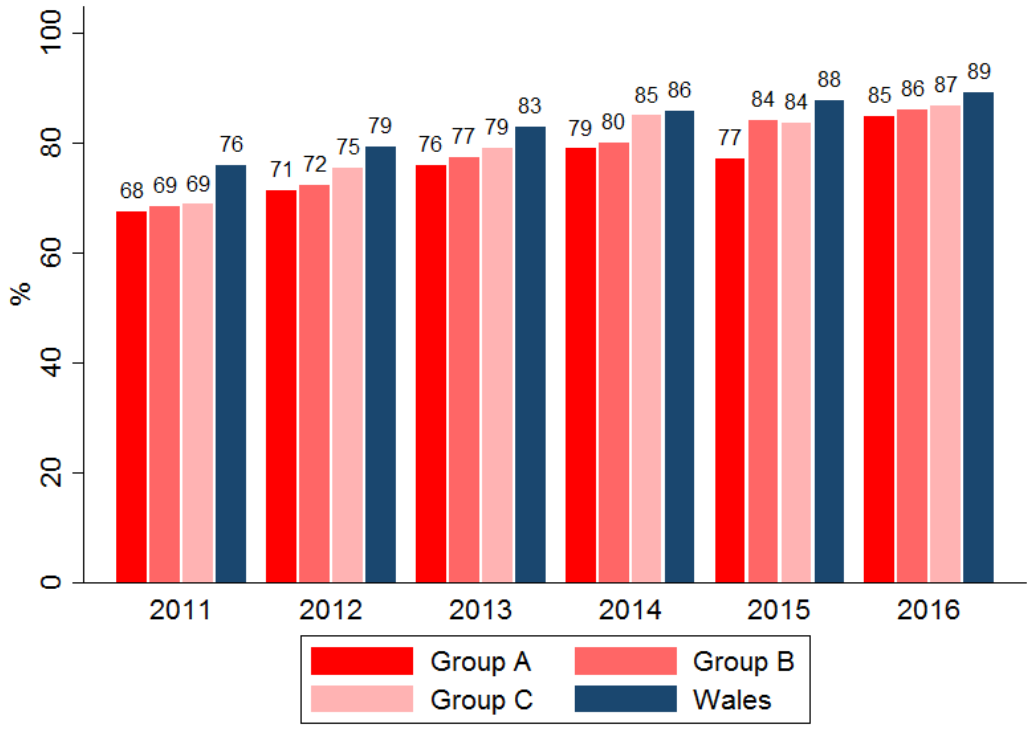
2.11 In the 2010/11 (2011 in the table) academic year, the average attainment in **KS3 English** was similar in each group of schools (68% for Groups A and B and 69% in Group C schools), which was around eight percentage points below the Welsh average of 76%.

2.12 By the 2013/2014 academic year (2014 in the table), differences could be observed between the three school groups. KS3 attainment levels in English in PtS schools improved (79% in Group A schools, 80% in Group B schools and 85% in Group C schools), as had attainment nationally (an average of 86%). In Group C schools, the gap in performance with all-Wales schools narrowed, from seven percentage points in 2010/2011 to one percentage point in 2013/2014, though increased to two percentage points by 2016. In Group A schools, the gap of eight percentage points with all Welsh schools in 2011 reduced marginally to seven percentage points in 2014, and further decreased to four percentage points in 2016, suggesting accelerated improvement in Group A schools.

2.13 Such improvement was less evident in Group A schools at **KS4**. In 2011, when the Welsh average for grade C and above was 63%, the mean in PtS schools was consistently lower and there were only minimal differences between the groups (51% of pupils in Group A, 53% in Group B and 54% in Group C schools achieved grade C and above). This meant a gap in performance with all Welsh schools of 12 percentage points for Group A, 10 percentage points for Group B and nine percentage points for Group C. By 2016, that gap had narrowed to two percentage points in Group C schools (that is, between 67% for Group C schools and 69% nationally - see Figure 2-2), though the improvements in performance were already evident in 2014 (pre-SCC)[6]. In Group A schools, the gap with all schools in Wales remained wide, at 11 percentage points.

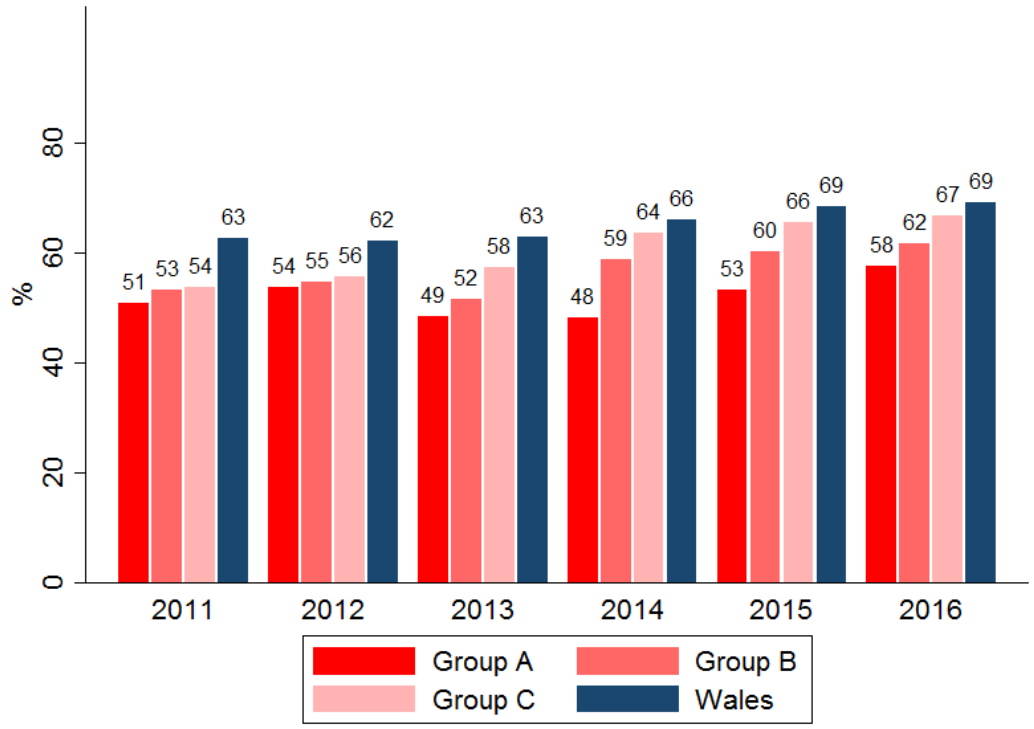
[6] This forms part of the definition of this group.

Figure 2-1: KS3 English attainment from 2010/11 to 2015/16 (% achieving the expected level)



Source: SQW

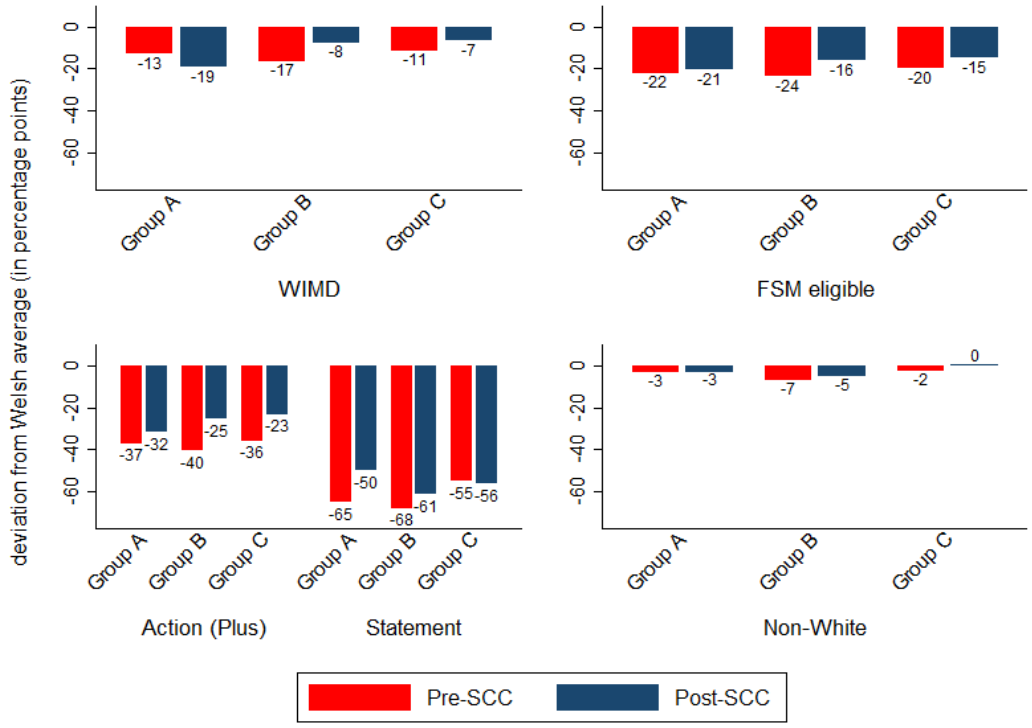
Figure 2-2: KS4 English attainment from 2010/11 to 2015/16 (% achieving the expected level)



Source: SQW

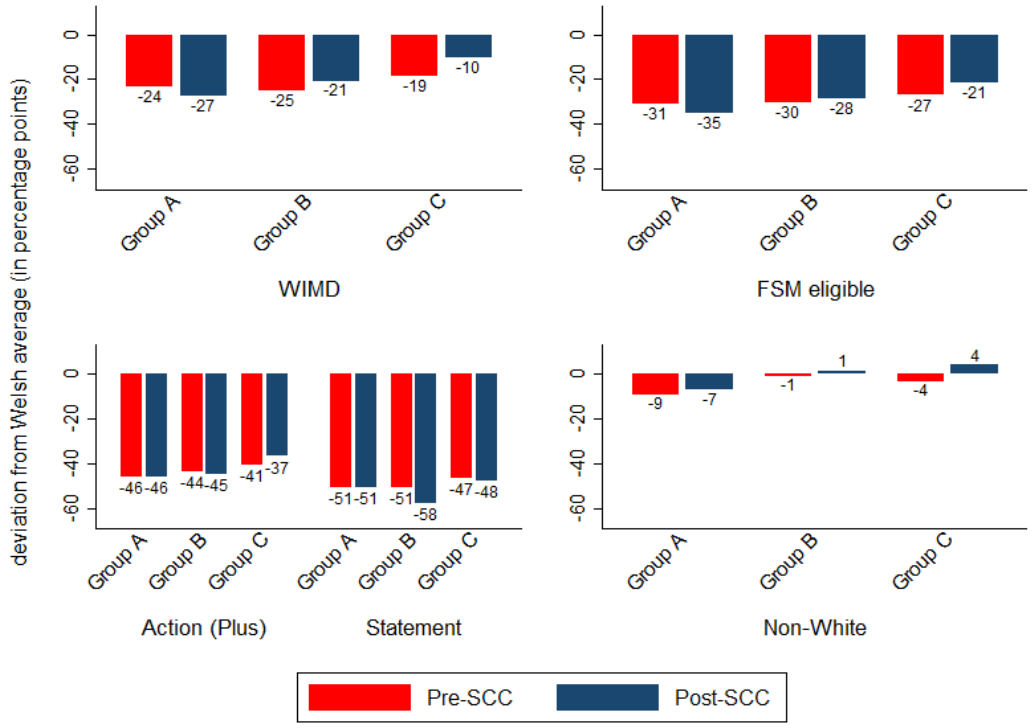
2.14 Beyond this aggregate picture, Figure 2-3 and Figure 2-4 summarise the broad trends in English attainment by various pupil-level characteristics at KS3 and KS4, respectively. This includes comparisons for pupils living in deprived areas (WIMD), those eligible for FSM, those with a Special Educational Needs (SEN) status, and pupils from black and minority ethnic groups. Again, it is important to reiterate that comparisons are made against the all-Wales average for all pupils.

Figure 2-3: Attainment in KS3 English by a range of characteristics for each Group, pre- and post-SCC (% difference relative to the all-pupil Welsh average)



Source: SQW

Figure 2-4: Attainment in KS4 English by a range of characteristics for each Group, pre- and post-SCC (% difference relative to the all-pupil Welsh average)



Source: SQW

2.15 For pupils living in disadvantaged areas (as indicated by the WIMD), the attainment differential with respect to the Welsh average was lowest for Group C schools; in other words, the performance of disadvantaged pupils in Group C was closer to the Welsh average (for all pupils) than the performance of disadvantaged pupils in Group A or Group B schools.

2.16 By contrast, pupils residing in deprived areas and attending Group A schools were at the biggest disadvantage with respect to the Welsh average at both KS3 and KS4. Moreover, this gap increased over time. This pattern was very similar for pupils eligible for FSM, with the one difference being that the gap with respect to the Welsh average was reduced for all groups at KS3 (but by a much larger margin for Group C relative to Group A schools).

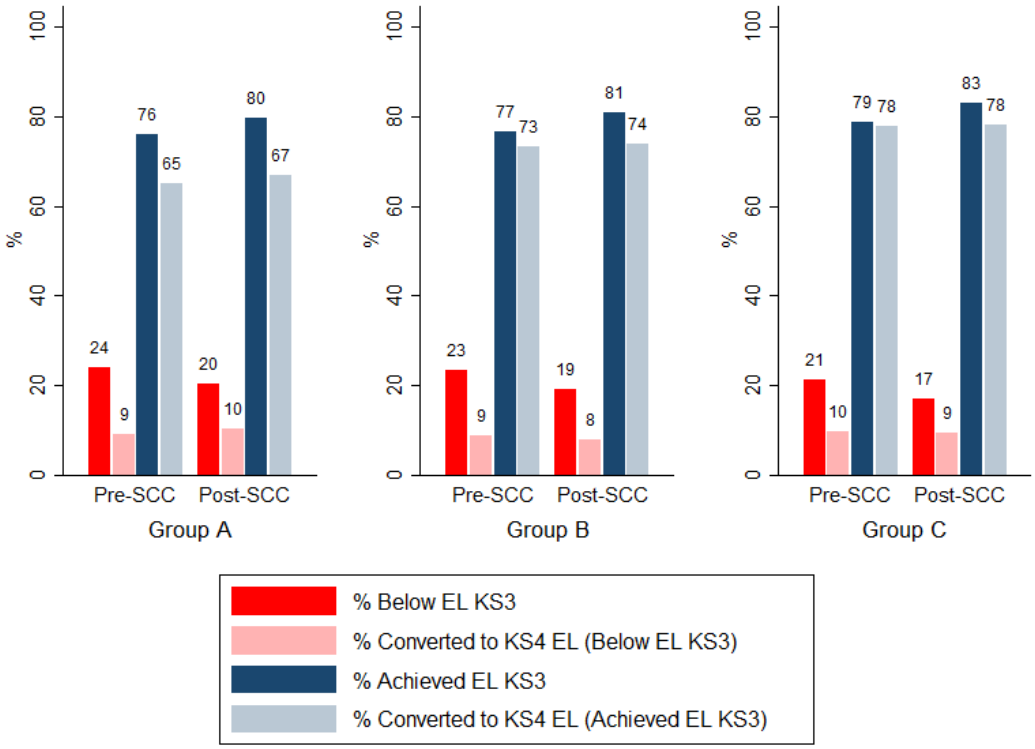
2.17 For Action (Plus) and SEN Statemented pupils at KS3, the data showed evidence of convergence over time towards the Welsh average – with the sole exception of Statemented pupils in Group C schools (where the gap widened by one percentage point). The story was less positive at KS4, where the gap remained the same or widened for all groups of pupils *except* those on Action Plus in Group C schools, where the gap narrowed by four percentage points post-SCC . This data snapshot, however, does not take into consideration any

broader trends in attainment for SEN pupils in Wales, as comparisons are made with respect to the overall Welsh average.

2.18 Finally, in terms of minority ethnic (non-white) pupils, there are indications that Group C schools – incidentally, also the group of schools with the largest proportion of black and minority ethnic, pupils – made considerable strides in terms of increased attainment over time. Pupils in this group moved from a position of lagging behind the Welsh average (over three percentage points below the Welsh average in KS4 English) to exceeding it in the post-SCC years (to almost four percentage points above). Minority ethnic, non-white pupils in all school groups at both KS3 and KS4 either converged towards, or exceeded, the Welsh average during the post-intervention period.

2.19 **Figure 2-5** presents the transition from KS3 to KS4 English, differentiating between pupils who achieved the expected level at KS3 and those who did not. The figure shows a few things of note. First, that over time more pupils achieved the expected level at KS3 in English (with an improvement from 76% to 80% in Group A schools, from 77% to 81% in Group B schools and 79% to 83% in Group C schools). Second, the figure illustrates the very low conversion rate for pupils who did not achieve the expected level at KS3 (less than one in ten pupils who failed to achieve the expected level at KS3 went on to achieve the expected level at KS4). Finally, across the three groups of schools, Group C achieved the most favourable outcomes for its pupils, and strengthened this position over time, achieving both the highest proportion of pupils achieving the expected level at KS3, and the highest conversion rate for these pupils in terms of their KS4 outcome. In the two years since the launch of SCC, nearly four fifths (78%) of pupils who achieved the expected level at KS3 went on to achieve the expected level at KS4, compared to two thirds (67%) of pupils in Group A schools.

Figure 2-5: The transition from KS3 to KS4 English, disaggregated by KS3 outcome and school Group, pre- and post-SCC



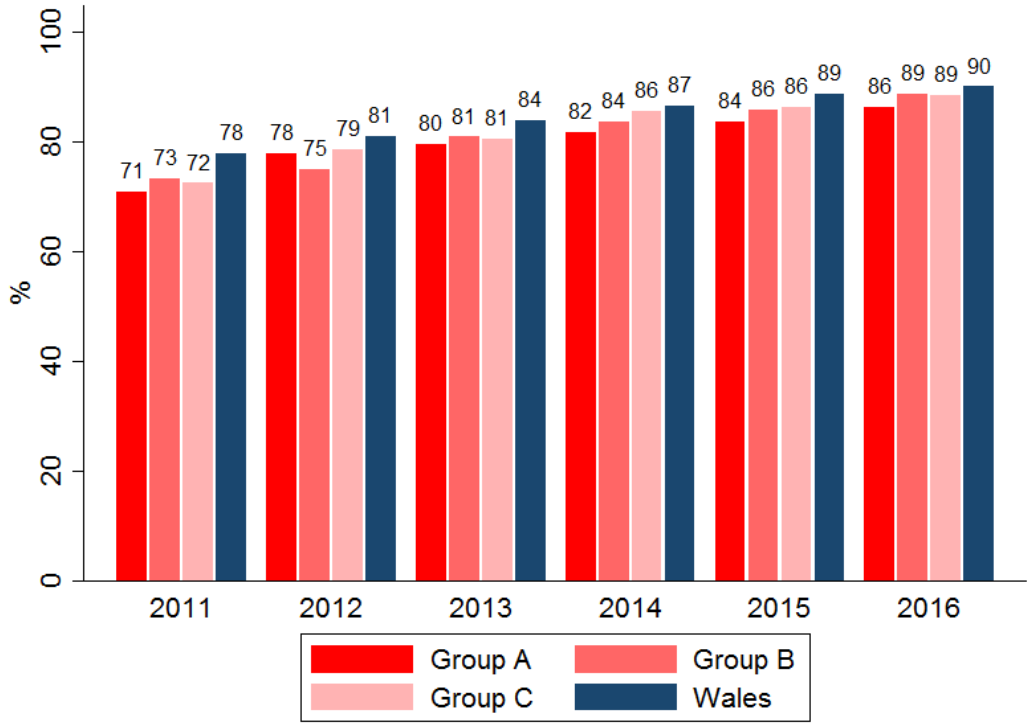
Source: SQW

Attainment in Maths

2.20 As for English, attainment in Maths in PtS schools increased in line with the all-Wales average. In addition, there are some broad signs of convergence (see Figure 2-6 and Figure 2-7). Differences between the three school groups were at their widest in 2015, with some volatility in the preceding years. For example, Group A schools consistently lagged behind the other groups, although 2012 proved to be a notable exception. In that year, a higher proportion of pupils in these schools than in Group B schools achieved the expected level.

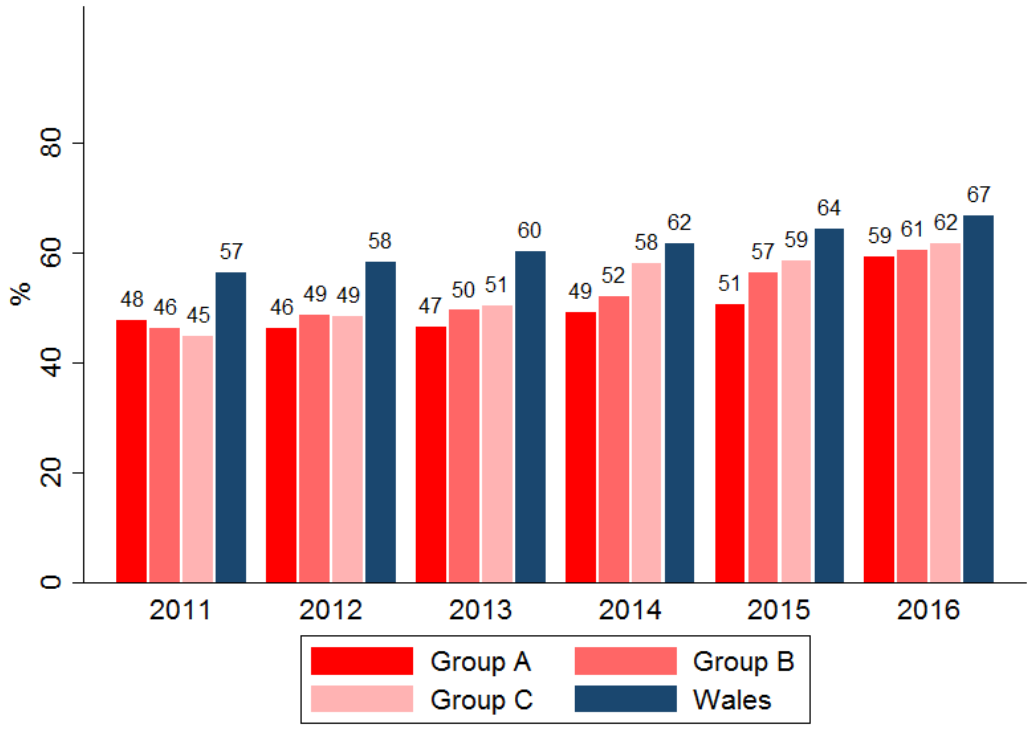
2.21 It is also clear that there is a more considerable attainment disparity at KS4 relative to KS3 between PtS schools and the all-Wales average. For example, in 2016, 88% of pupils in PtS schools achieved the expected level, compared to 90% of all pupils in Wales. At KS4, the equivalent percentages were 61% and 67% respectively, following several years of convergence.

Figure 2-6: KS3 Maths attainment from 2011-2016 (% achieving the expected level)



Source: SQW

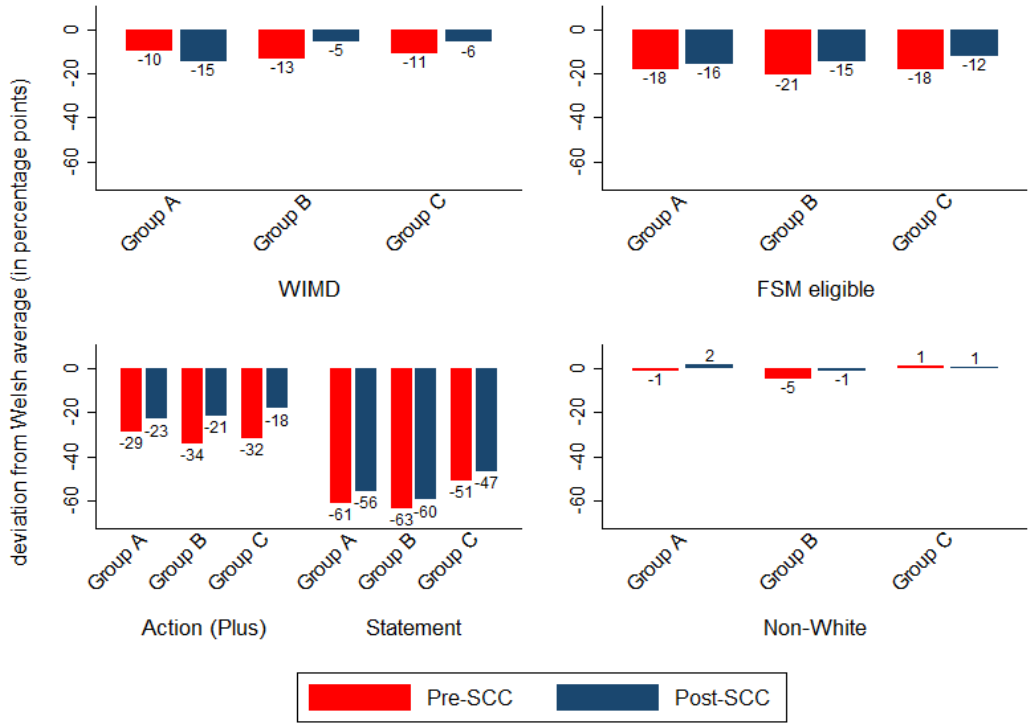
Figure 2-7: KS4 Maths attainment from 2011-2016 (% achieving the expected level)



Source: SQW

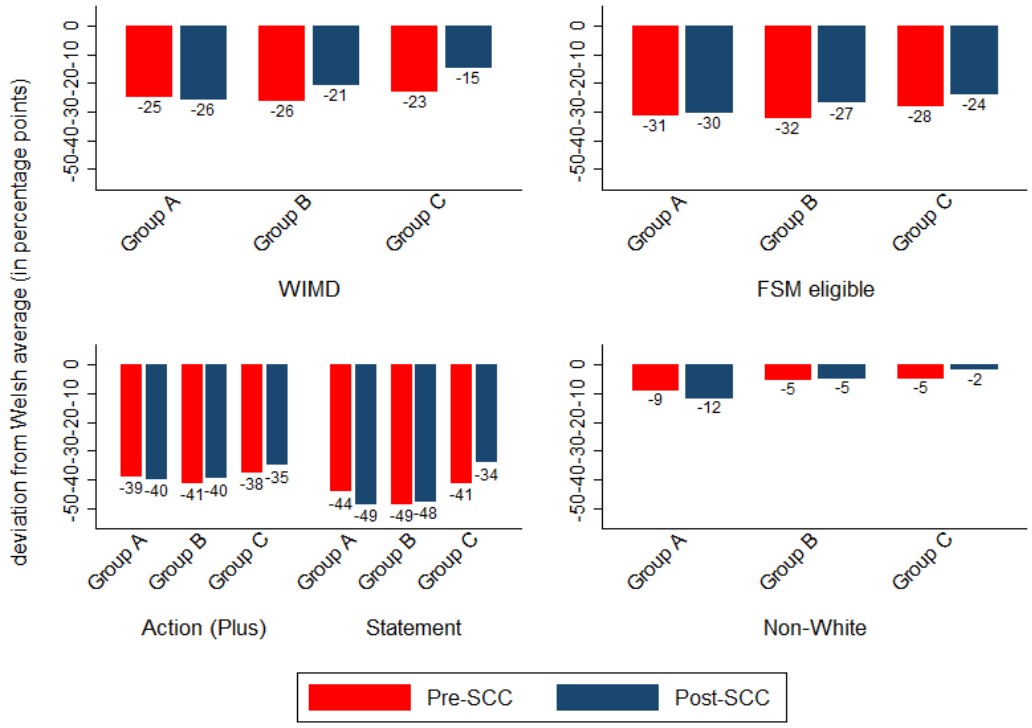
2.22 Figure 2-8 and Figure 2-9 present pre- and post-SCC attainment trends for Maths at KS3 and KS4, respectively, for pupils residing in areas of deprivation, those eligible for FSM, those with SEN, and non-white pupils.

Figure 2-8: Attainment in KS3 Maths by a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)



Source: SQW

Figure 2-9: Attainment in KS4 Maths by a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)



Source: SQW

2.23 In terms of pupils residing in the 10% most deprived regions in Wales (WIMD), there is evidence to suggest that some PtS schools have started to converge with the Welsh average since the introduction of SCC. Pupils in Group C schools closed the gap with respect to the Welsh average by the greatest margin, but pupils in Group A schools diverged, with a growing gap between those schools and the Welsh average, at both KS3 and KS4. For pupils eligible for FSM, patterns are similar to pupils living in deprived areas.

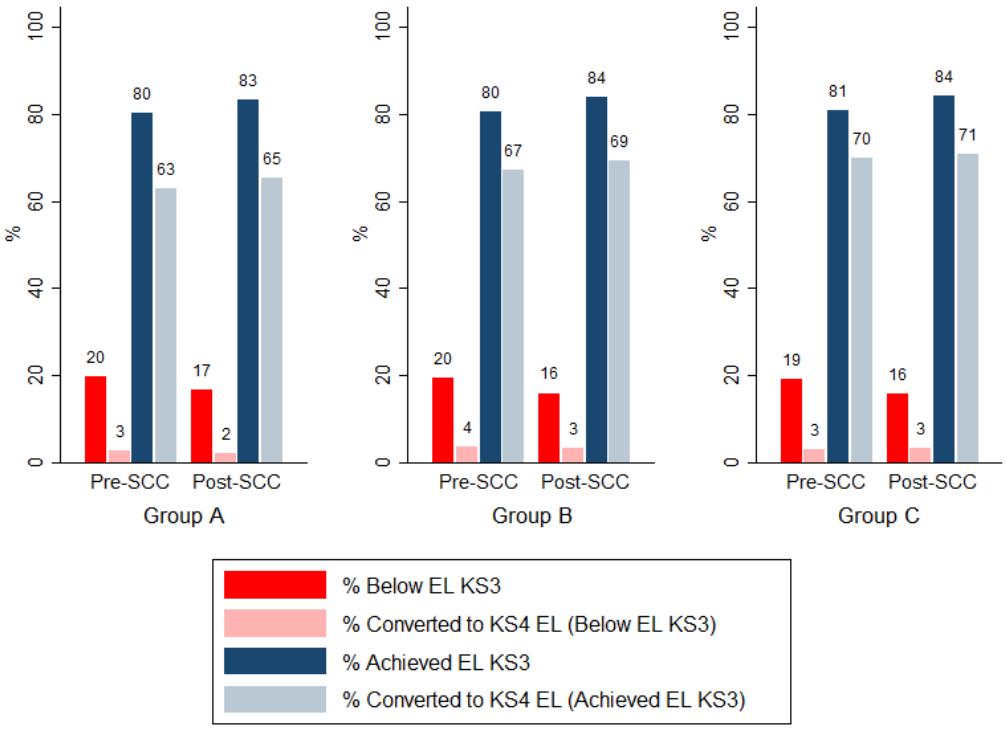
2.24 For SEN status pupils, the data show some convergence between the PtS schools and the Welsh average over time for pupils with Action (Plus) and Statement SEN status at KS3. At KS4 there is evidence of divergence for Group A schools (greater for statemented pupils), limited change for Group B schools, and convergence for Group C schools.

2.25 Finally, in terms of black and minority ethnic non-white pupils, there are mixed patterns across the school groups. This is most likely due to the small proportion of such non-white pupils in Welsh schools, which averaged 5.4% of pupils across all PtS schools in 2016 (a range of from less than one per cent to over 23% in individual schools). The data suggest that black and minority ethnic non-white pupils fare better in Maths in Group C schools (where this

group performs above the Welsh average, the only group to do so). More generally, black and minority ethnic, non-white pupils tend to outperform white pupils.

2.26 Finally, in terms of the conversion rate from KS3 to KS4 in Maths, Figure 2-10 illustrates broadly similar patters to those presented for English. It is notable, however, that the pupils who fail to achieve the expected level at KS3 are very unlikely to go on to reach the expected level at KS4 (only around 3% of such pupils are successful). Across all PtS schools, the proportion of pupils who were successful in achieving the expected level at KS3 and subsequently achieved to the expected level at KS4, increased post-SCC. This was highest for pupils in Group C schools.

Figure 2-10: The transition from KS3 to KS4 Maths, disaggregated by KS3 outcome and school Group, pre- and post-SCC



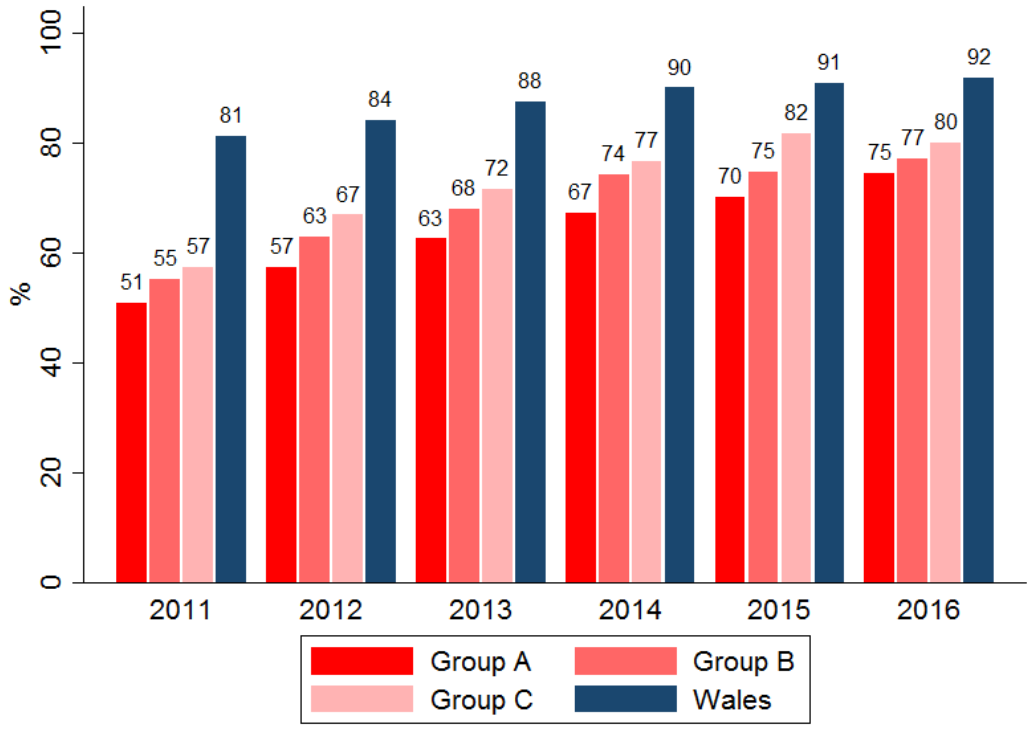
Source: SQW

Attainment in Welsh

2.27 For attainment in Welsh, this analysis focusses on KS3 results alone, as very few pupils in PtS schools sat a Welsh KS4 examination (107 pupils in 2016). As noted above, it is for this reason that we do not analyse attainment in Welsh in the later econometric modelling sections.

2.28 As illustrated in Figure 2-11, PtS schools have converged towards the Welsh average over time. In Group C schools, for example, the percentage of pupils achieving the expected level in KS3 Welsh increased from 57% in 2010/2011 to 80% by 2015/16, halving the gap with the Welsh average from 24 percentage points to 12 percentage points over this period. It is notable that the differences between the three schools groups are at their lowest in the 2015/16 academic year.

Figure 2-11: KS3 Welsh attainment from 2011-2016 (% achieving the expected level)

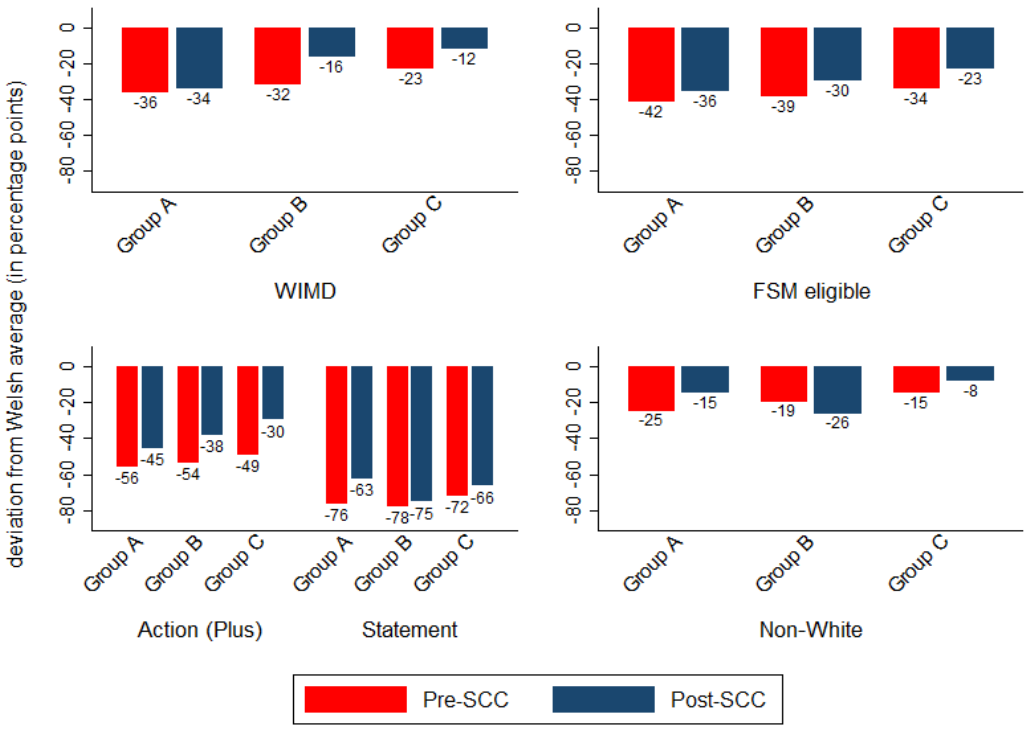


Source: SQW

2.29 In terms of specific pupil characteristics, Figure 2-12 shows that Group C schools made the most progress in reducing disparities with respect to the Welsh average over time, particularly for pupils living in deprived areas (WIMD), with FSM eligibility and on Action (Plus) SEN status. For pupils with a Statement of SEN, and also for black and minority ethnic, non-white pupils, patterns across school groups were more nuanced. In both cases, Group A schools made the most progress, while Group B schools made less. In those

schools, the gap between black and minority ethnic, non-white pupils and the Welsh average increased. However, it is important to restate the fact that black and minority ethnic, non-white pupils represent only a small proportion of the pupils in these schools.

Figure 2-12: Attainment in KS3 Welsh across a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)



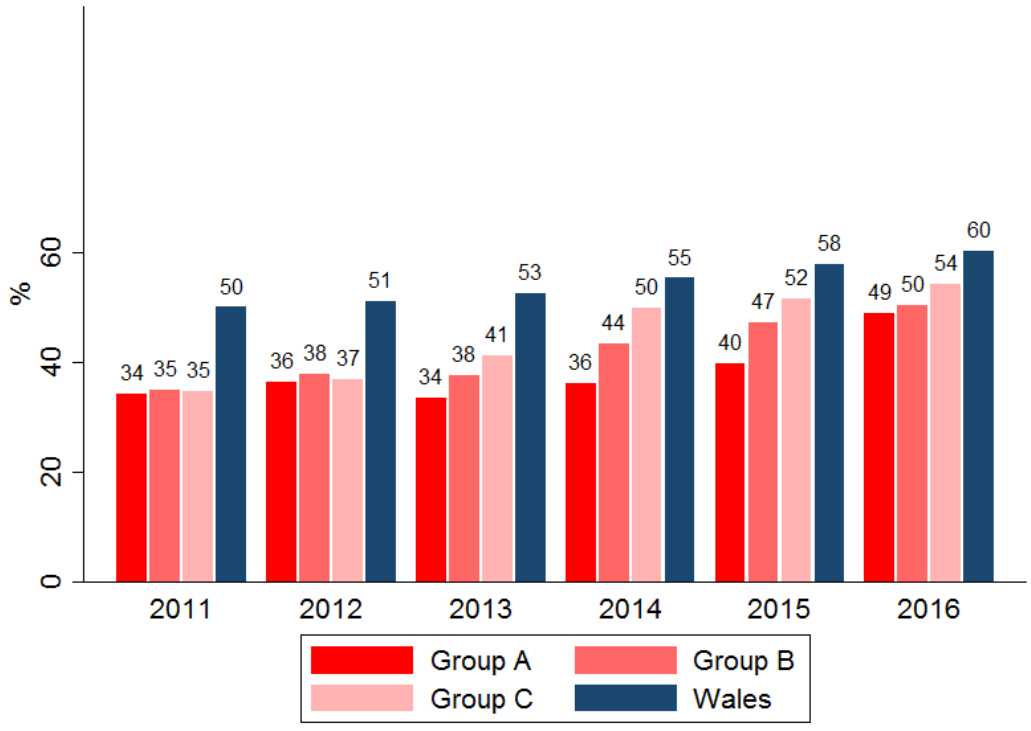
Source: SQW

Attainment in L2I

2.30 As the SCC intervention is not designed to target attainment in English and Maths specifically, we also present analysis of the L2I composite measure of attainment. The patterns presented in Figure 2-13 are broadly consistent with the attainment measures presented previously for English and Maths.

2.31 As Figure 2-13 shows, differences between the three schools groups in the 2010/11 academic year were minimal (a differential of one percentage point), increasing substantially by 2013/14 (a differential of 14 percentage points between Group A and C schools). This gap fell to approximately five percentage points by the 2015/16 academic year. Over this period, the gap between PtS schools and the Welsh average fell considerably, from around 15 percentage points in 2010/11 for Group C schools to six percentage points in 2015/16. It is notable that for Group B and C schools, the gap with respect to the Welsh average had been increasing prior to the introduction of SCC. For Group A schools, the majority of progress was made in the 2015/16 academic year (that is, post SCC).

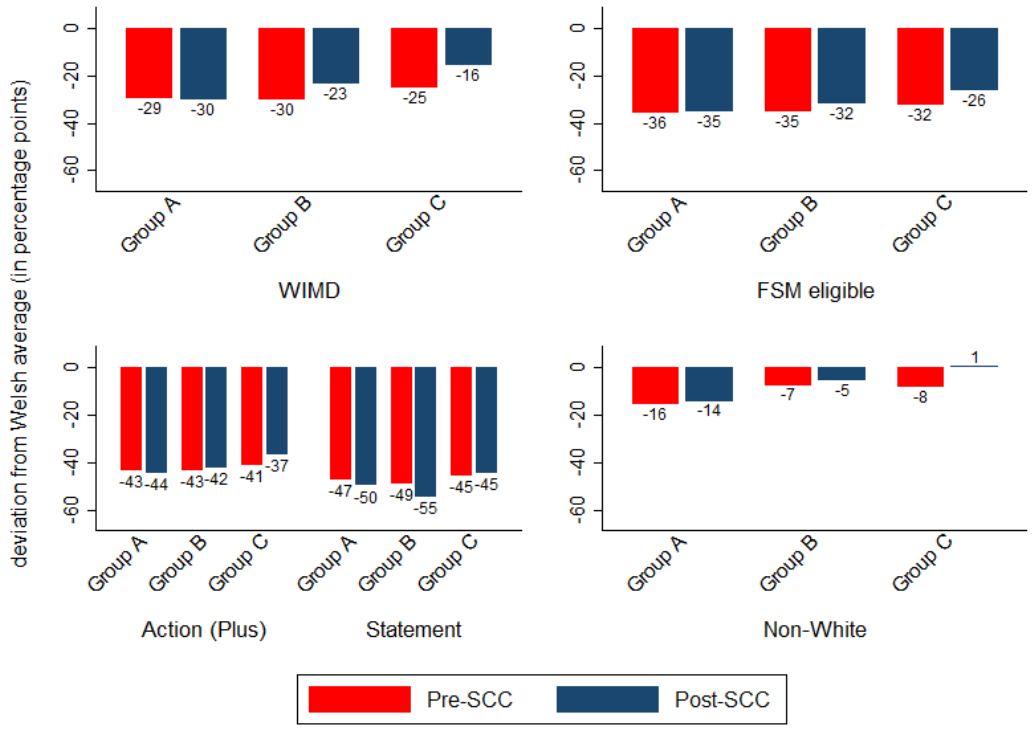
Figure 2-13: L2I attainment from 2011-2016 (% achieving the expected level)



Source: SQW

2.32 In terms of pupil characteristics, Figure 2-14 shows that pupils in Group C schools have seen the biggest improvement, particularly for pupils living in deprived areas. It is only for Statemented SEN pupils that the pattern is slightly different, particularly with respect to Statemented SEN pupils in Group B schools, where the gap in L2I attainment with respect to the Welsh average increased.

Figure 2-14: Attainment in L2I across a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)

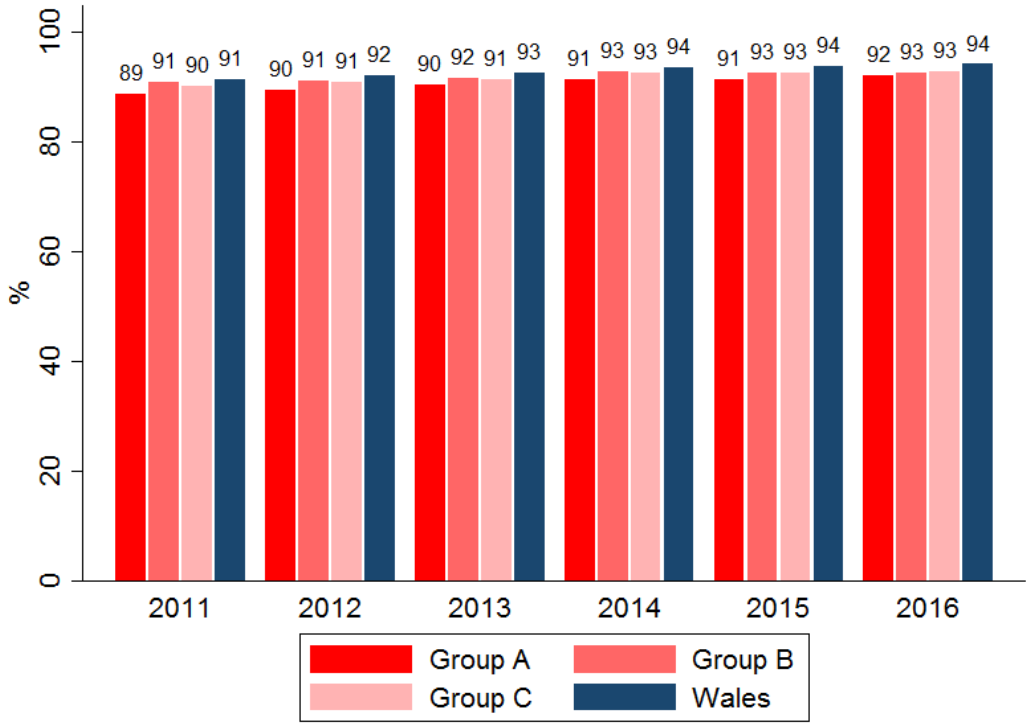


Source: SQW

Attendance rate

2.33 There are very limited differences in attendance rates across PtS schools, and between PtS schools and the Welsh average, across the full time period under analysis (a maximum disparity of 3%), as illustrated in Figure 2-15.

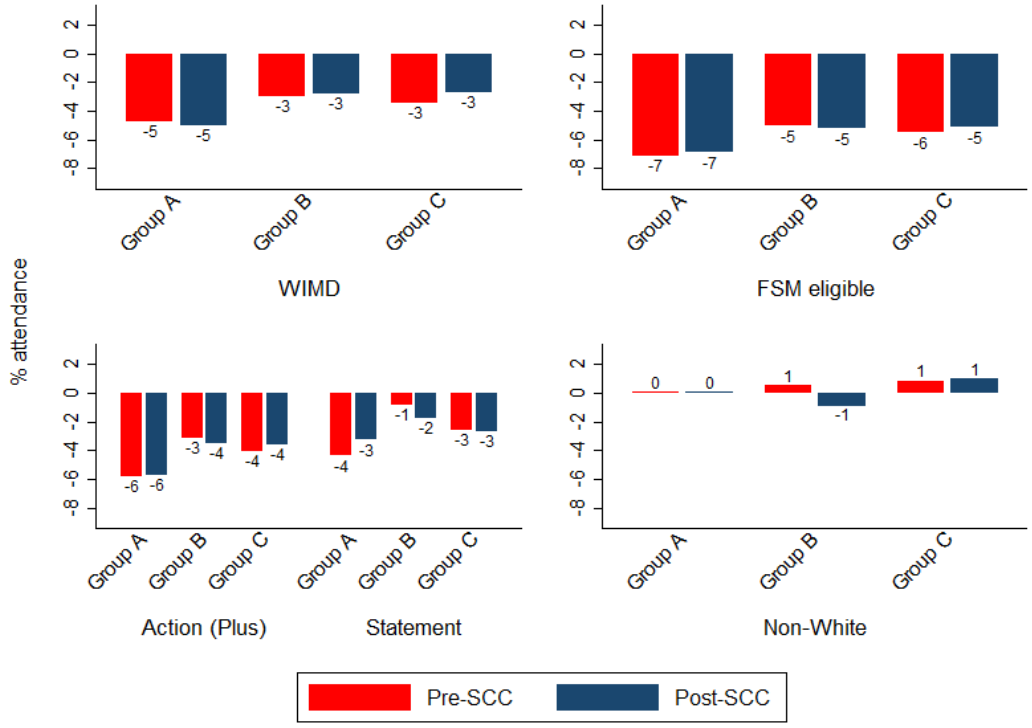
Figure 2-15: Attendance rate from 2011-2016 (%)



Source: SQW

2.34 More interestingly, however, there are differences by pupil characteristics across school groups. In terms of pupils living in deprived areas (WIMD), only Group C schools made progress in reducing their attendance disparity with respect to the Welsh average (see Figure 2-16). A similar story is true for FSM eligible pupils. In terms of SEN status, the data show that Group A schools have the largest disparity with respect to the Welsh average, both before and after the introduction of SCC. However, for Statemented SEN pupils this gap has fallen by around one percentage point over the two time periods presented.

Figure 2-16: Attendance rate across a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)

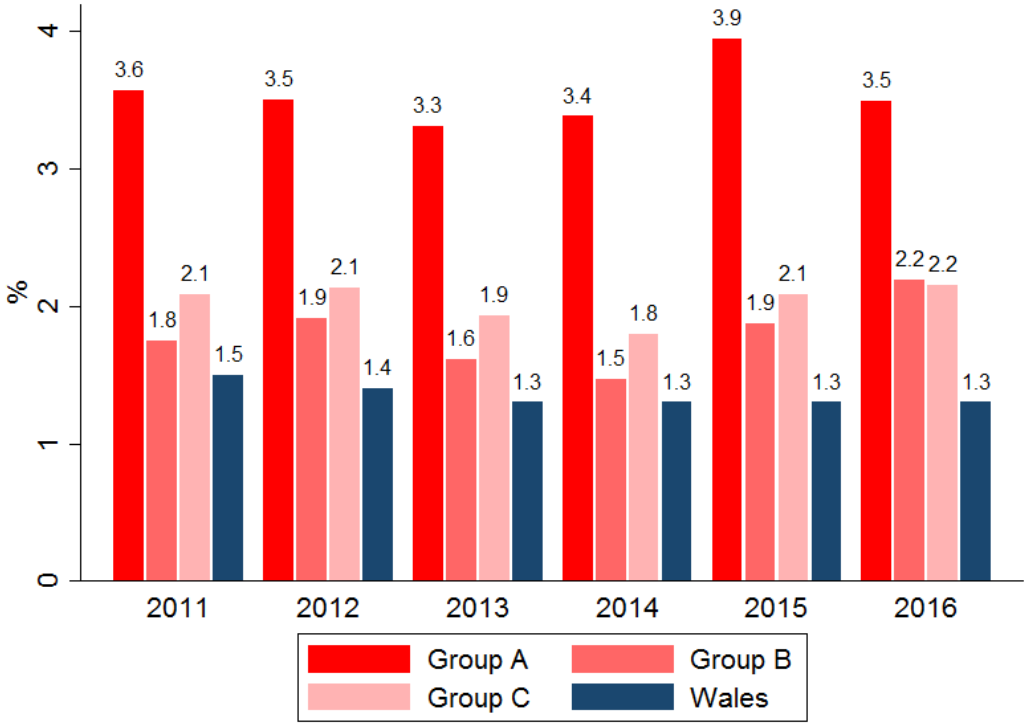


Source: SQW

Unauthorised absence rate

2.35 Unauthorised absence rates are higher in Group A schools by a clear margin, and were consistently more than double the Welsh average rate. As Figure 2-17 shows, there has been mixed progress over time for pupils in these schools, initially showing some signs of convergence, before increasing to a time-period maximum of 3.9% in the 2014/15 academic year. This figure fell to 3.5% in the 2015/2016 academic year. For Group B and C schools, the patterns are similarly mixed, although the differential with respect to the Welsh average is far less. In both cases, unauthorised absence rates were on a downward trajectory from 2010/11 to 2013/14, but then increased in the 2014/15 and 2015/16 academic years, after the introduction of SCC. This is a challenging finding, since reducing unauthorised absence was central to action planning in most PtS schools. In some instances (possibly most), the increase may have reflected better monitoring (with fewer instances of truancy passing un-recorded). In others, however, it may have reflected a higher level of challenge (both pastorally and academically) to pupils leading to an apparent rise in unauthorised absence.

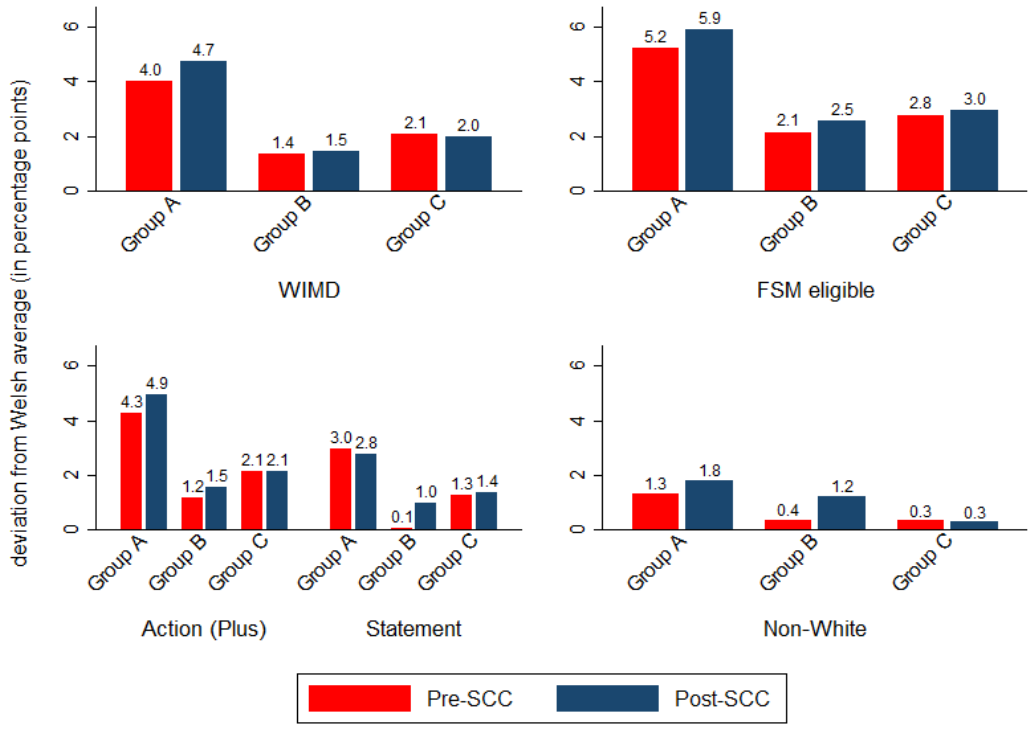
Figure 2-17: Unauthorised absence rate from 2011-2016 (%)



Source: SQW

2.36 Turning to pupil-level characteristics, Figure 2-18 illustrates a trend towards increasing divergence (higher rates of unauthorised absence) from the Welsh average over time, with a few exceptions across school groups. These exceptions are, however, limited, with very little evidence of improvement made across any pupil groups or any school grouping.

Figure 2-18: Unauthorised absence rate across a range of characteristics for each Group, pre- and post-SCC (% difference relative to the Welsh average)



Source: SQW

2.37 These variations between schools merit further investigation, not least to see whether the differences are significant. The following sections explore the next stages of the data analysis.

3. Multilevel (hierarchical) analysis of pupil-level data

3.1 The descriptive overview of the pupil-level data provides indications of differences in pupil outcomes across a variety of categories, including the different groups of PtS schools. This section presents a series of multivariate models in order to provide further evidence of the relative role, in statistical terms, of a range of factors in driving pupil-level outcomes.

The data and approach

3.2 This analysis focusses on three measures of attainment (English, Maths, and L2I), as well as attendance and unauthorised absence outcomes. Few pupils in these schools took Welsh as a first language, which means the sample size was too small to carry out a robust econometric analysis of Welsh language attainment.

3.3 The approach taken is that of multilevel modelling. This statistical approach enables both pupil-level and school-level drivers of pupil outcomes to be analysed together in order to identify the main factors in the available data (from the NPD) that appeared to be associated with higher levels of attainment and attendance.

3.4 Each of the models included a series of variables at school level, such as level of deprivation (proportion of pupils in lowest 10% of WIMD), gender parity of the cohort, proportion of pupils eligible for FSM and proportion of pupils with SEN status (see Table 3-1). At pupil level, variables included gender, FSM eligibility, prior attainment and attendance.

3.5 Some variables, therefore, were both background variables (to explore the impact of attendance on attainment, for example) and outcome variables (to explore the association between FSM and attendance). Finally, the models were all run with a full set of time variables, to assess significant differences on a year-by-year basis, pre- and post- SCC.

3.6 The available variables at pupil- and school- level are set out in Table 3-1.

Table 3-1: Variable list

Pupil-level	School-level
Gender	Gender ratio (% female)
Ethnicity	Ethnicity (% non-white)
FSM eligibility	FSM eligibility (% eligible for FSM)
SEN status	SEN status (% with SEN status)
Attendance	Attendance (% school average)
Live in deprived area (10% WIMD rank)	Proportion of pupils that live in lowest 10% of WIMD ranked LSOAs
Prior attainment	Primary language medium
	Group (assigned)
	School size (pupil numbers)

Source: SQW

3.7 The modelling was conducted in two steps:

- The first was to specify a model of pupil-level performance (such as attainment in maths) to form the basis of subsequent analysis (including the forecasting models – see Section 4).
- The second step was to use this model to test a range of time-interaction effects on the full range of pupil-characteristics, including ethnicity, SEN status, FSM eligibility and living in a deprived area (the lowest 10% of WIMD ranked LSOAs).

3.8 From the models, it was possible to identify the factors that appeared to be most closely associated with higher attainment and attendance, controlling for all other variables in the models. We should emphasise that the models were exploratory and, since they were limited to the data available in the NPD, could not be fully explanatory.

3.9 All models were run in Stata, making use of binary (Stata command "melogit") and continuous outcome variables (Stata command "mixed"). All models were run with "robust" standard errors (that, is the estimates are robust to some types of misspecification so long as the observations are independent).

3.10 It is important to note that all models presented in this section **include the all-pupil Welsh average** as a variable. This is included to control for a broad trend towards increasing attainment over time. In other words, year on year, a greater proportion of pupils achieved the expected level, on average, across all Welsh schools. We control for this trend in order to better distinguish specific trends – such as any evidence of convergence – from this broader

pattern of rising attainment, and making it easier to compare results over time. This variable is omitted from the figures for ease of presentation.

3.11 The results of the multilevel models are presented in the form of charts that plot the point estimate (coefficient[7]) and the confidence interval that surrounds them. A variable can be considered statistically significant where this confidence interval does not bisect the vertical line at zero. If the estimate is to the right of this zero-line, the association with the outcome variable can be considered positive (where statistically significant) and to the left, negative.

3.12 Finally, and relatedly, for ease of interpretation throughout this section, explanatory variables (i.e. gender) are interpreted in terms of being more or less likely to be associated with outcome variables (i.e. attainment in English). For example, if the gender variable (coded as female=1, male=0) is positive and significant in the model, this would be understood as saying that being female means it is more likely that the outcome variable is achieved. It is important to note that, from a technical standpoint, the models produce results in terms of odds-ratios, and increased/decreased odds.

3.13 Each chart is divided into three sections. The first set of coefficients at the top of each chart refer to key variables of interest, the second set refer to pupil-level factors, and the final set to school-level factors. For time-variables it is important to note that they are treated as categorical, dummy variables and the year 2009/2010 is the baseline year. In other words, all results should be interpreted in terms of their relationship to the performance of a particular outcome in 2009/2010.

3.14 Following each overview chart, a second set of four charts is presented to focus on specific interaction effects. The purpose of these additional charts is to reveal any important dynamics over time. Four interactions are focussed on, and these are living in a deprived area, FSM eligibility, SEN status, and ethnicity. Each chart forms an extension of the main chart preceding it but, for presentational purposes, only the key interaction variables are presented.

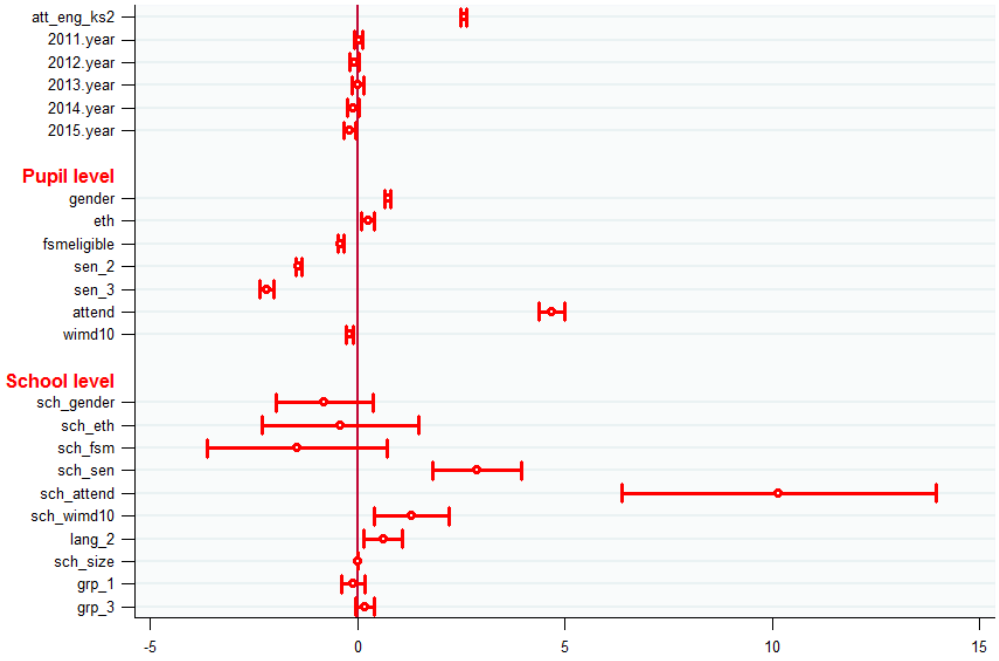
Attainment in English

3.15 The baseline model for KS3 attainment in English is presented in Figure 3-1 and shows a strong positive association between KS2 English attainment (att_eng_ks2) and KS3 attainment. In other words, higher attainment at KS3 is strongly associated with higher attainment at KS2. The time trend variables (2010.year-2015.year) further indicate that, over time the likelihood of attaining the expected level in KS3 English amongst pupils in these schools has decreased (once all other variables are taken into account). Given that

[7] Full multilevel model output tables are presented in the annex (in the form of odds-ratio's, as opposed to model coefficients in the charts) for ease of interpretation.

the models take the change in average Welsh attainment over time into account, this suggests that the rate of improvement in KS3 results since 2010 in PtS schools *may* be slower than the national average, though the findings are neither large nor statistically significant.

Figure 3-1: Baseline model for KS3 English



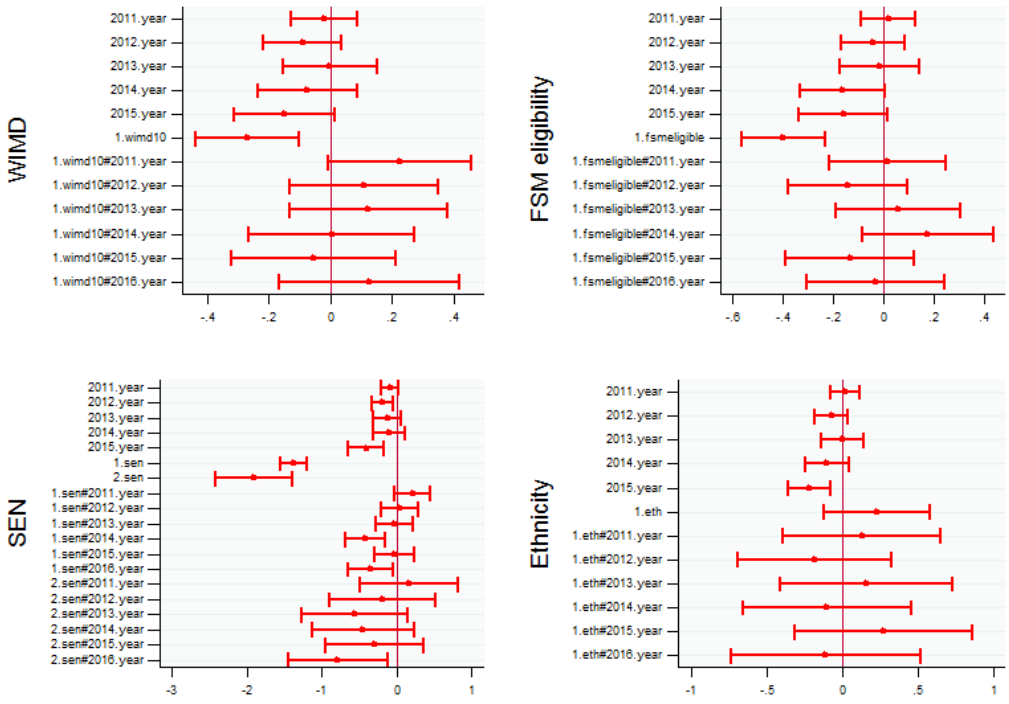
Source: SQW

3.16 In terms of pupil-level characteristics, being female, of ethnic minority status (non-white) and having higher rates of attendance are all associated with higher rates of attainment, while FSM eligibility, SEN status and living in a deprived area (wimd10) are all associated with lower rates of attainment. All of these coefficients are statistically significant.

3.17 Finally, in terms of school-level factors, four are significant in terms of increasing the likelihood of achieving the expected level in KS3 English across schools. Some of these are expected: pupils in schools with higher rates of attendance (sch_attend) do better than pupils in schools with low average attendance, for instance. Others are more challenging: pupils in schools with a higher proportion of SEN pupils (sch_sen) do better than their peers, as do pupils in schools with a higher proportion of pupils living in deprived areas (sch_wimd10), and being a Welsh language-medium school (land_2). Clearly there are other variables at work here.

3.18 Figure 3-2 takes a more focussed look at interaction effects between four key variables (WIMD, FSM eligibility, SEN status and ethnicity) individually and over time. The objective is to see how the relationship between each of these factors has altered over time. The results provide some evidence that SEN Action (Plus) (1.sen) and Statement (2.sen) pupils are falling further behind at KS3 (particularly in 2016), and that for both categories of SEN the trend is towards a reduced likelihood of achieving the expected level in KS3 English. Most of these results are not statistically significant and (as can be seen) are surrounded by large confidence intervals. The opposite trend is apparent for FSM and ethnic minority status pupils, where the likelihood of achieving the expected level of attainment appears to increase over time. In both cases, however, the results are statistically insignificant.

Figure 3-2: A focus on interaction effects for KS3 English

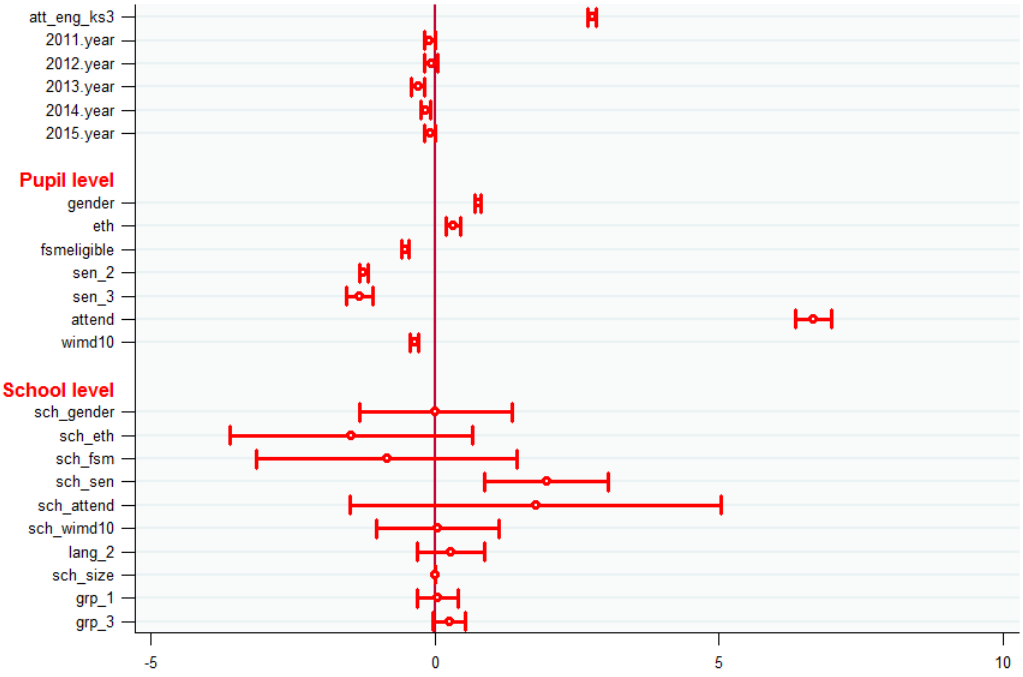


Source: SQW

3.19 For KS4 English, many of the patterns associated with KS3 attainment also hold, with a few exceptions. As can be seen in Figure 3-3, prior attainment remains highly positively associated with increased chances of achieving the expected level in KS4 English. The evidence shows that, relative to the base year (2009/2010) and taking into account changes in the Welsh national average, there has been little change in performance over time, with the exception of 2013 (the year pre-SCC) where attainment was lower, but has since recovered.

3.20 Across pupil-level variables, the patterns remain fully consistent with the KS3 findings. For the school-level variables, the patterns broadly remain the same, although the pupils in schools with a high proportion of SEN pupils have a greater likelihood of higher attainment in KS3 English. This does not mean that the SEN pupils do better, but that their peers, on average, do better than pupils in other schools.

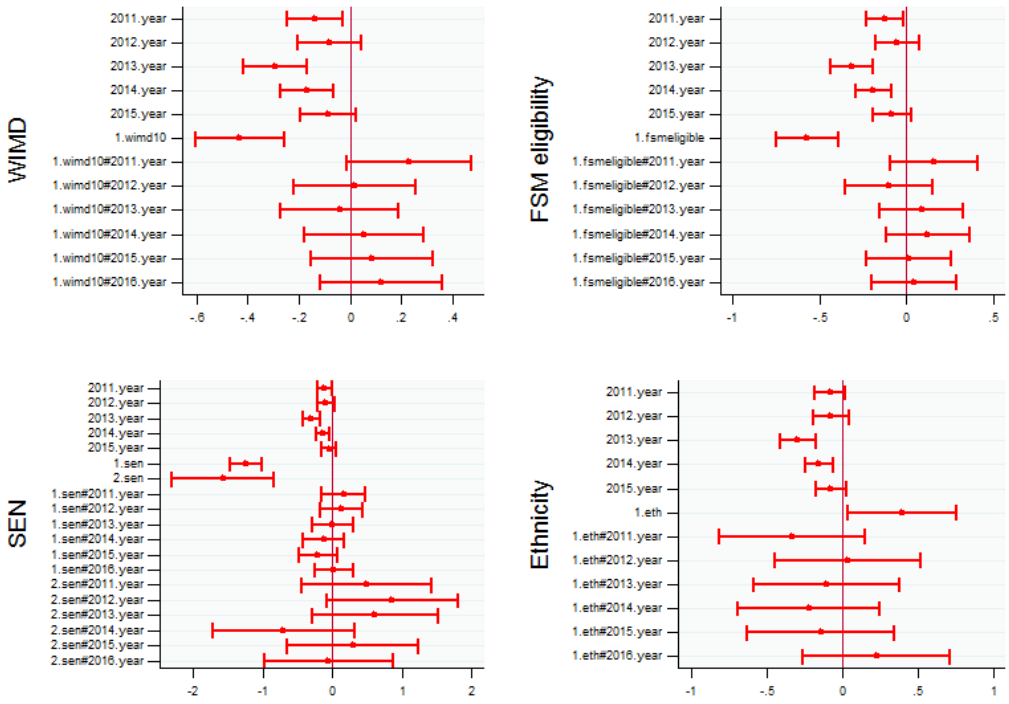
Figure 3-3: Baseline model for KS4 English



Source: SQW

3.21 In terms of interaction effects, Figure 3-4 presents a range of different trends, although none are statistically significant. For each of the variables (WIMD, FSM, SEN and Ethnicity), there are signs of improvement in the PtS schools in recent years compared to the baseline year 2009/2010. This trend is most clearly seen for the WIMD and FSM analysis, showing a general increase in the chances of achieving the expected level in KS4 English over time (even controlling for the upward trend in attainment seen across Wales as a whole). For SEN status and ethnicity variables, it is only in recent years (2015/2016 especially) that this positive trend is observed.

Figure 3-4: A focus on interaction effects for KS4 English

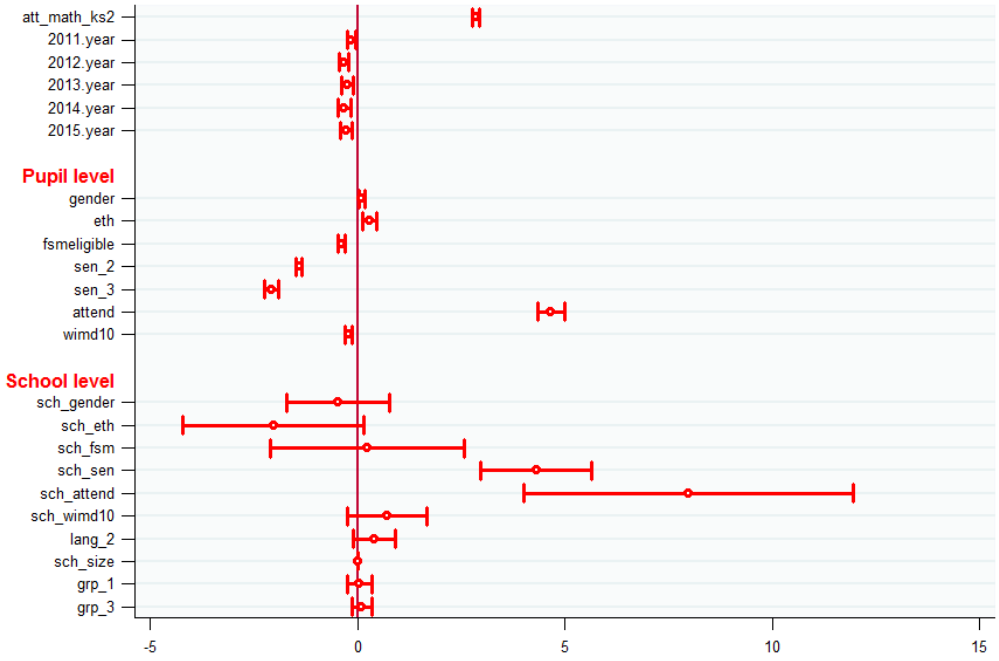


Source: SQW

Attainment in Maths

3.22 Figure 3-5 presents the multilevel model results for attainment in Maths at KS3. The picture is broadly consistent with the patterns observed for KS3 English.

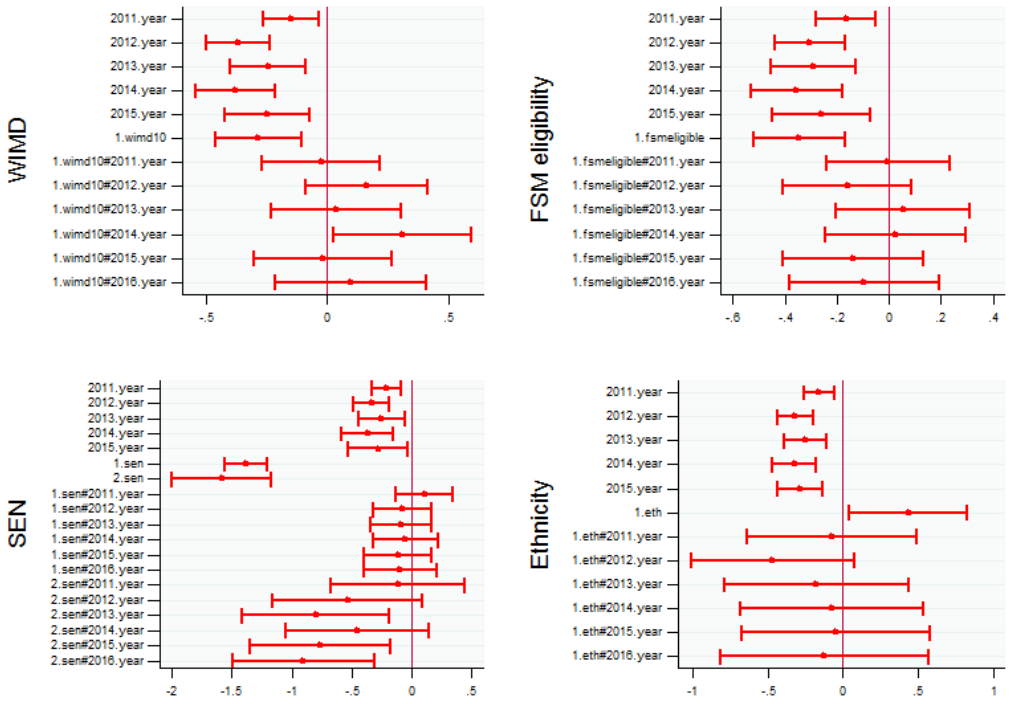
Figure 3-5: Baseline model for KS3 Maths



Source: SQW

3.23 One feature of Figure 3-6 that stands out is the decreased likelihood of pupils with a Statement of SEN achieving the expected level in KS3 Maths. Following a brief (though not significant) recovery in 2013/2014, these have deteriorated. For all other interaction effects the results appear to be mixed and very few of the coefficients are statistically significant.

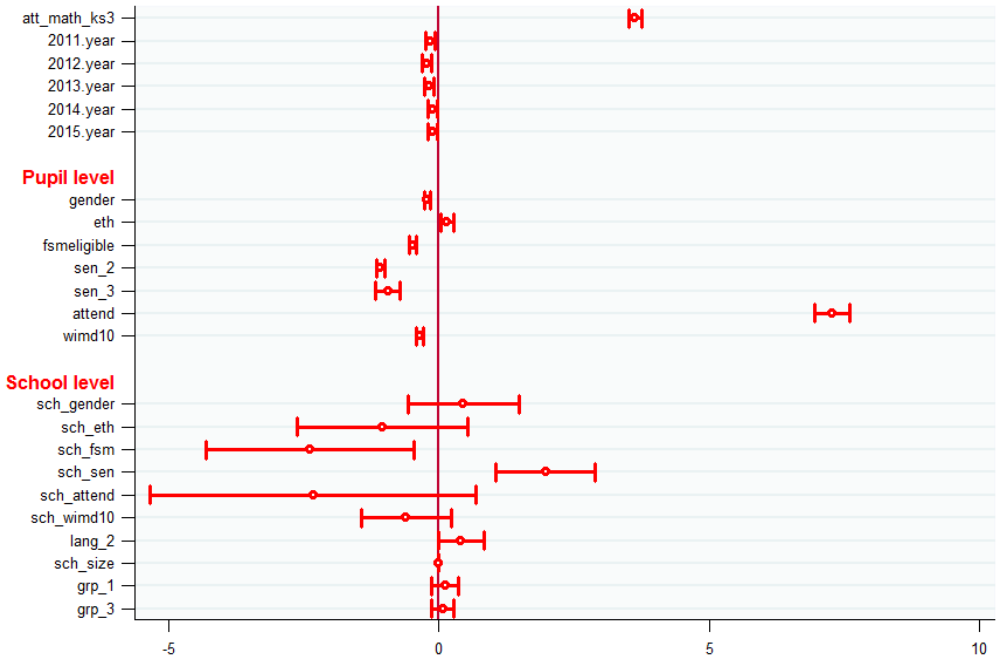
Figure 3-6: A focus on interaction effects for KS3 Maths



Source: SQW

3.24 Unlike the finding in the models for English or for KS3 Maths, boys had a greater chance of achieving the expected level in KS4 Maths. As shown in Figure 3-7, it is also clear than prior attainment matters for individual pupil's attainment in KS4 Maths, as does the pupil's own attendance rate. Consistent with the preceding models, being eligible for FSM or having SEN is associated with a lower likelihood of attaining the expected level. At the school-level, two variables are statistically significant. Pupils in schools with a higher proportion of FSM eligible pupils are less likely to achieve the expected level in KS3 Maths, while being in a school with a higher proportion of SEN status pupils is positively associated with the same outcome.

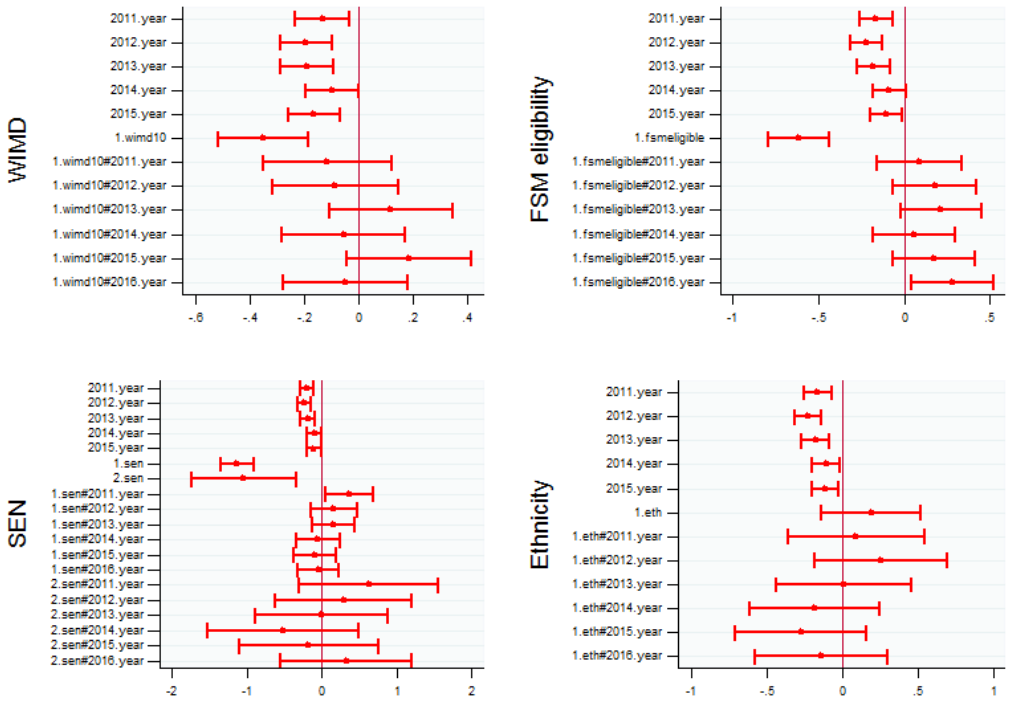
Figure 3-7: Baseline model for KS4 Maths



Source: SQW

3.25 In terms of interaction effects, Figure 3-8 provides a mixed picture across the variables of interest. There are encouraging signs for FSM eligible pupils and for SEN Statemented pupils, with coefficients moving in a more positive direction in recent years. However, only the former (for FSM pupils) is statistically significant, and only for 2015/2016. For the latter (SEN), this improvement is the opposite of the trend previously noted for KS3 Maths.

Figure 3-8: A focus on interaction effects for KS4 Maths

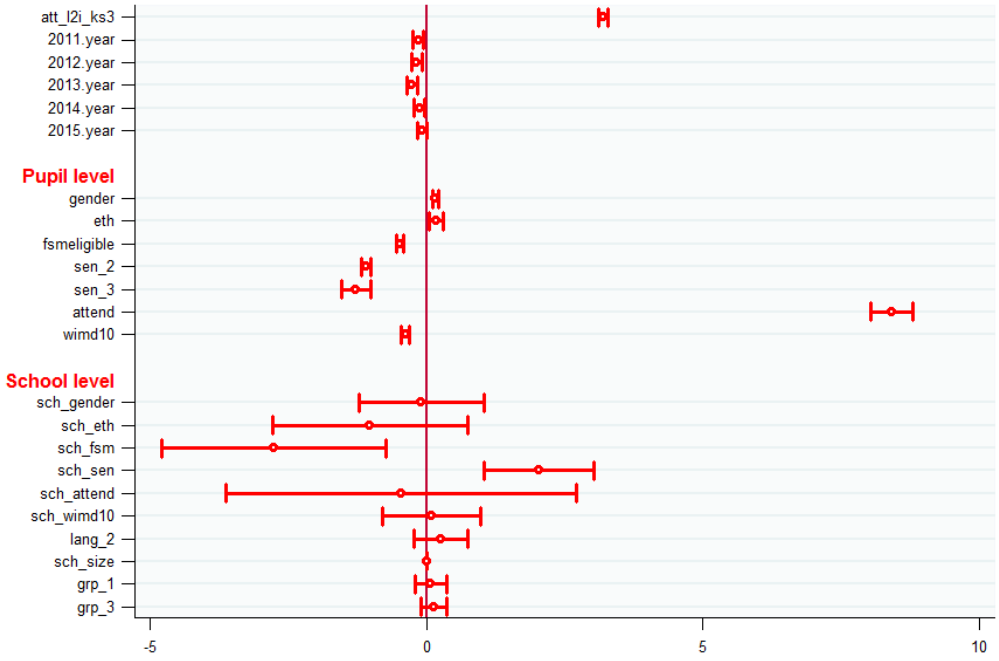


Source: SQW

Attainment in L2 inclusive (of English/Welsh and Maths)

3.26 As there is no equivalent measure of L2I (Level 2 inclusive) available at KS3, a composite variable is created to represent the best equivalent proxy with the data available. This variable simply indicates whether a pupil achieved the expected level in both English and Maths at KS3. As presented in Figure 3-9, this measure of prior attainment is clearly associated with KS4 L2I performance, as would be expected.

Figure 3-9: Baseline model for L2I



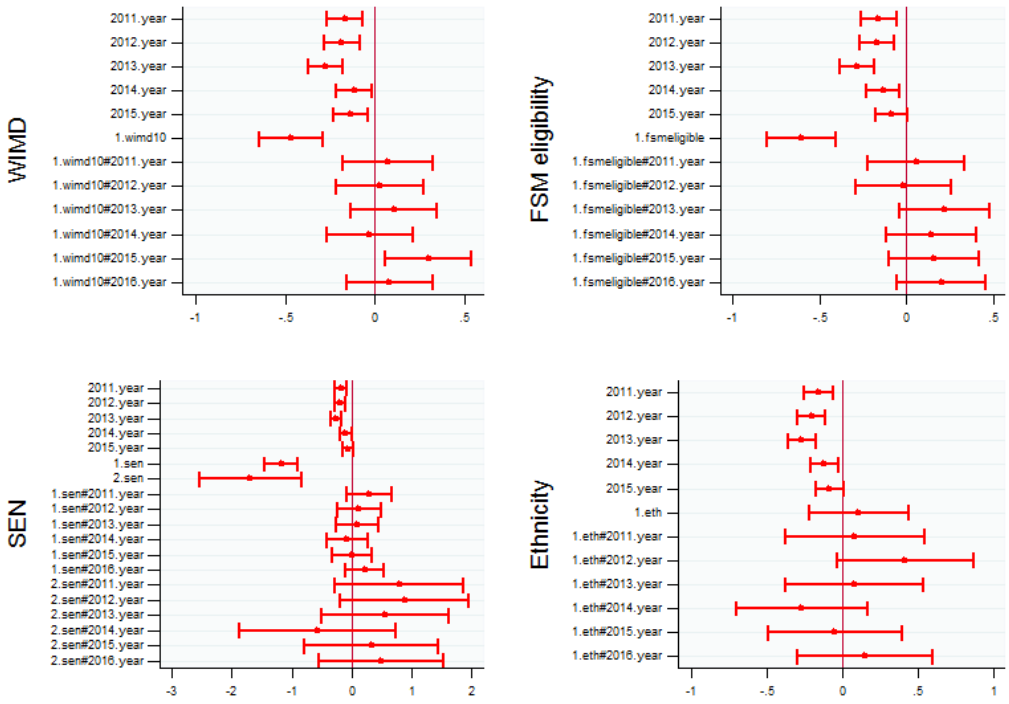
Source: SQW

3.27 In terms of pupil-level characteristics, higher rates of attainment are associated with high rates of attendance, with being female, and with non-white pupils. Lower levels of attainment are associated with pupils eligible for FSM, those with SEN status, and pupils living in deprived areas.

3.28 At the school-level, pupils in schools with high proportions of FSM eligible pupils are associated with lower rates of L2I attainment, while pupils attending schools with higher proportions of SEN status pupils are associated with higher attainment.

3.29 The full set of interaction effects are presented in Figure 3-10. For each of the characteristics focussed upon, the patterns are mixed. While there are some indications that WIMD and FSM eligible pupils are improving over time (i.e. closing the gap relative to non-WIMD and FSM ineligible pupils, respectively), these trends are volatile and do not reach statistical significance.

Figure 3-10: A focus on interaction effects for L2I



Source: SQW

Attendance

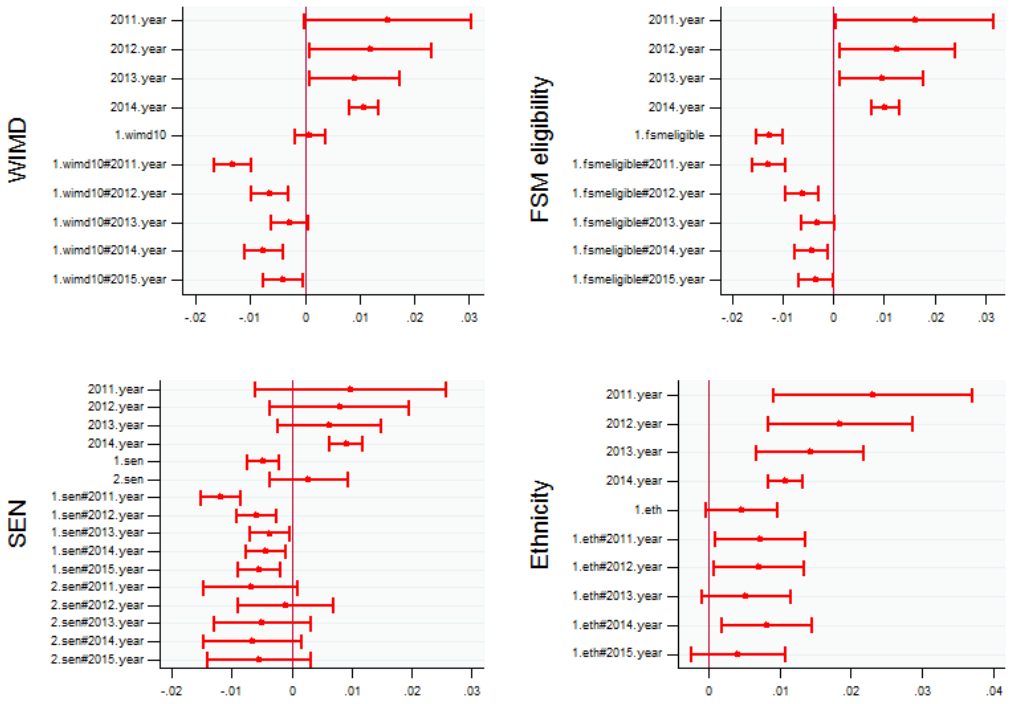
3.30 All the attendance models control for prior attendance in the previous year, but for presentational purposes this variable is omitted from the figures. Relative to the baseline year (2009/2010), pupil-level attendance has been higher in each subsequent year, but the rate of improvement has been declining. In terms of pupil-level characteristics, being female is associated with lower rates of attendance, as is being eligible for FSM, living in a deprived area, and having SEN (although only Action [Plus] status pupils) (see Figure 3-11). Non-white pupils are associated with higher rates of attendance. At the school level, the patterns are consistent with the preceding analysis. Schools in which there are high proportions of FSM eligible pupils are negatively associated with good attendance, while schools with a high proportion of SEN status pupils are positively associated with good attendance.

Figure 3-11: Baseline model for attendance rates

Source: SQW

3.31 The interaction effects, as presented in Figure 3-12, suggest that for FSM eligible pupils, as well as those living in the 10% most deprived regions, the difference with respect to non-FSM and non-WIMD10 pupils, respectively, has been decreasing over time. In terms of the attendance of SEN status and non-white pupils, the patterns are much more mixed.

Figure 3-12: A focus on interaction effects for attendance rates

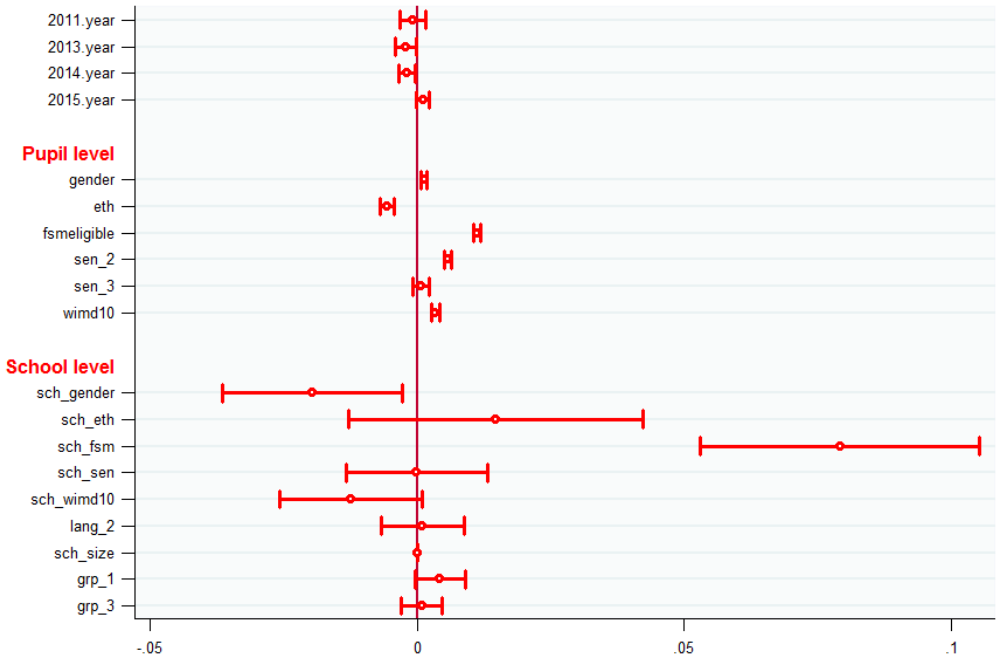


Source: SQW

Unauthorised absence

3.32 Figure 3-13 shows that high levels of unauthorised absence are associated with pupils who are eligible for FSM, those with SEN status (both Statement and Action [Plus]), and those living in a deprived area, At the school-level, pupils in schools with high proportions of FSM eligible pupils have significantly higher levels of unauthorised attendance. The only factor associated with lower rates of unauthorised absence is being from a minority ethnic or non-white group of pupils.

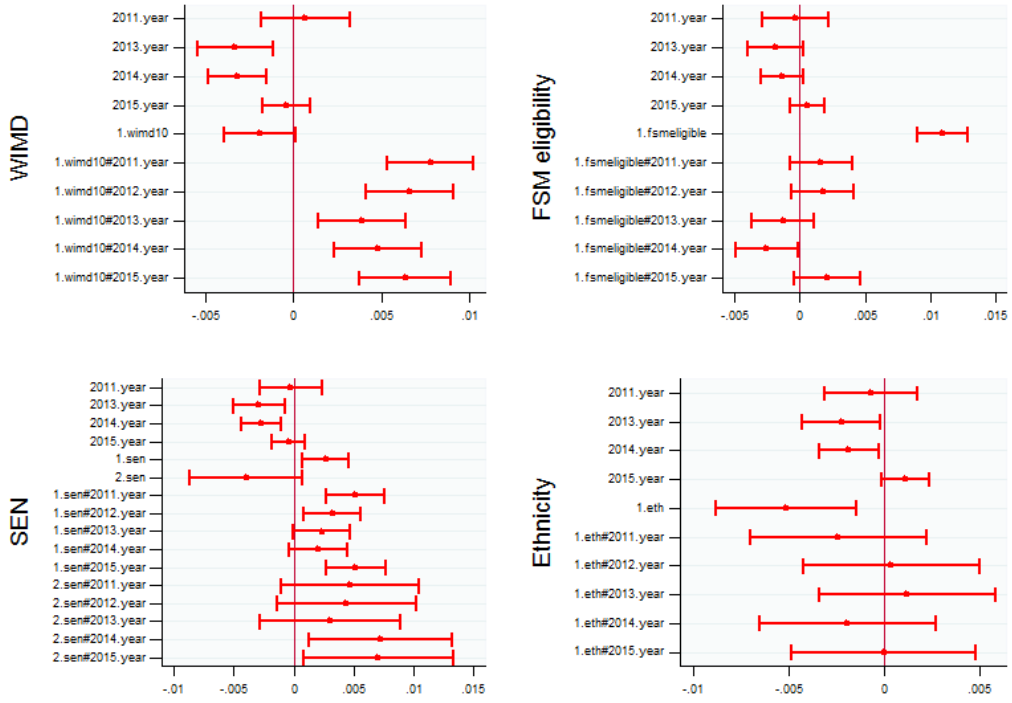
Figure 3-13: Baseline model for unauthorised absence rates



Source: SQW

3.33 In terms of interactions effects, Figure 3-14 shows mixed patterns for FSM eligible and non-white pupils over time. For pupils with SEN status, there is some evidence of increasing rates of absence for both Statemented and Action (Plus) pupils and similar evidence for pupils living in deprived areas.

Figure 3-14: A focus on interaction effects for unauthorised absence rates



Source: SQW

4. Assessing the performance of P2S schools

4.1 The principal challenge to overcome in assessing the performance of P2S schools is establishing a valid counterfactual scenario against which to judge their performance. Due to the nature of the intervention, as well as the mix of additional interventions taking place across schools, it was not possible to select a set of comparison schools against which to make comparisons or to test for differences using econometric methods. Accordingly, the approach adopted was experimental, creating a counterfactual scenario by analysing the trajectory of PtS schools prior to the onset of the SCC intervention and then using an econometric methodology to forecast the performance of these schools over subsequent years. We take these predictions and compare them to the reported results for each of the PtS schools. Various forecasting methods were trialled as part of this process, from straightforward linear trends of historic data, to conditional forecasting models that factor in the nature and characteristics (including past performance) of the cohort of pupils in each school in each forecasted year.

4.2 From a technical standpoint, the forecasting models and analyses were conducted in Stata using a combination of the commands “xtreg” and “forecast”. Together, these commands enable the development of models to describe the performance of PtS schools prior to the introduction of SCC in 2014/15, and then use this information to predict future values of the various outcomes (attainment, attendance, unauthorised absence).

4.3 As seen in the earlier analysis, trends in each of the outcome measures are volatile. On top of this, the relatively small sample size (39 schools) and a limited range of data available on pupil characteristics (that which is in the NPD), means that the results presented should be treated with caution, with attention paid to the confidence intervals that surround the estimates. In light of these issues, and to provide the best possible indication of trends in PtS school outcomes, four variations of the forecasting model are presented, as set out in Table 4-1.

Table 4-1: Forecasting models

Model	Description
Model 1 (unconditional)	A simple model that incorporates a time trend using 5 years of data (2009/10-2013/14).
Model 2 (simple conditional)	A baseline forecast model that incorporates a time trend, incorporating the prior attainment of each pupil-cohort and Welsh average attainment trajectory, using 5 years of data (2009/10-2013/14)*
Model 3 (extended conditional)	Similar to Model 2, but additionally incorporating some pupil-cohort characteristics (including gender balance, proportion of SEN pupils, and proportion of pupils living in deprived areas [lowest 10% WIMD ranked LSOAs]), using 5 years of data (2009/10-2013/14).
Model 4 (extended conditional, short time-period)	As Forecast **Model 3**, but using only 3 years of data (2011/12-2013/14).

Source: SQW; *for KS3 outcomes, the maximum time-period is 4 years due to the lack of availability to the team of historic KS2 data for pupils completing KS3 in 2009/10.

4.4 The first step of the forecasting process was to specify the underlying model from which to generate forecasts. This was conducted across two time-periods, from 2009/2010 to 2013/2014 (five years of data, four years for KS3 outcomes[8]) and from 2011/2012 to 2013/2014 (three years of data). As some outcomes are particularly volatile over time, this approach was adopted in order to understand how sensitive the models would be to this volatility, and to shed some light on the most appropriate time-horizon over which to forecast school performance, where possible. The remainder of this section proceeds with analysis and discussion of the preferred specification (**Model 3 – extended conditional**), unless otherwise stated. This model was preferred as it generally provided the best model fit across all outcome variables (see Table 4-2), suggesting that a longer time-horizon was (marginally) preferred for making forecasts, most likely because it was better at smoothing the volatility inherent in the data. Full model outputs are presented in the technical annex (presented in Table A-1 to Table A-4).

4.5 Focussing on the **Model 3** specification, the results show that the model fit varied across the outcome measures, ranging from 0.129 for KS4 English to 0.643 for KS3 Maths. It is interesting to note that the model for predicting KS3 outcomes in English and Maths outperforms the KS4 outcomes in terms of the goodness of fit of the model, suggesting that KS2 outcomes are a better predictor of KS3 outcomes, than KS3 outcomes are for KS4 outcomes. This is perhaps not surprising given that KS2 and KS3 are assessed on a similar

[8] Due to the lack of availability of historic KS2 data for pupils completing KS3 in 2009/10, the maximum data period is from 2010/11 – 2013/14.

basis (teacher assessment), than KS3 and KS4 (the latter being an independently assessed measure of performance).

Table 4-2: R-squared values for each type of model specification and outcomes variable

Model	KS3 English	KS4 English	KS3 Maths	KS4 Maths	L2I	Attendance	Unauthorised absence
Model 1	0.653	0.018	0.619	0.155	0.190	0.484	0.022
Model 2	0.648	0.096	0.625	0.239	0.342	0.620	0.286
Model 3	0.660	0.129	0.643	0.272	0.358	0.646	0.298
Model 4	0.607	0.195	0.629	0.227	0.397	0.635	0.170

Source: SQW

4.6 The results indicate that prior performance is a highly significant predictor of each outcome measure, and determines a considerable proportion of the model fit in each. It is also clear from the results that the average achievement across Wales is important, essentially acting as a proxy-control (particularly in terms of the attainment outcomes) for the general trend towards increasing performance over time.

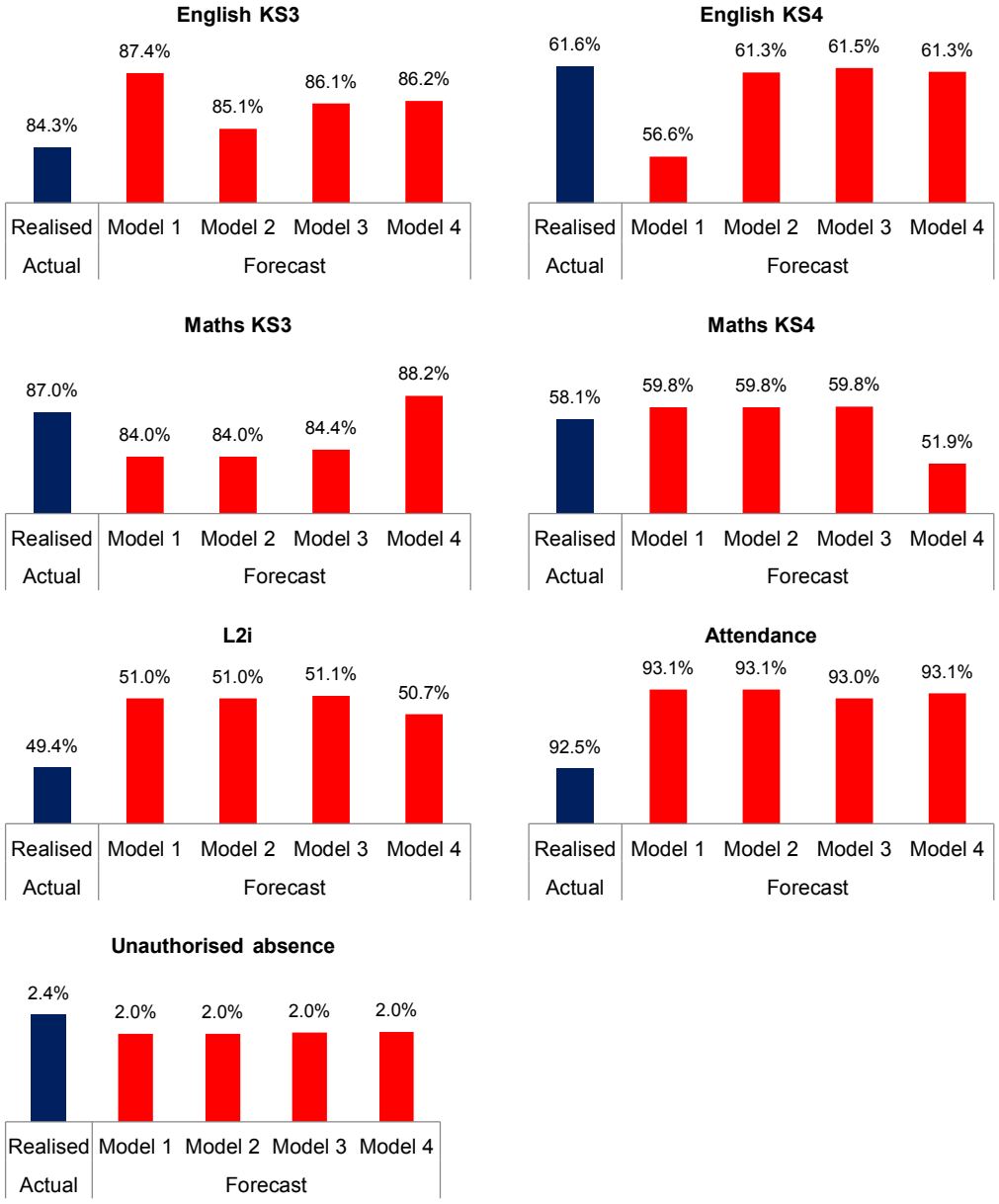
4.7 In terms of the added explanatory variables, WIMD and SEN, they feature as statistically significant in four of the seven outcomes models. The direction of influence, however, was not consistent across the outcomes. For example, higher proportions of WIMD pupils are positively associated with KS3 English performance, but significant and negatively associated with KS4 Maths (and very close to being significant and negatively associated with KS4 English at the 10% level). For KS3 Maths and Attendance, there is a positive association between higher proportions of SEN status pupils and these outcomes. More generally, the inclusion of these additional contextual variables adds modestly to the model fit (between 1-3% increase in the goodness of fit for each outcome – see Annex A).

4.8 The next step of the analysis is to take these underlying models as the foundation for making forecasts for the next two years of data (for the academic years 2014/2015 and 2015/2016). Under the preferred specification (Model 3), these forecasts are conditional upon several factors. In addition to the trends presented in each model for forecasted years, each school-level prediction is based upon the prior performance of the cohort (i.e. for KS4 Maths performance, the model controls for the KS3 performance of that cohort). It is also based on the cohort composition in terms of the proportion of pupils living in deprived areas (WIMD, 10% most deprived) and the proportion

of pupils with SEN. As described in more detail in the Annex, the tool used to make these forecasts is the “forecast” command in Stata, an in-built forecasting management tool. It is important to note that forecasts are made at the school-level, but using information from the full set of schools to make forecasts. For presentational purposes, we then aggregate the school-level forecasts into Groups. The Group variables do not enter into the model specifications in any way, and are only used as the basis for the post-estimation analysis.

4.9 Figure 4-1presents a comparison of the forecasts of each model specification for each outcome variable. Above all, the models show that small changes to the specification can alter the forecasts considerably. As illustrated in more detail in the annex, Model 3 is the preferred option, largely because the underlying specifications generally fit the data better.

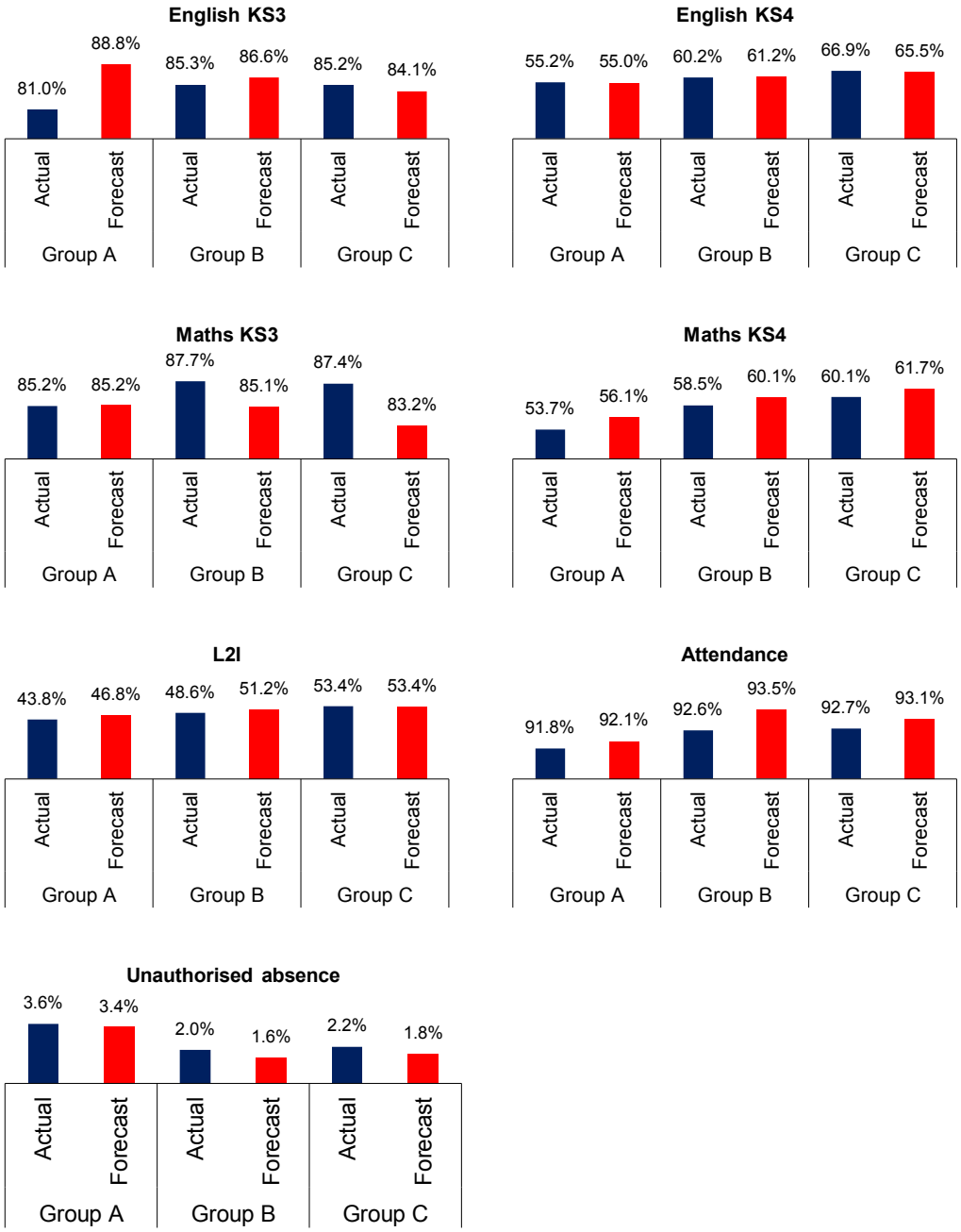
Figure 4-1: Comparison of model specifications for each outcome measure (figures are averages of 2014/15 and 2015/16 performance)



Source: SQW

4.10 As presented in Figure 4-2, there are patterns across the three school Groups, both in terms of the realised results and the forecast equivalents. For most outcomes, these patterns are consistent with each other. The two exceptions are KS3 English and Maths. It is notable that both of these differences refer to KS3 outcomes, which represent two models in which the underlying specification has the highest goodness of fit. This suggests that while there is a strong relationship between KS3 attainment and prior attainment at KS2, the role of the school has an important part to play in eventual attainment.

Figure 4-2: Comparison of realised outcomes and forecasts for each outcome measure (figures are averages of 2014/15 and 2015/16 performance), based on the preferred specification (Model 3)



Source: SQW

4.11 For the majority of outcomes, the Groups underperform against the forecasts, with a few exceptions (Group C in KS4 English and Maths, and all Groups in KS3 Maths). Group C are the highest performing schools in both realised and forecast results, and Group A is be the poorest performing. More detailed analysis on each outcome is provided below.

Attainment in English

4.12 Figure 4-3 and Figure 4-4 present the performance trajectory for the Groups (in red lines) against the Welsh average level of performance (blue line). For each Group the chart presents the actual realised values (solid lines) alongside forecast values (dashed lines).

4.13 Attainment outcomes for KS3 English are illustrated in Figure 4-3. The graph shows that only Group C schools exceeded their forecasts, with Group A schools performing well below the forecasted values. As highlighted in the previous section, the forecasting models for KS3 attainment tend to diverge considerably from the realised outcomes.

Figure 4-3: Actual and forecast performance of KS3 English by school Groups from 2009/10 to 2015/2016

Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

4.14 For KS4 English attainment, Figure 4-4 shows clear differences between the Groups, and relatively well-aligned forecasts in relation to realised results. Group A and C schools both exceeded their forecast performance and have converged with the Welsh average, while Group B have similarly made progress, albeit just below their forecasted level. It is also notable that both the forecasts and the realised results conform to the patterns expected for the three groups.

Figure 4-4: Actual and forecasted performance of KS4 English by school Groups from 2009/10 to 2015/2016

Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

Attainment in Maths

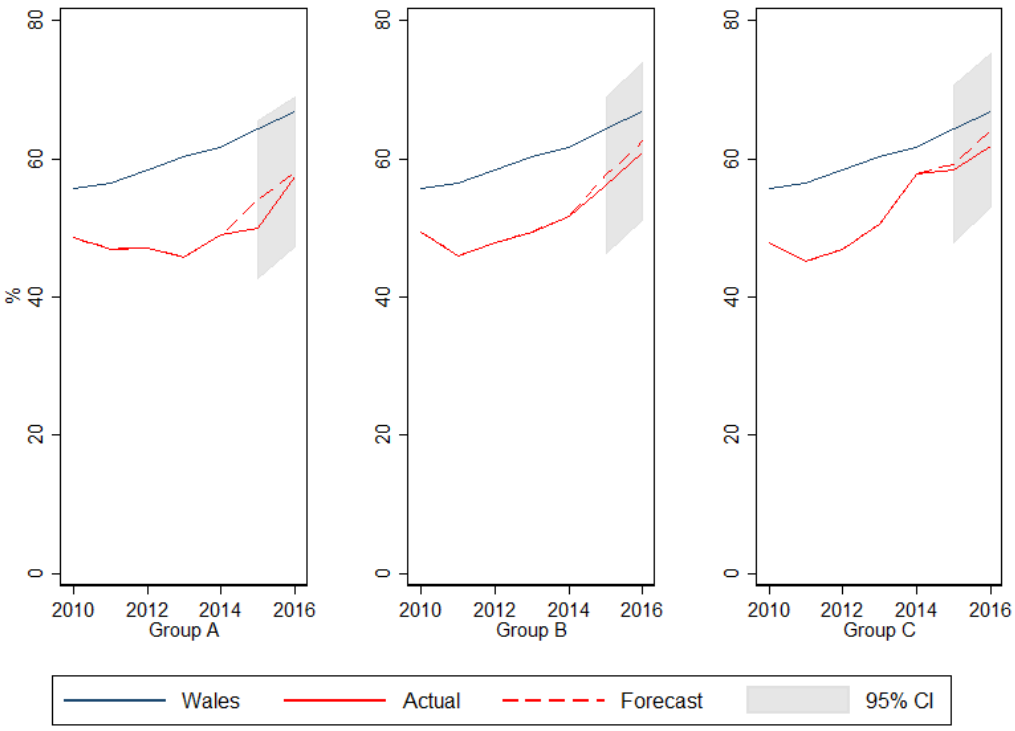
4.15 Turning to KS3 Maths attainment, Figure 4-5 presents a mixed picture, consistent with the challenge associated with forecasts at KS3. Forecasts for each group (based on the composition of the cohort) predicted strong performance decreases and divergence from the Welsh average, while in reality the PtS schools, on average, kept pace.

Figure 4-5: Actual and forecasted performance of KS3 Maths by school Groups from 2009/10 to 2015/2016

Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

4.16 The forecasts across the school Groups for KS4 Maths suggests that all would raise their performance and converge with the Welsh average at a relatively fast pace. As presented in Figure 4-6, while the school Groups did improve and converge with the Welsh average, none of the Groups did so at the forecasted rate.

Figure 4-6: Actual and forecasted performance of KS4 Maths by school Groups from 2009/10 to 2015/2016

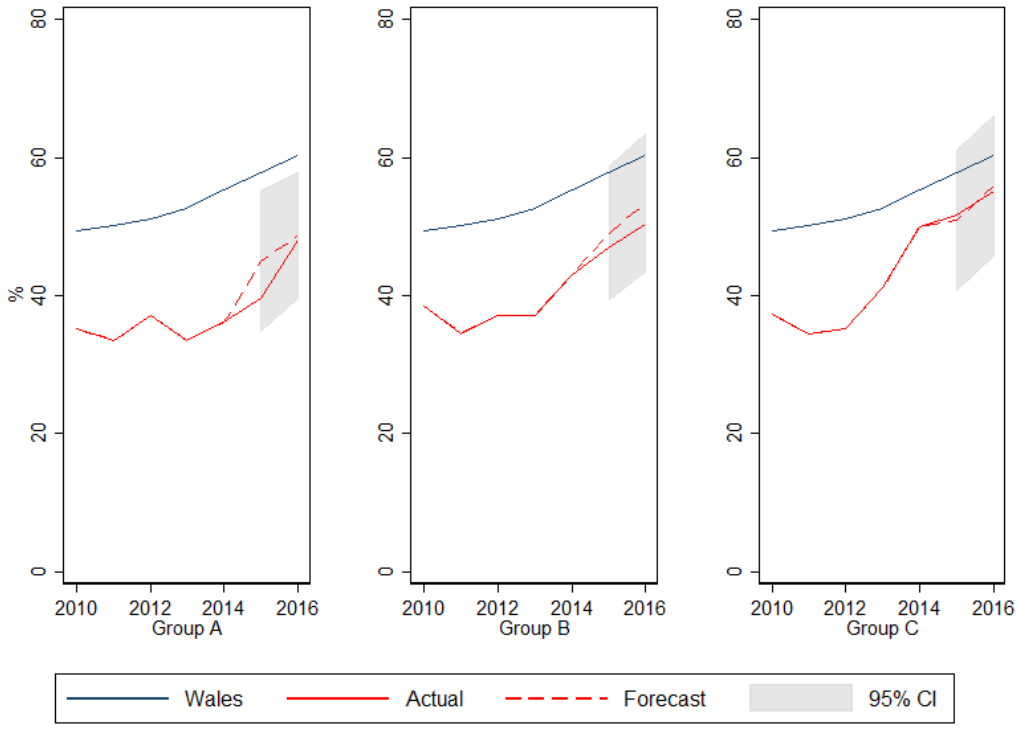


Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

Attainment in L2I

4.17 As for KS4 English and Maths attainment, the broader L2I measure of performance shows a link between actual and forecast results in the expected order across groups. As presented in Figure 4-7, none of the groups, on average, achieved their forecasted levels of attainment by the second year (although Group C schools did exceed their forecast in the first year).

Figure 4-7: Actual and forecasted performance of L2I by school Groups from 2009/10 to 2015/2016

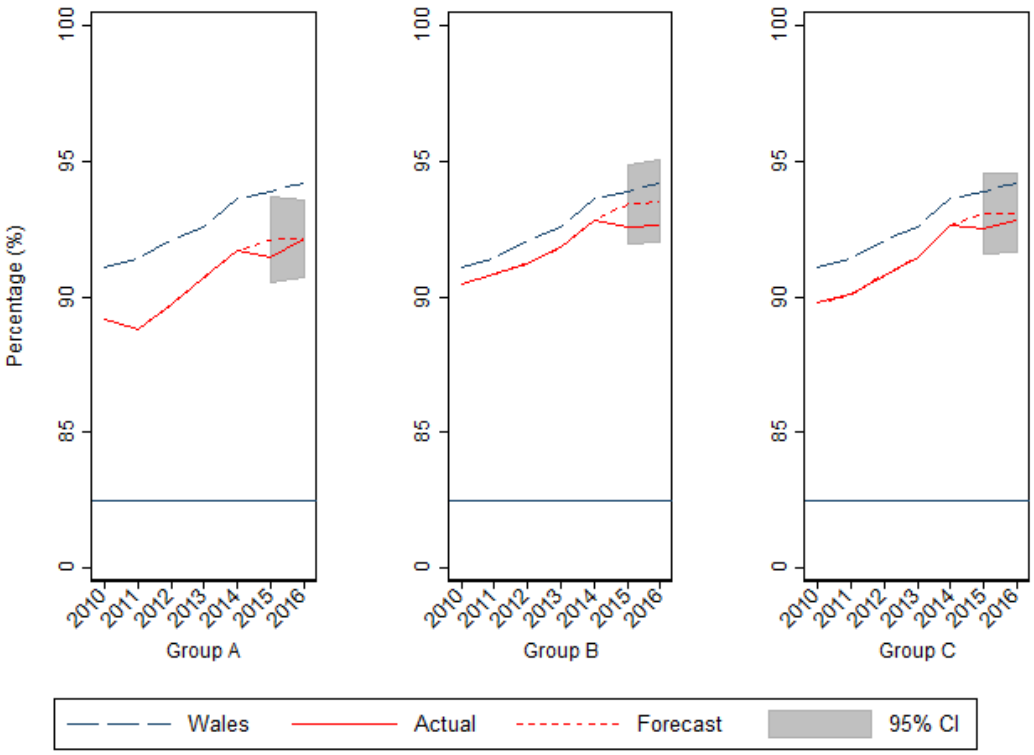


Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

Attendance

4.18 If we focus on realised performance, the data show that Group C schools outperformed Group B over the intervention period, while Group A closed the performance gap by a modest margin (see Figure 4-8). With respect to the Welsh average, the PtS schools, on average, saw attendance rates decline immediately after the intervention was implemented, with most recovering in the following year. In terms of the forecasting model, the prediction was that all schools would increase their attendance rates at a pace more or less consistent with the Welsh average. Comparing the realised and forecasted performance plots, it is only Group A schools that reached their forecast attendance levels by the 2nd year. They still, however, continue to lag behind Group B and Group C schools.

Figure 4-8: Actual and forecasted performance of attendance by school Groups from 2009/10 to 2015/2016



Source: SQW analysis of Stats Wales data. Solid lines represent actual outcomes, dashed lines represent forecasts. Note that the axis has been collapsed between zero and 80% to enable variations in the data to be seen.

Unauthorised absence

4.19 As illustrated in Figure 4-9, the forecasting model predicts that unauthorised absence rates would increase for all PtS schools and diverge from the Welsh average. Comparing this to the actual performance across school Groups and the evidence shows that Group A schools countered this predicted trend. Following a large increase in unauthorised absence rates after the introduction of SCC, they subsequently reduced them below the forecast level. Group B and C schools both had higher rates of unauthorised absence than forecast, however.

Figure 4-9: Actual and forecasted performance of unauthorised absence by school Groups from 2009/10 to 2015/2016

Source: SQW; solid lines represent actual outcomes, dashed lines represent forecasts.

Annex A: Technical annex

Table A-1: Full model outputs for each outcome variable for the period 2009/10-2013/14 for the preferred model specification (Model 1)

	KS3 English	KS4 English	KS3 Maths	KS4 Maths	L2I	Attendance	Unauthorised absence
	(2010/11-2013/14)	**(2009/10-2013/14)**	**(2010/11-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**
Year	0.0408***	0.00527	0.0322***	0.0150***	0.0157***	0.00502***	-0.000710
	(0.000)	(0.159)	(0.000)	(0.000)	(0.000)	(0.000)	(0.260)
Constant	-81.39***	-10.05	-64.06***	-29.66***	-31.26***	-9.195***	1.450
	(0.000)	(0.181)	(0.000)	(0.000)	(0.000)	(0.000)	(0.252)
N	227	225	227	225	225	228	228
R-squared	0.653	0.018	0.619	0.155	0.190	0.484	0.022

Source: SQW

Table A-2: Full model outputs for each outcome variable for the period 2009/10-2013/14 for the preferred model specification (Model 2)

	KS3 English	KS4 English	KS3 Maths	KS4 Maths	L2I	Attendance	Unauthorised absence
	(2010/11-2013/14)	**(2009/10-2013/14)**	**(2010/11-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**
Prior performance	0.387***	0.215***	0.215***	0.297***	0.272***	0.338***	0.525***
	(0.000)	(0.008)	(0.004)	(0.001)	(0.000)	(0.000)	(0.000)
Wales average	1.369	1.183**	3.699**	3.375***	2.698***	1.095***	0.108
	(0.463)	(0.019)	(0.026)	(0.005)	(0.000)	(0.000)	(0.941)
Year	-0.00706	-0.00833	-0.0722	-0.0462**	-0.0312***	-0.00166	-0.000396
	(0.910)	(0.151)	(0.113)	(0.015)	(0.003)	(0.199)	(0.747)
Constant	-0.616	-0.294	-1.964*	-1.422**	-0.990***	-0.395*	0.0109
	(0.583)	(0.298)	(0.066)	(0.013)	(0.001)	(0.054)	(0.704)
N	190	225	190	225	225	228	228
R-squared	0.648	0.096	0.625	0.239	0.342	0.620	0.286

Source: SQW

Table A-3: Full model outputs for each outcome variable for the period 2009/10-2013/14 for the preferred model specification (Model 3)

	KS3 English	KS4 English	KS3 Maths	KS4 Maths	L2I	Attendance	Unauthorised absence
	(2010/11-2013/14)	**(2009/10-2013/14)**	**(2010/11-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**
Prior performance	0.377***	0.197**	0.234***	0.313***	0.268***	0.297***	0.511***
	(0.000)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wales average	0.879	1.114**	3.134*	3.244***	2.650***	1.129***	0.284
	(0.667)	(0.027)	(0.061)	(0.005)	(0.000)	(0.000)	(0.849)
Year	0.00573	-0.00320	-0.0619	-0.0444**	-0.0298***	-0.00227	-0.000482
	(0.933)	(0.683)	(0.178)	(0.016)	(0.008)	(0.110)	(0.698)
Gender	0.0969	-0.0308	0.339	0.601	0.0905	0.105**	-0.0298
	(0.850)	(0.948)	(0.388)	(0.153)	(0.826)	(0.032)	(0.424)
WIMD	0.842*	-1.051	0.204	-0.803*	-0.682	-0.0806	0.0721
	(0.058)	(0.100)	(0.628)	(0.078)	(0.132)	(0.103)	(0.244)
SEN	0.157	-0.136	0.457*	0.223	0.115	0.0753***	0.00338
	(0.590)	(0.689)	(0.033)	(0.436)	(0.709)	(0.008)	(0.892)
Constant	-0.577	0.0233	-1.906*	-1.522**	-0.884**	-0.436**	0.00582
	(0.652)	(0.955)	(0.080)	(0.019)	(0.025)	(0.049)	(0.888)
N	190	225	190	225	225	228	228
R-squared	0.660	0.129	0.643	0.272	0.358	0.646	0.298

Source: SQW

Table A-4: Full model outputs for each outcome variable for the period 20011/13-2013/14 for the preferred model specification (Model 4)

	KS3 English	KS4 English	KS3 Maths	KS4 Maths	L2I	Attendance	Unauthorised absence
	(2010/11-2013/14)	**(2009/10-2013/14)**	**(2010/11-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**	**(2009/10-2013/14)**
Prior performance	0.272**	0.252**	0.122	0.260**	0.215**	0.0837	0.306***
	(0.011)	(0.020)	(0.192)	(0.019)	(0.011)	(0.287)	(0.008)
Wales average	0.942	0.636	1.106	-3.911	1.706*	0.907*	1.452
	(0.728)	(0.292)	(0.632)	(0.235)	(0.069)	(0.074)	(0.443)
Year	0.00609	0.00632	-0.000717	0.0847	-0.00469	0.000206	-0.000170
	(0.946)	(0.626)	(0.991)	(0.147)	(0.797)	(0.957)	(0.900)
Gender	-0.0577	1.569*	0.352	0.468	0.749	0.140	-0.0658
	(0.919)	(0.089)	(0.491)	(0.487)	(0.248)	(0.119)	(0.366)
WIMD	0.884*	-0.711	0.245	-0.682	-0.707	-0.00608	0.0249
	(0.050)	(0.459)	(0.604)	(0.402)	(0.286)	(0.946)	(0.781)
SEN	0.155	-0.440	0.563*	0.265	-0.0734	0.0758	0.00459
	(0.621)	(0.471)	(0.055)	(0.558)	(0.880)	(0.171)	(0.912)
Constant	-0.484	-0.534	-0.587	1.937	-0.782	-0.0875	0.0203
	(0.767)	(0.382)	(0.686)	(0.234)	(0.181)	(0.848)	(0.685)
N	152	151	152	151	151	152	152
R-squared	0.607	0.195	0.629	0.227	0.397	0.635	0.170

Source: SQW