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Effective Pre-School and Primary Education Project 3-11 (EPPE 3-11)

The Effectiveness of Primary Schools in England in Key Stage 2 for 2002, 2003 and 2004

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Contents

page

Executive summary	i-iii
Introduction	1
Methodology	3
Analysis and Instruments	4
Analysis Strategy	5
Results	6
Description of the sample	6
Comparing results of the four types of models	14
Key Stage 2 English	14
Key Stage 2 Mathematics	16
Key Stage 2 Science	16
Key Stage 2 Average Score	16
Results from expanded complex value added models	17
Main effects for prior attainment and pupil characteristics	26
Prior attainment	26
Pupil characteristics	27
Gender, Ethnicity and Ethnicity by Gender Interactions	29
Area of child residence	32
School composition	32
Interpretation of random effects in the final models	32
What does this mean for school effectiveness?	34
Comparison of school effectiveness across subjects	34
Stability of school effectiveness across years	35
Distribution of school level residuals (effectiveness)	35
Summary and Discussion	36
Appendix 1: Conversion Table: Key Stage 1 Point Scores	41
Appendix 2: The results of the four models for each subject for each year	42
Appendix 3: Expanded complex value added models without random effects	70
Appendix 4: Examples of histograms of school effectiveness scores	79
References	81

EXECUTIVE SUMMARY

This report covers children's progress during Key Stage 2 in all primary schools in England over a 3-year period (2002-2004). Value added multilevel models are used to investigate children's progress in Key Stage 2 by controlling for prior attainment, as well as several background influences. These analyses allow measurement of the extent to which children's progress can be attributed to the primary school attended. Primary schools where children make significantly greater progress than predicted (on the basis of prior attainment and intake characteristics) can be viewed as *more effective*, and schools where children make less progress than predicted can be viewed as *less effective*. The phrase effectiveness throughout this report refers to this measure of progress, not to any other characteristics or qualities of schools.

The analyses focus on progress, rather than attainment, in four areas; English, Mathematics, Science and average score. The value added models controlled for pupil background characteristics such as gender, ethnic group, English as an additional language, free school meal eligibility and special educational needs. Further development of the value added models measured the differential effects for boys and girls in different ethnic groups, as well as considering area effects. The child's postcode was used to relate the child's residence to the Index of Multiple Deprivation (IMD) and to variables derived from the 2001 Census. Further variables reflecting the composition of schools were also used in the analyses. From these analyses, it is possible to identify trends in effectiveness in terms of academic outcomes over the three successive years.

The analyses are designed to answer the question: *What affects pupils' progress over Key Stage 2 in primary school?* In analysing progress, the value added models include measures of a child's ability at the start of Key Stage 2, i.e. measures of their Key Stage 1 attainment as well as predictor variables that might explain progress. The consequences of this strategy are as follows:

- The inclusion of Key Stage 1 attainment in the value added models will absorb the effects of several child, parent, family, home and area factors, if their effects do not persist additively over the Key Stage 2 period. Hence the relative importance of these factors in measuring progress may appear substantially less than would be the case if Key Stage 1 scores are excluded in the models, i.e. attainment only is considered.
- Where children are not showing high levels of attainment in Key Stage 1 assessments, there is more scope for progress for such children. Hence such children may show bigger progress effects, without necessarily showing high attainment at the end of Key Stage 2.

In all the models developed, regardless of subject or year, the prior attainment of pupils is by far the greatest contributor to their performance in Key Stage 2 assessments. The powerful effect of prior attainment has consequences for the effect sizes to be attributed to other variables, such as pupil characteristics. As Key Stage 1 attainment will absorb much of the effects of other variables upon school attainment, the effects of other variables is likely to be substantially less than if the models focussed on the contribution of other variables in predicting *attainment* at Key Stage 2 rather than *progress* across Key Stage 2. In this report the effects for other variables can be regarded as effects on progress across the Key Stage 2 period.

With regard to other pupil characteristics, pupils who are younger in their school year consistently show better progress, across subjects and years, and the effect sizes

indicate that this is substantial. However, this does not mean that younger pupils are showing higher attainment at the end of Key Stage 2. They are starting from a substantially lower attainment and are showing better progress, but still have lower Key Stage 2 attainment in all subjects. The younger pupils are therefore narrowing the gap with their older classmates.

Pupils' eligibility for free school meals can be regarded as a marker for family poverty. This marker consistently predicts poorer progress in Key Stage 2 for all subjects across all years. However, these effects are not large, being slightly less for Mathematics than for the other subjects. Pupils eligible for free school meals are attaining lower Key Stage 2 attainment indicating that the gap related to poverty is widening.

Pupils for whom English is an additional language (EAL), show better progress than native English speakers for all areas except Science. This effect is small but consistent. As these pupils may well be starting from a lower base, and are not reaching higher attainment at Key Stage 2, this finding reflects a narrowing of the gap between EAL pupils and native speakers.

Where pupils have a special educational need (SEN) they show substantially less progress across all subjects in all years. The effect is greater for English and the average score, but is substantial for all subjects. This indicates that the gap between SEN pupils and non-SEN pupils is widening.

When Key Stage 2 attainment is considered, there are consistent gender effects. Girls attain better in English for all ethnic groups, while boys attain better in Mathematics, except for the two Black ethnic groups where girls are equal or better than boys. In Science there is no clear pattern of gender difference in attainment.

When Key Stage 2 progress is considered, there are consistent gender effects, but also ethnicity by gender interaction effects that need to be considered. For example, for White British and Irish (WBI) pupils, girls show more progress in English, whereas in Mathematics and Science, and consequently in the 3-subject average, boys show more progress. For some ethnic groups (Bangladeshi, Chinese, "other" and "Unknown") gender effects are similar to the WBI group. For the remaining ethnic groups there is some consistent gender by ethnic group interaction in one or more subjects, and these are discussed in detail in the results and discussion. Gender by ethnicity interactions mean that the relative difference between any pair of ethnic groups, e.g. between the WBI group and Black Caribbean or Pakistani will be different for boys than for girls.

Overall the results for ethnic group differences are compatible with data on attainment from DfES reports. Pupils of Chinese and Indian origin show high levels of attainment relative to the average. However, pupils of Black Caribbean, Pakistani and Bangladeshi origin do worse than the average. In terms of progress across the Key Stages, progress for Bangladeshi and Black African pupils is greater than the average across Key Stage 2 and across Key Stage 4. Pakistani pupils also show greater improvement across Key Stage 4. Pupils from Chinese, Indian and "other" ethnic backgrounds show greater improvement across each of the Key Stages. However, pupils from White, Black Caribbean and Black Other ethnic groups show less progress than the national average.

The results associated with the interactions between gender and ethnic background lead to qualifications being placed upon the differences in progress associated with ethnic group. Note that in all ethnic groups, Key Stage 2 attainment in English is better for girls

than boys, whereas attainment in Mathematics and Science is very similar. For some ethnic groups there are significant differences between the performance of girls and boys. DfES (2006) refers to girls consistently outperforming boys in all of the minority ethnic groups over Key Stages 1 to 4. Currently this is true for GCSE overall attainment. The results reported here, which are for progress rather than attainment, partially confirm such a view but indicate that the nature of ethnic by gender interactions require a rather more nuanced approach. The effects associated with ethnic groups may also be changing as different cohorts of children work their way through school.

Different cultural norms for gender may partly explain the differential gender effects for some ethnic groups. Black ethnic groups show fairly consistent better progress by girls, Indian girls show better progress for Science, yet Pakistani boys show better progress for Mathematics. Gender differences may well vary by social class groups. Also the effects of poverty and social class may vary by ethnic group. Further investigation may shed further light on these issues.

There are consistent small effects associated with the area in which a pupil resides, which reflect the effects of level of deprivation. Primary schools typically have distinct catchment areas, and hence school composition effects may reflect the effect of area deprivation. Further research on area effects may be fruitful e.g. in considering the component domains of the Index of Multiple Deprivation; i.e. income, employment, health, education, housing, environment and crime rather than just overall deprivation. Also commercially derived descriptions of area types that include cultural as well as economic aspects of communities may provide a perspective on area influences rather different from deprivation-based measures. The data and technology are now available to investigate the possible impact of Area-Based Initiatives, e.g. Education Action Zones and New Deal for Communities, individually or in concert, upon school effectiveness.

The analysis of school level measures of effectiveness across subjects and across years indicates some consistency and stability but also that there is considerable variation and change amongst schools in their degree of effectiveness across subjects and across years. In particular, measures involving English seem open to most variation and instability, and measures of school effects upon Mathematics are most stable.

The analysis of random effects indicates that there are marked differences in the amount of progress that schools produce dependent upon the level of initial ability of pupils. School differences for progress that is dependent upon the initial level of ability of a pupil can be termed differential effectiveness. The level of differential effectiveness is markedly different for different primary schools. This phenomenon has been described for secondary schools but not in the literature on primary schools. In this sense the description of differential effectiveness for primary schools is a first for this report. The consequences of differential effectiveness are that while all children benefit from being in an effective primary school rather than an ineffective one (in terms of contextualised pupil progress), the consequences are considerably greater for low ability children than for high ability children.

The analysis of differential effectiveness for primary schools strongly suggests, but does not prove, that a major differentiating feature between effective and ineffective schools (in terms of contextualised pupil progress) resides in their degree of success with low ability children in particular. In a perfect world with perfectly effective primary schools, initial differences in pupil ability would be overcome by the end of primary school as far

as inherent pupil constitution and potential would allow, i.e. initial differences would “wash out”. The most effective schools are moving in this direction.

Introduction

The White Paper "Excellence in Schools" (DfEE, 1997) highlighted the need for better information about pupils to be available to support the drive to raise standards. Specifically pupil level information was needed to track individual pupil's progress and that this information then needed to be linked to data on pupil attributes, e.g. ethnicity, special needs, FSM eligibility etc, to contextualise the pattern of educational performance. The National Pupil Database implemented in 1999 included a unique pupil number (UPN) (DFEE, 2000) and all key stage results from the summer of 2000. The Pupil Level Annual Schools Census (PLASC) provides individual records (together with names and UPNs) for all pupils on the Census day. These records include details of ethnicity, first language, special education needs, FSM eligibility, post code, etc. Linking these databases provides a basis for the analysis of pupil progress as related to basic demographic attributes of pupils. Where this analysis is undertaken using multilevel modelling (Goldstein, 1987) for sufficient numbers of pupils within a school, then the school level residuals can be used as an indicator of the impact of attending a specific school having allowed for the characteristics of pupils attending that school (i.e. school effectiveness).

Such measures of school effectiveness need to be distinguished from DfES performance tables. The primary school performance tables in England for 2003 were intended to be value-added. However, most of the best-performing schools also had high raw-score attainment (and were in advantaged areas). Goldstein (2004) draws attention to the, "positive correlation between the value added and raw scores as probably due to misspecification of the statistical procedure being used". He notes that, "it is important to ensure that the adjustment for intake scores is adequate", but suggests that this is not the case. "The DfES assumption is that each school has just a single value added score that applies whatever the initial intake score happens to be. With this assumption it can be shown that you will in fact obtain the relationship seen" (a correlation between raw scores and value added ones). However research has shown that the, "assumption of a single value added score is untenable, and the observed relationship ... may just be a case of having improperly specified the statistical analysis".

Goldstein's critique starts from the premise that value added should be a comprehensive measure of school performance, which adjusts for all external factors that may have had an impact on performance – socio-economic factors as well as pupil prior attainment – and takes account of systematic deviations between value added scores measured over the full range of prior attainment. DfES say that the present value added measure is not intended to be such a measure – rather it is a relatively simple measure that adjusts raw examination scores for prior attainment only, as recommended in the 1997 report of the 'National Value Added Project' (Fitz-Gibbon, 1997). The DfES value added measure adopted met this criterion – it adjusted performance only for pupils' prior attainment, and not for other pupil or school characteristics, including socio-economic factors, that might impact on school performance. Thus it is a quite distinct value added measure that differs in important ways from the various value added measures recently developed in school effectiveness research. In this research it is recognised that using raw test or examination results to assess school performance does not take account of differences between schools in the talents and motivations of individual students, the nature of their families and communities (Sammons, 2006). Indeed it could be argued that, "Natural justice demands that schools are held accountable only for those things they can influence (for good or ill) and not for all the existing differences between their intakes" (Nuttall, 1990). Thus exploring the impact of pupil intake is crucial to any use of school performance figures to promote social inclusion and widen educational achievement.

The aim of this study (tier 1 within the EPPE 3-11 project) is to compare the effectiveness across Key Stage 2 of all primary schools in England. This study will provide effectiveness measures for the schools in the EPPE sample and allow the research team to place the schools that EPPE 3-11 children attend in the context of all other schools in England. These data would be used to enable comparison between the effectiveness and characteristics of schools in the EPPE 3-11 sample with schools as a whole. The effectiveness measures will be derived from the 2002, 2003 and 2004 Key Stage 2 results for English, Mathematics and Science. Factors known to

influence the Key Stage 2 results, pupils' prior achievement at Key Stage 1 and certain individual pupil characteristics, will be included in the analysis so that the measures of effectiveness reflect the schools' effectiveness rather than the composition of the school. The phrase effectiveness throughout this report refers to this measure of progress, not to any other characteristics or qualities of schools.

There is other work on school effectiveness undertaken by DfES/Ofsted (<http://www.standards.dfes.gov.uk/performance/1316367/CVAinPAT2005/?versi>) and the Fischer Family Trust (www.fischertrust.org) that produces school performance statistics based upon the value-added that schools achieve. Typically the models used are based on data from the National Pupil Database and the PLASC (now called School Census) database. The models explored in this report build upon that approach through further incorporation of area-level variables, the examination of gender by ethnicity interactions and the exploration of differential effectiveness for pupils for different levels of ability in primary schools through the examination of random effects in the multilevel models.

Methodology

A school effectiveness research design is used that enables the research team to investigate children's progress over Key Stage 2. Multilevel modelling is used to identify and explore primary school effects and the 'value added' by different primary schools.

In order to understand the relationship between an outcome and some predictor variables the traditional statistical method has been regression analysis (multiple linear regression or OLS [Ordinary Least Squares] regression). Social scientists dealing with difficult hierarchical data have traditionally utilised individual-level statistical tools such as regression, usually disaggregating group-level information to the individual level, so that all predictors are tied to the individual level of analysis. In applying regression to data on pupils within schools the error variance estimation is problematic, because some predictor variables will be measured at the individual pupil level (e.g. gender, ethnicity) and some will be measured at the school level (e.g. % of pupils eligible for free school meals, size of school). However pupils are nested within schools and hence there is a hierarchical structure to the data. Standard regression techniques have difficulty with such a hierarchical structure and treat all variables as measured at the individual level. With a hierarchical data structure, this leads to inaccurate error variance estimates, and this affects the estimation of the effects for predictor variables. This problem increases because, not only are pupils nested within schools, but schools are nested within Local Authorities (LAs) and LAs have their own descriptor variables. Potentially there is greater similarity between pupils within the same school, and also there may be similarity between schools within the same LA. Such correlation between pupil scores within a school (or between schools within a LA) means that the independence of measurement assumption of standard regression is violated, which results in lower standard errors of the estimates than would happen if nesting within data were acknowledged, and this results in errors in estimating level of significance. Additionally using standard regression assumes that the regression coefficients apply across all contexts. Such a notion may well be misleading in that predictor variables may vary in their effect, say between urban and rural schools.

Multilevel modelling (Goldstein, 1987) was invented to overcome such problems. It is a development of regression analysis, but takes account of the hierarchical structure within the data. Thus multilevel modelling produces more accurate predictions, and estimates of the differences between pupils, between schools, and between LAs. Goldstein (2003) provides a full description of multilevel modelling and its application to educational data.

Using such multilevel models (Paterson and Goldstein, 1991; Goldstein, 1995), which capitalise on the hierarchical structure of the data (i.e. pupils clustered within schools), measures of school effectiveness can be derived. Research in the school effectiveness field (Goldstein et al., 1992; Mortimore et al., 1994; DFEE, 1995; Strand, 2002; Tizard et al., 1988; Tymms et al., 1997) has shown that prior attainment is the most crucial information to control for in measuring school effects and is the strongest predictor of future attainment. Pupil background data is also important as a way of 'fine tuning' the value added scores (Sammons, 1999; Thomas and Mortimore, 1996). Furthermore, it has been demonstrated (Sammons et al., 1997) that schools may vary internally in their impact on different measures of child outcomes.

The focus of this study is in terms of the three KS2 outcomes for English, Mathematics and Science, and also the average score for these three subjects. Research indicates that schools are subject to considerable change both internally and externally, and therefore it is important to examine both the stability and instability in effects from one year to another (Gray et al., 1998). Hence a comparison of measures of effectiveness from one year to another is of interest. This report concerns three cohorts, children who take their KS2 national assessments in 2002, 2003, and 2004. Looking at the results for the primary schools over three separate years enables the stability of school effectiveness to be established school by school.

Analysis and Instruments

Value added multilevel models are used to investigate children's progress over their time in KS2 by controlling for a child's prior attainment, as well as a number of background influences. These analyses are used to establish the extent to which children's progress is associated with the primary school attended. The calculation of residuals (based on differences between children's expected and actual attainments at the end of KS2) for each school provides a value added indicator of each school's effectiveness in promoting progress in a given outcome. Primary schools where children make significantly greater progress than predicted on the basis of prior attainment and intake characteristics can be viewed as *more effective* (positive outliers in value added terms). Primary schools where children make less progress than predicted can be viewed as *less effective* (negative outliers in value added terms).

In the value added analyses of pupil's progress over KS2, pupil's KS2 national curriculum test scores in English, Mathematics and Science are used as outcomes. Prior attainment in English, Mathematics and Science is measured using KS1 national curriculum test scores. The conversion from KS1 levels to point scores is detailed in Appendix 1. Pupils' results from the two time points have been matched, using name, gender and date of birth. Using Pupil Level Annual Schools' Census (PLASC) data, the value added models are developed through controlling for pupil background characteristics such as gender, ethnic group, English as first or additional language, free school meals eligibility and SEN provision type. Yet further development of the value added models has been undertaken by adding further control variables reflecting the characteristics of the area in which the pupil resides. Trends in effectiveness in terms of academic outcomes can be identified over three successive years.

The Pupil Level Annual Schools' Census (PLASC) provides the following information:

At the pupil level:

- Unique Pupil Number (UPN)
- Gender
- Date of birth
- Date of admission to school
- Home postcode
- Ethnic group
- English as first language or not
- Free school meal eligibility
- SEN provision type
- Details of permanently excluded pupils.

These data are used to contextualise the pupils' progress from Key Stage 1 to Key Stage 2, and hence provide estimates of school effectiveness adjusted for pupil characteristics.

The child's postcode from PLASC was used to relate the child's area of residence to data from the 2004 Index of Multiple Deprivation (IMD) and the Index of Deprivation Applied to Children (IDAC) (Office of the Deputy Prime Minister, 2004), and the 2001 Census. The range of possible variables reflecting area characteristics is very large. The IMD and IDAC produce similar results and are highly associated, and the IMD was chosen for use here as it had slightly more consistent effects. For the purposes of this report the following variables were extracted for use in analyses as descriptors of the area in which the child resides:

Overall Index of Multiple Deprivation (IMD)

% of adults (16-74 years) with no qualifications

% of households headed by a lone parent

% of households that are owner-occupier

% of adults (16-74 years) in managerial jobs

% of adults (16-74 years) in intermediate jobs

% of adults (16-74 years) in lower supervisory & technical jobs

% of adults (16-74 years) in routine jobs

% of adults (16-74 years) never worked & long-term unemployed

Also the PLASC data were used to extract two variables of school composition. These were

% of children in the school eligible for free school meals (FSM)

% of children in the school that have special educational needs (SEN).

Analysis Strategy

For each of the years 2002, 2003 and 2004, in order to estimate the measures of school effectiveness, four Key Stage 2 examination scores (English, Mathematics, Science and average score) were individually analysed using multilevel linear models (Goldstein, 2003; Lindsey, 1999; Snijders & Bosker; 1999). These models take into account the hierarchical structure of the data, with the pupils clustered within schools, and the schools clustered within LAs. Within the multilevel modelling framework, it is possible to estimate measures of individual school effectiveness, after taking account of the lack of independence between pupils and schools, whilst allowing for the effects of covariates to be assessed and controlled for. Four types of model were fitted for each of the three subjects, as well as for the average of the three subjects:

- the null model with no explanatory variables;
- the simple value added model with variables of previous achievement as covariates;
- the complex value added model, which in addition to previous achievement also includes individual pupil characteristics;
- the expanded complex value added model, which goes beyond the complex value added model to include interaction terms reflecting gender by ethnic group interactions as well as descriptors of pupils' area of residence, and measures of school composition.

Thus for each of the years 2002, 2003 and 2004, four types of model have been fitted to four outcomes resulting in 16 models for each year, i.e. 48 models overall.

At Key Stage 1, pupils took examinations in Mathematics, English reading, comprehension and spelling and teachers assessed their pupils' ability in Science. The English Reading and comprehension scores have been used to create a new Reading score. If a pupil scored Level 3 or 4+ for the comprehension test then the pupil was assigned this level for the new Reading variable. If a pupil scored below Level 3 then the pupil retained their original English Reading level. The KS1 examination results were converted into points (see Appendix I) and included in the models as continuous variables. From the PLASC data there were several pupil level measures available: age at start of academic year (which was centred around the mean), gender (male as the baseline category), English not first language, entitled to free school meals, special educational needs (which includes pupils at Stage 1 or later) and ethnic group (with White British and Irish (WBI) as the baseline category).

The school effects have been estimated from the expanded complex value added models without random effects. As the variation in each model is partitioned between LAs, schools and pupils, the estimates of school effectiveness have been calculated by summing the LA and school effects. Standard deviations for the estimates of school effectiveness have also been calculated. These effects reflect the effectiveness of schools after taking into account the pupils' previous level of achievement and the pupils' characteristics and the structure of the data.

The multilevel models were fitted using MLwiN (Centre for Multilevel Modelling, University of Bristol, UK) further analyses were performed using the SAS program package (version 9.1, SAS Institute, Cary, NC).

Results

Description of Sample

For data to be analysed it was necessary to have Key Stage 1 results, Key Stage 2 results and PLASC data matched by pupil UPN. The number of LAs, schools and pupils for 2002, 2003 and 2004 for whom complete data were available is given in Table 1. The number of schools in the LAs ranged from 1 to 522 (median=70, IQR=70). The number of pupils in a school ranged from 1 to 240 (median=33, IQR=36).

Table 1: Number of LAs, Schools and Pupils with complete data by year

2002			2003			2004		
No. of LAs	No. of Schools	No. of Pupils	No. of LAs	No. of Schools	No. of Pupils	No. of LAs	No. of Schools	No. of Pupils
149	15317	548297	155	15846	560168	150	14765	538951

A summary of pupil characteristics for 2002, 2003 and 2004 is shown in Table 2.

Table 2 Summary of Pupil Characteristics

Pupil Characteristics	2002		2003		2004	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Age in months	126.2	3.52	125.5	3.49	126.1	3.51
	Number	%	Number	%	Number	%
Female	270049	49.3	274888	49.1	265483	49.3
English as an additional Language	41807	7.6	44892	8.0	45930	8.5
Free School Meal Eligibility	91479	16.7	91325	16.3	90935	16.9
SEN other*	119349	21.8	102102	18.2	99815	18.5
SEN statement	14684	2.7	15747	2.8	12268	2.3
Ethnic Group						
White British and Irish	471843	86.1	466946	83.4	447052	82.9
White other	10328	1.9	7956	1.4	8417	1.6
Mixed	346	0.1	14597	2.6	14919	2.8
Black Caribbean	7437	1.4	7279	1.3	7298	1.4
Black African / Black Other	9651	1.8	7822	1.4	8806	1.6
Indian	11703	2.1	11686	2.1	11490	2.1
Pakistani	12752	2.3	13580	2.4	14235	2.6
Bangladeshi	4577	0.8	4873	0.9	5131	1.0
Chinese	1518	0.3	1469	0.3	1531	0.3
Any Other ethnic origin	10495	1.9	5655	1.0	6105	1.1
Not known	7648	1.4	18305	3.3	13967	2.6

*Pupil considered to have special educational needs if at Stage 1 or further on the SEN Code of practice (1994).

The distributions of the Key Stage 2 marks for English, Mathematics, Science and average score for 2003 are shown in Figures 1-4. The data for Key Stage 2 marks for 2002, 2003 and 2004 are summarised in Table 3. The distributions show a negative skew, which is less marked for English and the average scores.

Figure 1: Histogram of the Key Stage 2 English Total Scores for 2003

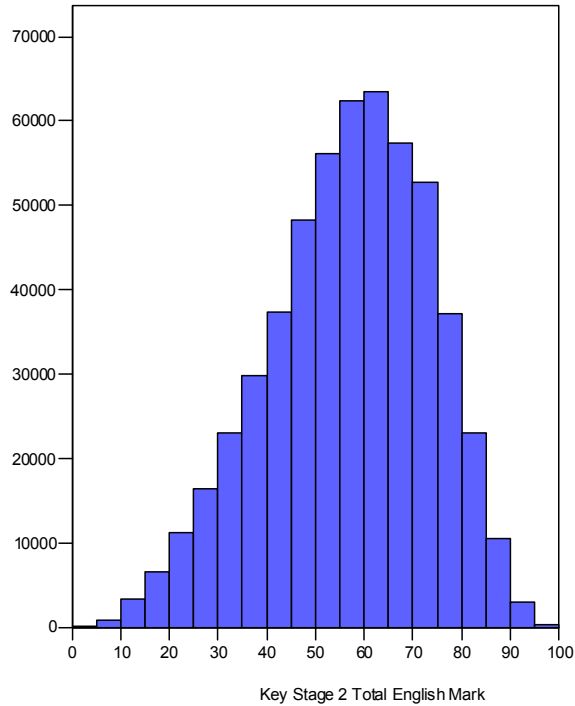


Figure 2: Histogram of the Key Stage 2 Mathematics Total Scores for 2003

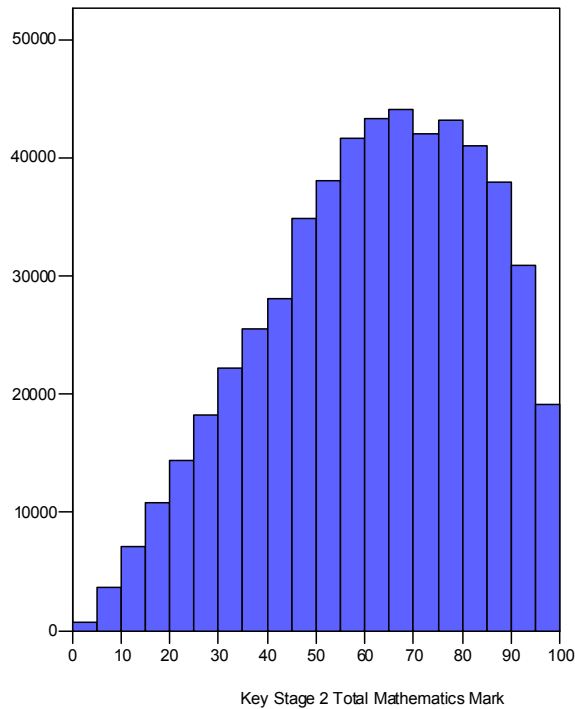


Figure 3: Histogram of the Key Stage 2 Science Total scores for 2003

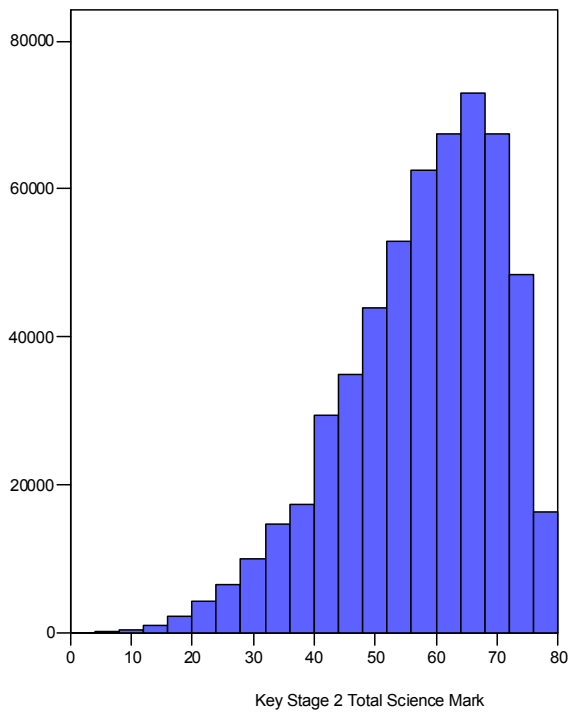


Figure 4: Histogram of the Average Key Stage 2 Scores for 2003

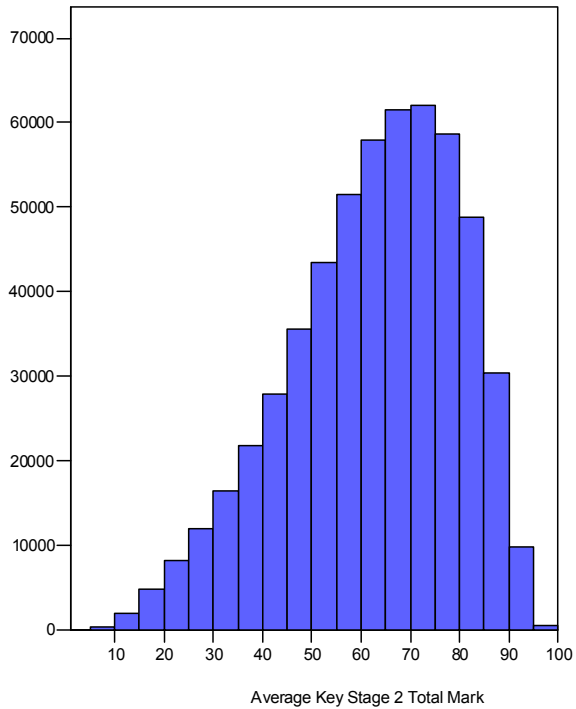


Table 3: Summary of Key Stage 2 total scores for each year

Year	Subject	Number of Pupils	Mean	Standard Deviation	Range	Not Awarded	
						Number	%
2002	English	533328	60.0	15.3	0-100	25081	4.6
	Mathematics	536875	63.3	20.5	0-100	22382	4.1
	Science	542159	57.5	12.9	2-80	7951	1.5
	Average score	542566	64.6	16.5	2.9-98.7	10105	1.8
2003	English	543919	56.3	16.6	0-100	28906	5.16
	Mathematics	547351	60.8	22.0	0-100	26265	4.69
	Science	553033	57.2	12.9	1-80	9004	1.61
	Average score	553506	62.4	17.2	1.8-99.3	11895	2.12
2004	English	523963	53.8	15.2	0-100	24966	4.6
	Mathematics	527401	64.7	21.8	0-100	21683	4.0
	Science	533469	55.8	12.9	0-80	7914	1.5
	Average score	533976	62.2	16.7	2.4-98.1	8965	1.7

Table 4 shows the KS2 scores broken down by pupil characteristics. The standard deviation is similar for boys and girls and all pupils, so only the mean is shown. In English, overall and in all categories (except SEN) girls outperform boys in KS2 attainment in all years. In Mathematics boys tend to perform better than girls on average and in all categories, with the exception of a couple of ethnic groups (black Caribbean girls are comparable to boys in 2003 and perform better in 2002 and 2004; black African and black other girls perform better in 2004) but differences are small. In Science, the gender differences are not so consistent and also tend to be quite small. Overall and in all categories except ethnicity, boys performed slightly better than girls in 2002 and 2004. In 2002, black Caribbean, black African and black other, Chinese and any other ethnic origin girls performed slightly better. While in 2004, girls with mixed, black Caribbean, Black African and black other ethnicity performed better, and Pakistani girls were comparable to the boys. In 2003, girls tend to perform better, or are comparable to the boys in nearly all categories, with the exception of SEN.

Table 4a: Key Stage 2 English total scores broken down by pupil characteristics

Characteristic		2002				2003				2004			
		Boys	Girls	All		Boys	Girls	All		Boys	Girls	All	
		Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)
Age	< 122 months	55.6	59.5	57.6	(15.3)	51.0	56.4	53.7	(16.5)	48.9	53.9	51.4	(15.0)
	122 – 130 months	57.9	61.9	59.9	(15.3)	53.6	59.0	56.3	(16.6)	51.0	56.3	53.6	(15.1)
	> 130 months	60.5	64.7	62.6	(15.1)	56.4	61.8	59.0	(16.5)	53.8	59.1	56.4	(15.2)
Gender		58.0	62.1	60.0	(15.3)	53.6	59.1	56.3	(16.6)	51.2	56.4	53.8	(15.2)
English as an additional Language	Yes	55.5	59.2	57.3	(15.1)	51.5	56.4	53.9	(16.4)	49.4	54.5	51.9	(14.8)
	No	58.2	62.3	60.3	(15.3)	53.8	59.3	56.5	(16.6)	51.4	56.6	54.0	(15.2)
Free School Meal Eligibility	Yes	50.0	53.8	51.9	(15.4)	45.2	50.1	47.7	(16.7)	43.7	48.8	46.3	(15.0)
	No	59.6	63.7	61.6	(14.8)	55.2	60.7	57.9	(16.1)	52.6	57.9	55.3	(14.8)
SEN	No	63.3	65.5	64.5	(12.7)	58.6	62.2	60.5	(14.1)	55.6	59.2	57.5	(13.1)
	SEN other*	45.2	45.2	45.2	(13.5)	38.6	39.0	38.7	(14.3)	37.6	38.7	38.0	(12.9)
	SEN statement	39.8	39.6	39.8	(16.9)	34.2	35.2	34.4	(17.5)	35.4	35.4	35.4	(15.9)
Ethnicity	White British and Irish	58.3	62.3	60.3	(15.3)	53.9	59.3	56.5	(16.6)	51.4	56.6	54.0	(15.2)
	White other	59.4	63.0	61.2	(15.6)	55.6	61.1	58.4	(16.9)	52.5	57.5	55.0	(15.6)
	Mixed	58.9	62.8	60.9	(14.3)	55.0	60.3	57.7	(16.5)	52.1	57.7	54.9	(14.9)
	Black Caribbean	53.5	58.9	56.3	(14.8)	50.2	56.6	53.4	(15.9)	47.0	54.3	50.7	(14.8)
	Black African & Black Other	55.6	60.0	57.8	(14.8)	52.7	58.4	55.6	(15.9)	49.4	55.8	52.7	(14.9)
	Indian	58.4	62.1	60.3	(14.3)	54.9	59.5	57.2	(15.5)	52.9	57.7	55.3	(13.8)
	Pakistani	52.1	55.3	53.7	(15.1)	47.5	52.4	49.9	(16.4)	46.3	51.5	48.9	(14.5)
	Bangladeshi	53.8	57.6	55.8	(14.3)	50.2	55.1	52.7	(15.8)	48.7	52.9	50.9	(14.4)
	Chinese	62.9	67.8	65.4	(14.5)	59.1	64.9	62.0	(15.6)	56.3	61.6	59.0	(15.3)
	Any other ethnic origin	58.5	62.9	60.7	(15.2)	54.1	59.2	56.6	(16.9)	50.9	56.1	53.5	(15.6)
	Ethnic origin unknown	58.1	62.0	60.0	(15.5)	51.5	57.7	54.5	(17.0)	49.6	55.4	52.4	(15.6)

*Pupil considered to have special educational needs if at Stage 1 or further on the SEN Code of practice (1994).

Table 4b: Key Stage 2 Mathematics total scores broken down by pupil characteristics

Characteristic		2002				2003				2004			
		Boys	Girls	All		Boys	Girls	All		Boys	Girls	All	
		Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)
Age	< 122 months	61.1	59.2	60.1	(20.8)	59.0	56.2	57.6	(22.0)	62.7	60.5	61.6	(22.0)
	122 – 130 months	63.9	62.2	63.1	(20.4)	62.3	59.3	60.8	(21.9)	65.6	63.5	64.6	(21.8)
	> 130 months	67.2	65.7	66.4	(19.9)	65.3	62.9	64.1	(21.6)	68.8	67.1	68.0	(21.3)
Gender		64.1	62.4	63.3	(20.5)	62.3	59.4	60.8	(22.0)	65.7	63.7	64.7	(21.8)
English as an additional Language	Yes	62.3	60.4	61.3	(21.2)	60.1	56.9	58.5	(22.7)	63.9	61.7	62.8	(22.4)
	No	64.2	62.6	63.4	(20.4)	62.4	59.6	61.1	(21.9)	65.9	63.9	64.9	(21.7)
Free School Meal Eligibility	Yes	54.4	52.6	53.5	(20.7)	51.9	48.8	50.4	(22.0)	55.6	53.4	54.5	(22.1)
	No	65.9	64.3	65.1	(19.9)	64.2	61.4	62.8	(21.4)	67.7	65.8	66.8	(21.1)
SEN	No	70.8	66.7	68.6	(17.4)	68.6	63.2	65.7	(19.4)	72.0	67.6	69.6	(19.0)
	SEN other*	48.5	41.5	45.9	(19.4)	43.9	35.3	40.9	(19.9)	47.3	39.1	44.4	(20.4)
	SEN statement	40.2	34.1	38.8	(21.9)	38.0	31.4	36.5	(22.6)	43.0	34.7	41.1	(23.0)
Ethnicity	White British and Irish	64.4	62.6	63.5	(20.4)	62.6	59.8	61.2	(21.8)	66.1	64.0	65.1	(21.7)
	White other	65.5	63.3	64.4	(20.7)	64.5	61.3	62.9	(22.1)	68.0	65.2	66.6	(22.1)
	Mixed	63.9	63.4	63.6	(20.0)	62.4	59.4	60.9	(22.2)	65.6	64.1	64.9	(21.8)
	Black Caribbean	56.4	56.9	56.7	(20.2)	53.5	53.5	53.5	(21.7)	56.5	58.3	57.4	(21.5)
	Black African & Black Other	59.9	59.4	59.6	(20.4)	57.5	56.8	57.1	(21.9)	60.5	61.6	61.1	(21.6)
	Indian	67.3	65.9	66.6	(19.8)	65.6	61.8	63.7	(21.7)	70.0	67.0	68.5	(20.8)
	Pakistani	57.4	54.5	56.0	(21.5)	54.8	51.2	53.1	(22.6)	58.5	55.9	57.2	(22.5)
	Bangladeshi	59.1	57.3	58.2	(20.7)	58.2	54.6	56.4	(22.0)	62.4	59.1	60.7	(22.1)
	Chinese	76.6	75.1	75.8	(17.6)	75.6	73.5	74.6	(19.4)	80.2	78.7	79.4	(18.9)
	Any other ethnic origin	65.0	63.9	64.5	(20.9)	64.1	61.2	62.7	(23.3)	67.8	65.6	66.7	(22.8)
	Ethnic origin unknown	63.7	61.5	62.6	(20.6)	59.6	57.1	58.4	(22.3)	63.5	61.7	62.6	(22.2)

*Pupil considered to have special educational needs if at Stage 1 or further on the SEN Code of practice (1994).

Table 4c: Key Stage 2 Science total scores broken down by pupil characteristics

Characteristic		2002				2003				2004			
		Boys	Girls	All		Boys	Girls	All		Boys	Girls	All	
		Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)
Age	< 122 months	56.0	55.3	55.7	(13.2)	55.3	55.4	55.4	(13.1)	54.4	53.9	54.1	(13.1)
	122 – 130 months	57.7	57.2	57.4	(12.9)	57.2	57.2	57.2	(12.9)	55.9	55.5	55.7	(12.9)
	> 130 months	59.6	59.2	59.4	(12.5)	58.9	59.1	59.0	(12.5)	57.6	57.4	57.5	(12.6)
Gender		57.8	57.3	57.5	(12.9)	57.2	57.2	57.2	(12.9)	56.0	55.6	55.8	(12.9)
English as an additional Language	Yes	54.5	54.3	54.4	(14.0)	53.8	53.7	53.7	(13.9)	52.7	52.6	52.7	(13.8)
	No	58.0	57.5	57.8	(12.8)	57.5	57.5	57.5	(12.8)	56.3	55.8	56.1	(12.8)
Free School Meal Eligibility	Yes	51.4	50.6	51.0	(13.8)	50.5	50.0	50.2	(13.8)	49.5	48.8	49.1	(13.7)
	No	59.0	58.6	58.8	(12.3)	58.5	58.6	58.5	(12.3)	57.2	57.0	57.1	(12.3)
SEN	No	61.4	59.9	60.6	(10.9)	60.6	59.5	60.0	(11.0)	59.3	57.9	58.5	(11.1)
	SEN other*	49.7	45.0	47.9	(13.4)	48.1	43.5	46.5	(13.5)	46.7	41.9	45.0	(13.4)
	SEN statement	44.2	39.2	43.0	(15.7)	43.5	38.7	42.4	(15.6)	43.3	37.6	41.9	(15.2)
Ethnicity	White British and Irish	58.1	57.6	57.8	(12.8)	57.6	57.6	57.6	(12.7)	56.4	55.9	56.1	(12.7)
	White other	58.5	57.9	58.2	(13.3)	58.2	58.5	58.3	(13.3)	56.7	56.5	56.6	(13.5)
	Mixed	58.3	57.7	58.0	(12.5)	57.5	57.5	57.5	(12.7)	56.1	56.3	56.2	(12.7)
	Black Caribbean	53.3	54.5	53.9	(13.2)	52.4	53.6	53.0	(13.2)	50.7	52.6	51.7	(13.0)
	Black African & Black Other	54.6	55.2	54.9	(13.3)	53.4	54.7	54.0	(13.2)	52.0	53.4	52.7	(13.1)
	Indian	57.5	57.3	57.4	(12.8)	56.9	56.5	56.7	(12.7)	55.9	55.5	55.7	(12.6)
	Pakistani	50.9	50.2	50.5	(14.5)	50.3	50.0	50.1	(14.3)	49.2	49.2	49.2	(14.2)
	Bangladeshi	53.1	52.8	53.0	(13.8)	52.8	52.1	52.4	(13.8)	52.4	51.2	51.8	(13.5)
	Chinese	61.7	62.2	62.0	(12.0)	60.5	61.2	60.9	(11.9)	60.9	60.6	60.7	(11.8)
	Any other ethnic origin	57.6	57.9	57.8	(13.1)	56.0	55.9	56.0	(13.8)	55.0	54.9	54.9	(13.9)
Ethnic origin unknown	57.6	56.9	57.3	(13.1)	55.9	56.3	56.1	(13.2)	55.1	54.8	54.9	(13.1)	

*Pupil considered to have special educational needs if at Stage 1 or further on the SEN Code of practice (1994).

Table 4d: Key Stage 2 Average scores broken down by pupil characteristics

Characteristic		2002				2003				2004			
		Boys	Girls	All		Boys	Girls	All		Boys	Girls	All	
		Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)	Mean	Mean	Mean	(s.d.)
Age	< 122 months	61.5	62.2	61.9	(16.7)	59.0	60.2	59.6	(17.3)	59.1	60.1	59.6	(16.8)
	122 – 130 months	64.0	64.9	64.4	(16.4)	61.9	63.0	62.4	(17.2)	61.5	62.7	62.0	(16.7)
	> 130 months	66.9	67.9	67.4	(16.0)	64.6	65.9	65.3	(16.9)	64.3	65.7	65.0	(16.4)
Gender		64.2	65.0	64.6	(16.5)	61.9	63.0	62.4	(17.2)	61.7	62.8	62.2	(16.7)
English as an additional Language	Yes	61.3	62.0	61.7	(17.2)	59.0	59.7	59.4	(17.8)	59.1	60.2	59.7	(17.2)
	No	64.4	65.3	64.8	(16.4)	62.1	63.3	62.7	(17.1)	61.9	63.1	62.5	(16.7)
Free School Meal Eligibility	Yes	55.0	55.8	55.4	(17.1)	52.3	53.1	52.7	(17.6)	52.6	53.7	53.1	(17.1)
	No	66.0	66.8	66.4	(15.7)	63.7	64.9	64.3	(16.5)	63.4	64.7	64.1	(16.0)
SEN	No	70.2	69.0	69.6	(13.2)	67.6	66.5	67.0	(14.2)	67.2	66.3	66.7	(13.8)
	SEN other*	51.0	46.7	49.4	(15.3)	46.5	42.0	44.9	(15.4)	46.5	42.3	45.0	(15.3)
	SEN statement	40.5	36.2	39.4	(18.3)	38.2	34.6	37.3	(18.0)	39.9	34.9	38.7	(17.9)
Ethnicity	White British and Irish	64.5	65.3	64.9	(16.4)	62.2	63.4	62.8	(17.1)	62.0	63.1	62.6	(16.6)
	White other	65.5	65.8	65.7	(16.8)	63.8	64.9	64.4	(17.4)	63.2	64.1	63.7	(17.3)
	Mixed	65.0	65.7	65.3	(15.7)	62.6	63.6	63.1	(17.1)	62.0	63.7	62.9	(16.6)
	Black Caribbean	58.2	60.9	59.6	(16.2)	55.7	58.7	57.2	(16.9)	55.0	59.2	57.1	(16.3)
	Black African & Black Other	60.7	61.5	61.6	(16.3)	58.4	60.9	59.7	(16.9)	57.8	61.0	59.4	(16.5)
	Indian	65.5	66.3	65.9	(15.8)	63.6	63.8	63.6	(16.5)	63.9	64.5	64.2	(15.7)
	Pakistani	56.8	56.9	56.8	(17.6)	54.2	54.7	54.4	(18.1)	54.6	55.7	55.2	(17.3)
	Bangladeshi	59.0	59.8	59.4	(16.7)	57.4	57.8	57.6	(17.3)	58.2	58.3	58.3	(16.8)
	Chinese	72.0	73.4	72.7	(14.5)	70.0	71.6	70.8	(15.4)	70.8	71.8	71.3	(15.1)
	Any other ethnic origin	64.6	66.1	65.3	(16.7)	62.0	63.0	62.5	(18.3)	61.7	63.0	62.3	(17.8)
Ethnic origin unknown	64.0	64.5	64.3	(16.7)	59.6	61.3	60.4	(17.6)	60.0	61.4	60.7	(17.1)	

*Pupil considered to have special educational needs if at Stage 1 or further on the SEN Code of practice (1994).

Comparing results of the four types of models

Four types of model have been fitted for each of the three subjects, as well as for the average of the three subjects for each of the years 2002, 2003 and 2004. The four model types are:

- the null model with no explanatory variables;
- the simple value added model with variables of previous achievement as covariates;
- the complex value added model, which in addition to previous achievement also includes individual pupil characteristics;
- the expanded complex value added model, which expands the complex value added model to include gender by ethnic group interactions, descriptors of pupils' area of residence, and measures of school composition, as well as including random effects for Key Stage 1 predictors, FSM and gender.

The estimates for the four models types, for four outcomes (English, Mathematics, Science and average score) for the 3 years (i.e. 48 models) are presented in detail in Table 12 in Appendix 2. In this section, the variance explained by the explanatory variables in each of the model types is first considered for each KS2 subject. The effect of the explanatory variables in the expanded complex value added models is then discussed for each subject and across years. In Appendix 2 the effect of the explanatory variables in the null, simple value added and the complex value added models are briefly discussed.

In addition to these 48 models, the expanded complex value added models are also computed without random effects to provide school level residuals for English, Mathematics, Science and average scores for each year. These 12 models are shown in Table 13 in Appendix 3. With these 12 additional models there were 60 models that were computed.

Variance Explained

The variance explained in the null, simple and complex value added models is summarised in Table 6 for each of the subjects and years.

Key Stage 2 English

From the null models for 2002, 2003 and 2004, it can be estimated that only 1-2% of the variance found between the KS2 English total scores is explained by differences in the LAs, 13-15% is due to school differences and the majority of variance (84-85%) is due to the differences between pupils.

The simple value added models for 2002, 2003 and 2004, where prior attainment is included, shows that including previous performance reduces the total unexplained variance by 56-58%, the variance attributed to LA differences by 56-71%, school differences by 52-57% and pupil differences by 59-60%. After adding into the model the individual pupil characteristics, total variance was further reduced by 7% in all years. Variation at the LA level varied in 2002 increasing by 5% but reducing by 5-11% in 2003 and 2004. Variation at the school level decreased further in all years by 4-5%, and variation at the pupil level reduced in all years by 7-8%. Compared to the null model, the complex value added model reduced the total variance by 59-61% in all years. All the pupil characteristics, with the exception of some ethnic group differences, were found to be significantly related to progress in KS2 English and the KS1 effects remained.

The expanded complex value added model, which includes characteristics of pupil's area of residence and school composition, further reduces the pupil level variation by 5% in each year.

Table 5: Percentage of variance at each level of the random effects models by subject and year

Subject	Model	Percentage of Variance								
		LA Level			School Level			Pupil Level		
		2002	2003	2004	2002	2003	2004	2002	2003	2004
English	Null	1.72	1.60	1.29	13.42	14.35	14.66	84.86	84.05	84.04
	Simple Value Added	1.20	1.58	1.27	16.69	19.39	21.16	82.10	79.03	77.57
	Complex Value Added	1.36	1.61	1.21	16.97	19.93	21.90	81.67	78.46	76.90
Mathematics	Null	1.21	1.14	1.16	12.74	12.51	12.00	86.05	86.35	86.84
	Simple Value Added	0.99	0.92	0.98	17.28	17.36	16.67	81.73	81.72	82.35
	Complex Value Added	1.05	0.96	0.92	17.55	17.90	16.91	81.40	81.14	82.17
Science	Null	1.27	1.66	1.53	18.64	17.46	16.15	80.09	80.87	82.32
	Simple Value Added	0.90	0.89	0.87	21.96	19.65	19.42	77.14	79.45	79.72
	Complex Value Added	0.99	0.76	0.82	21.96	19.54	19.20	77.05	79.70	79.98
Average	Null	1.56	1.65	1.50	16.64	15.87	14.40	81.80	82.48	84.09
	Simple Value Added	1.24	1.29	1.32	21.58	21.13	21.14	77.17	77.58	77.54
	Complex Value Added	1.36	1.33	1.30	21.75	21.35	21.31	76.90	77.31	77.39

Key Stage 2 Mathematics

Estimation from the null models for 2002, 2003 and 2004, reveals that the majority of the variation in the KS2 Mathematics scores occurred between pupils (86-87%) with only 12-13% of the total variation occurring between schools and only 1% between LAs.

The simple value added models for 2002, 2003 and 2004, where prior attainment is included, show that including previous performance reduces the total unexplained variance by 53-55%, the variance attributed to LA differences by 61-64%, school differences by 36-38% and pupil differences by 55-58%. After adding into the model the individual pupil characteristics (see the complex value added model), total variance was further reduced by 6-7%. Variation at the LA level reduced by 2-12%. Variation at the school level decreased further in all years by 4-5%, and variation at the pupil level reduced in all years by 6-8%. Compared to the null model, the complex value added model reduced the total variance by 56-58% in all years. All the pupil characteristics, with the exception of some ethnic group differences, were found to be significantly related to progress in KS2 Mathematics. The effects of prior attainment remained.

The expanded complex value added model, which includes characteristics of pupil's area of residence and school composition, further reduces the pupil level variation by 4% in each year.

Key Stage 2 Science

For the years 2002, 2003 and 2004, 80-82% of the variation in the KS2 Science scores was found between pupils, 16-19% between schools and only 1-2% between LAs.

For the KS2 Science scores, the simple value added model with the categorical KS1 scores reduced the total unexplained variance in the null model by 45-48%, the variation between LAs by 61-72%, the variation between schools by 35-41% and the variation between pupils by 47-48%. Prior attainment in KS1 subjects was significantly related to the KS2 Science scores. The inclusion of the pupil characteristics further reduced the total unexplained variance by 3-4%. The variance between LAs fluctuated, reducing in two years by 9-17% and increasing in one year by 6%. The variance between schools reduced by 4-5% and that for pupils reduced by 3-4%. Compared to the null model, the complex value added model reduced the total variance by 47-49% in all years. All the pupil characteristics, with the exception, for some years, of some ethnic group differences and English as an additional language (EAL), were found to be significantly related to progress in KS2 Science. The effects of prior attainment remained.

The expanded complex value added model, which includes characteristics of pupil's area of residence and school composition, further reduces the pupil level variation by 5-6% in each year.

Key Stage 2 Average score

From the null models for 2002, 2003 and 2004, it can be estimated that only 2% of the variance found between the KS2 average scores is explained by differences in the LAs, 14-17% is due to school differences and the majority of variance (82-84%) is due to the differences between pupils.

The simple value added models for 2002, 2003 and 2004, where prior attainment is included, shows that including previous performance reduces the total unexplained variance by 62-64%, the variance attributed to LA differences by 67-72%, school differences by 45-52% and pupil differences by 64-66%. After adding into the model the individual pupil characteristics, total variance was further reduced by 7-8%. Variation at the LA level varied in 2002 increasing by 1% but reducing by 4-8% in 2003 and 2004. Variation at the school level decreased further in all years by 6-7%, and variation at the pupil level reduced in all years by 7-8%. Compared to the null model, the complex value added model reduced the total variance by 65-66% in all years. All the pupil characteristics, with the exception of occasional ethnic group differences in one year, were found to be significantly related to progress in average score and the KS1 effects remained.

The expanded complex value added model, which includes characteristics of pupils' area of residence and school composition, further reduces the pupil level variation by 5-6% in each year.

Results from the expanded complex value added models

The remainder of the results section will consider the final models, i.e. the expanded complex value added models, with random effects for 2002, 2003 and 2004 for KS2 English, Mathematics, Science and average score. Table 5 presents the results of these final models by each of the KS2 subjects, and year.

In the tables effect sizes are given for each of the predictor variables. The method for computing the effect size is as follows.

For the binary explanatory variables:

$$\text{Effect size} = \frac{\beta}{\sigma_{\text{pupil}}}$$

Where β is the model parameter estimate and σ_{pupil} is the standard deviation at the pupil level.

This is equivalent to the difference between the means of the two categories, measured in standard deviation units.

For continuous explanatory variables, following Tymms et al. (1997), Tymms (2004) and Elliot & Sammons (2004), the following method was used:

$$\text{Effect size} = \frac{2\beta * \text{s.d.}}{\sigma_{\text{pupil}}}$$

Where s.d. = standard deviation of the independent (explanatory) variable, and σ_{pupil} is the standard deviation at the pupil level.

This is equivalent to the difference in values of the dependent variable corresponding to the points one standard deviation above and below the mean of the independent variable, measured in standard deviation units.

Table 6a: Results of multilevel model English: Expanded Complex Value Added Model

Fixed Effects		2002				2003				2004				
		Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept		24.64	(0.25)	<0.001		15.28	(0.27)	<0.001		14.09	(0.26)	<0.001		
Reading		1.25	(0.01)	<0.001	1.32	1.34	(0.01)	<0.001	1.34	1.23	(0.01)	<0.001	1.28	
Writing		0.79	(0.01)	<0.001	0.71	0.91	(0.01)	<0.001	0.77	0.88	(0.01)	<0.001	0.80	
Mathematics		0.58	(0.01)	<0.001	0.54	0.64	(0.01)	<0.001	0.57	0.58	(0.01)	<0.001	0.53	
Science		<Level 1	2.45	(0.20)	<0.001	0.29	3.97	(0.2)	<0.001	0.44	5.33	(0.20)	<0.001	0.64
		Level 1	-0.99	(0.05)	<0.001	-0.12	-0.73	(0.05)	<0.001	-0.08	-0.08	(0.05)	ns	
		Level 3+	2.12	(0.04)	<0.001	0.25	2.55	(0.04)	<0.001	0.28	2.66	(0.04)	<0.001	0.32
Age at Start of Academic year ⁺			-0.13	(0.00)	<0.001	-0.11	-0.12	(0.00)	<0.001	-0.09	-0.08	(0.003)	<0.001	-0.07
Female			1.05	(0.03)	<0.001	0.12	2.15	(0.03)	<0.001	0.24	2.52	(0.03)	<0.001	0.30
English as an additional Language			0.64	(0.09)	<0.001	0.08	0.66	(0.10)	<0.001	0.07	0.80	(0.09)	<0.001	0.10
Free School Meal Eligibility (FSM)			-1.23	(0.04)	<0.001	-0.15	-1.35	(0.04)	<0.001	-0.15	-1.20	(0.04)	<0.001	-0.14
SEN			-6.44	(0.11)	<0.001	-0.76	-6.04	(0.12)	<0.001	-0.67	-5.11	(0.11)	<0.001	-0.61
SEN other			-6.60	(0.04)	<0.001	-0.78	-7.01	(0.04)	<0.001	-0.77	-6.00	(0.04)	<0.001	-0.72
Ethnic Group		White other	0.70	(0.14)	<0.001	0.08	1.30	(0.16)	<0.001	0.14	1.54	(0.14)	<0.001	0.19
		Mixed	1.15	(0.67)	ns		0.96	(0.11)	<0.001	0.11	0.71	(0.11)	<0.001	0.09
		Caribbean	-1.50	(0.16)	<0.001	-0.18	-0.71	(0.17)	<0.001	-0.08	-1.04	(0.16)	<0.001	-0.12
		Black African & Black Other	-0.24	(0.14)	ns		0.83	(0.17)	<0.001	0.09	0.52	(0.15)	<0.001	0.06
<i>(comparison White British and Irish)</i>		Indian	-0.17	(0.15)	ns		0.16	(0.16)	ns		0.56	(0.14)	<0.001	0.07
		Pakistani	-0.31	(0.15)	0.04	-0.04	0.10	(0.16)	ns		0.14	(0.15)	ns	
		Bangladeshi	1.65	(0.23)	<0.001	0.20	2.24	(0.23)	<0.001	0.25	1.68	(0.21)	<0.001	0.20
		Chinese	2.36	(0.33)	<0.001	0.28	2.52	(0.36)	<0.001	0.28	1.84	(0.32)	<0.001	0.22
		Any other ethnic origin	0.61	(0.13)	<0.001	0.07	1.60	(0.19)	<0.001	0.18	1.00	(0.17)	<0.001	0.12
		Ethnic origin unknown	-0.24	(0.17)	ns		-0.34	(0.11)	0.002	-0.04	-0.24	(0.11)	0.03	-0.03
Interactions		White other * Female	0.13	(0.18)	ns		0.56	(0.22)	0.01	0.06	-0.05	(0.19)	ns	
		Mixed * Female	-0.49	(0.94)	ns		0.18	(0.16)	ns		0.25	(0.15)	ns	
		Caribbean * Female	0.78	(0.21)	<0.001	0.09	0.28	(0.23)	ns		0.79	(0.21)	<0.001	0.09
		Black African & Black Other * Female	0.25	(0.18)	ns		-0.06	(0.22)	ns		0.55	(0.19)	0.004	0.07
		Indian * Female	0.07	(0.17)	ns		0.19	(0.18)	ns		0.19	(0.17)	ns	
		Pakistani * Female	-0.06	(0.17)	ns		-0.11	(0.17)	ns		0.10	(0.16)	ns	
		Bangladeshi * Female	0.44	(0.27)	ns		0.27	(0.28)	ns		0.02	(0.25)	ns	
		Chinese * Female	1.11	(0.45)	0.01	0.13	0.50	(0.49)	ns		0.56	(0.44)	ns	
		Any other ethnic origin * Female	0.33	(0.18)	ns		-0.12	(0.26)	ns		0.43	(0.23)	ns	
		Ethnic origin unknown * Female	-0.08	(0.21)	ns		0.20	(0.15)	ns		0.14	(0.15)	ns	
IMD overall			-0.002	(0.002)	ns		-0.001	(0.002)	ns		-0.002	(0.002)	ns	
% with no qualifications ^{&}			-0.02	(0.002)	<0.001	-0.07	-0.03	(0.002)	<0.001	-0.08	-0.02	(0.002)	<0.001	-0.07
% of lone parent families ^{&}			-0.01	(0.002)	0.01	-0.01	-0.01	(0.002)	<0.001	-0.02	-0.004	(0.002)	0.04	-0.01
% with own household ^{&}			0.004	(0.001)	<0.001	0.02	0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.04
% in managerial jobs ^{&}			0.01	(0.003)	<0.001	0.04	0.01	(0.003)	<0.001	0.03	0.01	(0.003)	0.002	0.03

Table 6a: Results of multilevel model English: Expanded Complex Value Added Model (continued)

Fixed Effects	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.03	-0.03	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}	-0.05	(0.003)	<0.001	-0.10	-0.05	(0.003)	<0.001	-0.10	-0.04	(0.003)	<0.001	-0.10
% never worked & long term unemployed ^{&}	-0.02	(0.01)	<0.001	-0.03	-0.02	(0.01)	<0.001	-0.02	-0.01	(0.01)	0.02	-0.01
% of children in school with free meals	-0.05	(0.002)	<0.001	-0.17	-0.04	(0.003)	<0.001	-0.15	-0.04	(0.003)	<0.001	-0.15
% of children in school with SEN	-0.03	(0.01)	<0.001	-0.06	-0.05	(0.01)	<0.001	-0.10	-0.02	(0.01)	0.04	-0.02
Random Effects												
LA Level Variance	0.64	(0.10)	<0.001		1.36	(0.20)	<0.001		1.04	(0.16)	<0.001	
School Level Variance												
Intercept	79.17	(1.60)	<0.001		89.13	(1.82)	<0.001		83.44	(1.74)	<0.001	
Reading	0.07	(0.004)	<0.001		0.08	(0.01)	<0.001		0.09	(0.01)	<0.001	
Writing	0.09	(0.01)	<0.001		0.11	(0.01)	<0.001		0.11	(0.01)	<0.001	
Mathematics	0.04	(0.004)	<0.001		0.05	(0.004)	<0.001		0.06	(0.004)	<0.001	
Female	1.07	(0.10)	<0.001		1.42	(0.12)	<0.001		1.55	(0.11)	<0.001	
Free School Meals	2.30	(0.20)	<0.001		2.19	(0.22)	<0.001		1.48	(0.19)	<0.001	
School Level Covariance												
Intercept * Reading	-1.62	(0.06)	<0.001		-1.75	(0.07)	<0.001		-1.57	(0.07)	<0.001	
Intercept * Writing	-1.31	(0.08)	<0.001		-1.58	(0.09)	<0.001		-1.46	(0.08)	<0.001	
Intercept * Mathematics	-0.68	(0.06)	<0.001		-0.67	(0.07)	<0.001		-0.81	(0.07)	<0.001	
Intercept * Female	-2.29	(0.30)	<0.001		-2.11	(0.34)	<0.001		-2.67	(0.32)	<0.001	
Intercept * Free School Meals	-0.83	(0.44)	ns		-1.47	(0.49)	0.003		0.28	(0.43)	ns	
Reading * Writing	-0.004	(0.004)	ns		0.004	(0.01)	ns		-0.001	(0.004)	ns	
Reading * Mathematics	0.01	(0.003)	0.004		0.01	(0.003)	0.004		0.001	(0.003)	ns	
Reading * Female	0.03	(0.02)	ns		0.04	(0.02)	0.01		0.05	(0.02)		0.002
Reading * Free School Meals	-0.04	(0.02)	ns		0.002	(0.03)	ns		-0.03	(0.02)	ns	
Writing * Mathematics	-0.01	(0.004)	0.03		-0.02	(0.004)	<0.001		-0.01	(0.004)	ns	
Writing * Female	0.02	(0.02)	ns		-0.001	(0.02)	ns		-0.01	(0.02)	ns	
Writing * Free School Meals	0.06	(0.03)	0.04		0.03	(0.03)	ns		-0.02	(0.03)	ns	
Mathematics * Female	0.03	(0.01)	0.02		0.01	(0.02)	ns		0.05	(0.02)		0.002
Mathematics * Free School Meals	0.02	(0.02)	ns		0.02	(0.02)	ns		0.004	(0.02)	ns	
Female * Free School Meals	-0.02	(0.11)	ns		-0.05	(0.12)	ns		0.01	(0.11)	ns	
Pupil Level Variance	72.14	(0.15)	<0.001		82.16	(0.17)	<0.001		69.80	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 6b: Results of multilevel model Mathematics: Expanded Complex Value Added Model

Fixed Effects		2002				2003				2004				
		Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept		16.33	(0.35)	<0.001		4.91	(0.37)	<0.001		7.44	(0.38)	<0.001		
Reading		0.59	(0.01)	<0.001	0.44	0.72	(0.01)	<0.001	0.52	0.66	(0.01)	<0.001	0.45	
Writing		0.49	(0.01)	<0.001	0.31	0.47	(0.01)	<0.001	0.29	0.47	(0.01)	<0.001	0.28	
Mathematics		2.47	(0.01)	<0.001	1.63	2.85	(0.01)	<0.001	1.81	2.88	(0.01)	<0.001	1.74	
Science		<Level 1	1.68	(0.26)	<0.001	0.14	5.76	(0.26)	<0.001	0.46	7.17	(0.29)	<0.001	0.57
		Level 1	-2.60	(0.07)	<0.001	-0.22	-1.55	(0.07)	<0.001	-0.12	-1.52	(0.08)	<0.001	-0.12
		Level 3+	2.53	(0.05)	<0.001	0.21	3.40	(0.06)	<0.001	0.27	3.47	(0.05)	<0.001	0.27
Age at Start of Academic year ⁺			-0.29	(0.01)	<0.001	-0.17	-0.33	(0.01)	<0.001	-0.18	-0.29	(0.01)	<0.001	-0.16
Female			-3.87	(0.04)	<0.001	-0.32	-5.21	(0.04)	<0.001	-0.41	-3.91	(0.04)	<0.001	-0.31
English as an additional Language			2.16	(0.12)	<0.001	0.18	1.83	(0.13)	<0.001	0.15	2.31	(0.13)	<0.001	0.18
Free School Meal Eligibility (FSM)			-1.30	(0.06)	<0.001	-0.11	-1.26	(0.06)	<0.001	-0.10	-1.50	(0.06)	<0.001	-0.12
SEN			-6.91	(0.15)	<0.001	-0.58	-4.24	(0.15)	<0.001	-0.34	-5.08	(0.16)	<0.001	-0.40
SEN other			-7.74	(0.05)	<0.001	-0.64	-7.47	(0.06)	<0.001	-0.59	-7.79	(0.06)	<0.001	-0.61
Ethnic Group		White other	0.62	(0.19)	0.001	0.05	1.46	(0.22)	<0.001	0.12	2.32	(0.22)	<0.001	0.18
		Mixed	0.09	(0.95)	ns		0.31	(0.16)	0.05	0.03	0.18	(0.16)	ns	
		Caribbean	-2.67	(0.22)	<0.001	-0.22	-2.87	(0.23)	<0.001	-0.23	-3.32	(0.23)	<0.001	-0.26
		Black African & Black Other	-0.80	(0.20)	<0.001	-0.07	-0.52	(0.23)	0.02	-0.04	-1.33	(0.22)	<0.001	-0.11
<i>(comparison White British and Irish)</i>		Indian	1.66	(0.20)	<0.001	0.14	1.95	(0.21)	<0.001	0.15	1.79	(0.22)	<0.001	0.14
		Pakistani	0.08	(0.21)	ns		0.51	(0.22)	0.02	0.04	-0.39	(0.22)	ns	
		Bangladeshi	1.61	(0.32)	<0.001	0.13	2.47	(0.32)	<0.001	0.20	1.92	(0.32)	<0.001	0.15
		Chinese	7.27	(0.46)	<0.001	0.61	7.63	(0.49)	<0.001	0.61	7.82	(0.48)	<0.001	0.62
		Any other ethnic origin	1.02	(0.18)	<0.001	0.09	3.29	(0.26)	<0.001	0.26	3.38	(0.26)	<0.001	0.27
		Ethnic origin unknown	-0.38	(0.23)	ns		-0.05	(0.15)	ns		-0.30	(0.16)	ns	
Interactions		White other * Female	-0.02	(0.25)	ns		0.47	(0.30)	ns		-0.48	(0.29)	ns	
		Mixed * Female	1.20	(1.34)	ns		0.13	(0.22)	ns		0.14	(0.22)	ns	
		Caribbean * Female	1.02	(0.29)	<0.001	0.09	1.85	(0.31)	<0.001	0.15	1.62	(0.31)	<0.001	0.13
		Black African & Black Other * Female	0.67	(0.26)	0.01	0.06	1.32	(0.3)	<0.001	0.11	1.51	(0.29)	<0.001	0.12
		Indian * Female	0.38	(0.24)	ns		0.22	(0.25)	ns		-0.17	(0.25)	ns	
		Pakistani * Female	-0.89	(0.23)	<0.001	-0.07	-0.78	(0.24)	0.001	-0.06	-0.77	(0.23)	<0.001	-0.06
		Bangladeshi * Female	0.16	(0.38)	ns		-0.11	(0.39)	ns		-0.74	(0.38)	0.05	-0.06
		Chinese * Female	0.72	(0.64)	ns		0.29	(0.68)	ns		1.08	(0.67)	ns	
		Any other ethnic origin * Female	0.50	(0.25)	0.04	0.04	-0.01	(0.35)	ns		-0.11	(0.34)	ns	
		Ethnic origin unknown * Female	-0.17	(0.30)	ns		-0.31	(0.20)	ns		-0.06	(0.23)	ns	
IMD overall			-0.004	(0.002)	ns		0.000	(0.003)	ns		-0.004	(0.003)	ns	
% with no qualifications ^{&}			-0.02	(0.003)	<0.001	-0.05	-0.02	(0.003)	<0.001	-0.04	-0.03	(0.004)	<0.001	-0.06
% of lone parent families ^{&}			-0.01	(0.003)	0.01	-0.01	-0.01	(0.003)	<0.001	-0.02	-0.01	(0.003)	<0.001	-0.03
% with own household ^{&}			0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.04
% in managerial jobs ^{&}			0.01	(0.004)	0.002	0.03	0.02	(0.004)	<0.001	0.04	0.01	(0.004)	ns	

Table 6b: Results of multilevel model Mathematics: Expanded Complex Value Added Model (continued)

	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects												
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.02	-0.05	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}	-0.05	(0.01)	<0.001	-0.03	-0.05	(0.01)	<0.001	-0.02	-0.05	(0.01)	<0.001	-0.02
% in routine jobs ^{&}	-0.05	(0.004)	<0.001	-0.08	-0.05	(0.004)	<0.001	-0.07	-0.06	(0.004)	<0.001	-0.09
% never worked & long term unemployed ^{&}	-0.01	(0.01)	ns		-0.01	(0.01)	ns		-0.004	(0.01)	ns	
% of children in school with free meals	-0.05	(0.00)	<0.001	-0.13	-0.06	(0.004)	<0.001	-0.14	-0.06	(0.004)	<0.001	-0.15
% of children in school with SEN	-0.05	(0.01)	<0.001	-0.07	-0.08	(0.01)	<0.001	-0.11	-0.02	(0.01)	ns	-0.01
Random Effects												
LA Level Variance	1.65	(0.25)	<0.001		2.06	(0.30)	<0.001		1.50	(0.23)	<0.001	
School Level Variance												
	Intercept	173.32	(3.33)	<0.001	164.22	(3.33)	<0.001		197.60	(3.98)	<0.001	
	Reading	0.11	(0.01)	<0.001	0.10	(0.01)	<0.001		0.13	(0.01)	<0.001	
	Writing	0.12	(0.01)	<0.001	0.08	(0.01)	<0.001		0.09	(0.01)	<0.001	
	Mathematics	0.21	(0.01)	<0.001	0.20	(0.01)	<0.001		0.27	(0.01)	<0.001	
	Female	1.97	(0.21)	<0.001	2.33	(0.23)	<0.001		2.40	(0.24)	<0.001	
	Free School Meals	4.03	(0.39)	<0.001	3.75	(0.42)	<0.001		4.72	(0.44)	<0.001	
School Level Covariance												
	Intercept	* Reading	-2.29	(0.12)	<0.001	-2.12	(0.13)	<0.001	-2.14	(0.15)	<0.001	
	Intercept	* Writing	-1.03	(0.14)	<0.001	-0.86	(0.15)	<0.001	-1.13	(0.16)	<0.001	
	Intercept	* Mathematics	-4.18	(0.14)	<0.001	-3.83	(0.15)	<0.001	-5.09	(0.18)	<0.001	
	Intercept	* Female	-0.96	(0.60)	ns	-1.51	(0.63)	0.02	-0.15	(0.70)	ns	
	Intercept	* Free School Meals	-1.74	(0.88)	0.05	-2.77	(0.91)	0.002	-1.76	(1.02)	ns	
	Reading	* Writing	-0.01	(0.01)	ns	-0.004	(0.01)	ns	-0.01	(0.01)	ns	
	Reading	* Mathematics	0.01	(0.01)	0.03	0.01	(0.01)	ns	-0.03	(0.01)	0.003	
	Reading	* Female	-0.06	(0.03)	ns	-0.06	(0.03)	ns	-0.08	(0.04)	0.03	
	Reading	* Free School Meals	-0.06	(0.04)	ns	0.03	(0.05)	ns	0.01	(0.05)	ns	
	Writing	* Mathematics	-0.04	(0.01)	<0.001	-0.02	(0.01)	0.004	-0.01	(0.01)	ns	
	Writing	* Female	-0.08	(0.03)	0.02	0.02	(0.04)	ns	-0.04	(0.04)	ns	
	Writing	* Free School Meals	0.05	(0.05)	ns	-0.05	(0.05)	ns	0.01	(0.06)	ns	
	Mathematics	* Female	0.17	(0.03)	<0.001	0.13	(0.03)	<0.001	0.17	(0.04)	<0.001	
	Mathematics	* Free School Meals	0.07	(0.05)	ns	0.13	(0.05)	0.01	0.07	(0.06)	ns	
	Female	* Free School Meals	0.04	(0.21)	ns	-0.004	(0.23)	ns	-0.11	(0.24)	ns	
Pupil Level Variance	144.43	(0.30)	<0.001		158.96	(0.32)	<0.001		161.12	(0.33)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 6c: Results of multilevel model Science: Expanded Complex Value Added Model

Fixed Effects	2002				2003				2004				
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept	33.98	(0.24)	<0.001		32.04	(0.23)	<0.001		29.45	(0.24)	<0.001		
Reading	0.67	(0.01)	<0.001	0.73	0.64	(0.01)	<0.001	0.72	0.70	(0.01)	<0.001	0.75	
Writing	0.20	(0.01)	<0.001	0.19	0.20	(0.01)	<0.001	0.19	0.19	(0.01)	<0.001	0.17	
Mathematics	0.98	(0.01)	<0.001	0.95	1.06	(0.01)	<0.001	1.05	1.06	(0.01)	<0.001	1.0	
Science	<Level 1	-3.09	(0.16)	<0.001	-0.38	-2.02	(0.15)	<0.001	-0.25	-0.27	(0.17)	ns	
	Level 1	-2.93	(0.05)	<0.001	-0.36	-2.63	(0.05)	<0.001	-0.33	-2.35	(0.05)	<0.001	-0.29
	Level 3+	2.08	(0.04)	<0.001	0.26	2.06	(0.04)	<0.001	0.26	2.40	(0.04)	<0.001	0.30
Age at Start of Academic year ⁺		-0.13	(0.003)	<0.001	-0.11	-0.12	(0.003)	<0.001	-0.11	-0.14	(0.003)	<0.001	-0.12
Female		-2.02	(0.03)	<0.001	-0.25	-1.58	(0.03)	<0.001	-0.20	-1.76	(0.03)	<0.001	-0.22
English as an additional Language		0.01	(0.08)	ns		-0.09	(0.08)	ns		0.27	(0.08)	0.001	0.03
Free School Meal Eligibility (FSM)		-1.36	(0.04)	<0.001	-0.17	-1.38	(0.04)	<0.001	-0.17	-1.34	(0.04)	<0.001	-0.17
SEN		-2.30	(0.10)	<0.001	-0.28	-1.93	(0.09)	<0.001	-0.24	-2.17	(0.10)	<0.001	-0.27
SEN other		-3.45	(0.04)	<0.001	-0.42	-3.36	(0.04)	<0.001	-0.42	-3.23	(0.04)	<0.001	-0.40
Ethnic Group	White other	0.17	(0.13)	ns		0.78	(0.14)	<0.001	0.10	1.15	(0.14)	<0.001	0.14
	Mixed	0.83	(0.64)	ns		0.22	(0.10)	0.03	0.03	0.13	(0.10)	ns	
	Caribbean	-2.09	(0.15)	<0.001	-0.26	-1.82	(0.15)	<0.001	-0.23	-2.20	(0.15)	<0.001	-0.27
	Black African & Black Other	-1.07	(0.13)	<0.001	-0.13	-1.13	(0.15)	<0.001	-0.14	-1.37	(0.14)	<0.001	-0.17
	(comparison White British and Irish)												
	Indian	-0.98	(0.14)	<0.001	-0.12	-0.98	(0.14)	<0.001	-0.12	-1.04	(0.14)	<0.001	-0.13
	Pakistani	-2.47	(0.14)	<0.001	-0.30	-2.01	(0.14)	<0.001	-0.25	-2.30	(0.14)	<0.001	-0.28
	Bangladeshi	-0.36	(0.21)	ns		-0.003	(0.20)	ns		-0.07	(0.20)	ns	
	Chinese	1.84	(0.31)	<0.001	0.23	1.20	(0.31)	<0.001	0.15	2.15	(0.31)	<0.001	0.26
	Any other ethnic origin	-0.02	(0.12)	ns		0.07	(0.17)	ns		0.38	(0.17)	0.02	0.05
	Ethnic origin unknown	-0.27	(0.16)	ns		-0.11	(0.09)	ns		-0.04	(0.11)	ns	
Interactions	White other * Female	0.38	(0.17)	0.03	0.05	0.71	(0.19)	<0.001	0.09	0.30	(0.19)	ns	
	Mixed * Female	-0.01	(0.90)	ns		0.27	(0.14)	0.05	0.03	0.39	(0.14)	0.01	0.05
	Caribbean * Female	1.21	(0.20)	<0.001	0.15	0.69	(0.20)	<0.001	0.09	1.09	(0.20)	<0.001	0.13
	Black African & Black Other * Female	0.86	(0.18)	<0.001	0.11	0.92	(0.19)	<0.001	0.11	1.17	(0.18)	<0.001	0.14
	Indian * Female	0.52	(0.16)	0.001	0.06	0.39	(0.16)	0.01	0.05	0.41	(0.16)	0.01	0.05
	Pakistani * Female	0.18	(0.16)	ns		-0.19	(0.15)	ns		0.26	(0.15)	ns	
	Bangladeshi * Female	0.30	(0.26)	ns		-0.30	(0.25)	ns		-0.55	(0.24)	0.02	-0.07
	Chinese * Female	1.36	(0.43)	0.002	0.17	0.60	(0.43)	ns		0.58	(0.43)	ns	
	Any other ethnic origin * Female	0.74	(0.17)	<0.001	0.09	0.02	(0.23)	ns		0.45	(0.22)	0.04	0.06
	Ethnic origin unknown * Female	-0.04	(0.20)	ns		-0.02	(0.13)	ns		0.01	(0.15)	ns	
IMD overall		-0.001	(0.002)	ns		0.000	(0.002)	ns		0.004	(0.002)	0.04	0.02
% with no qualifications ^{&}		-0.02	(0.002)	<0.001	-0.06	-0.02	(0.002)	<0.001	-0.06	-0.02	(0.002)	<0.001	-0.08
% of lone parent families ^{&}		-0.01	(0.002)	<0.001	-0.02	-0.01	(0.002)	<0.001	-0.03	-0.01	(0.002)	<0.001	-0.03
% with own household ^{&}		0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.04
% in managerial jobs ^{&}		0.01	(0.003)	0.01	0.02	0.01	(0.003)	0.04	0.02	0.002	(0.003)	ns	

Table 6c: Results of multilevel model Science: Expanded Complex Value Added Model (continued)

Fixed Effects	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
% in intermediate jobs ^{&}	-0.02	(0.004)	<0.001	-0.02	-0.03	(0.004)	<0.001	-0.03	-0.04	(0.004)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}	-0.04	(0.01)	<0.001	-0.03	-0.02	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.02
% in routine jobs ^{&}	-0.04	(0.003)	<0.001	-0.09	-0.05	(0.003)	<0.001	-0.11	-0.05	(0.003)	<0.001	-0.11
% never worked & long term unemployed ^{&}	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.03
% of children in school with free meals	-0.02	(0.003)	<0.001	-0.08	-0.03	(0.002)	<0.001	-0.13	-0.04	(0.002)	<0.001	-0.15
% of children in school with SEN	-0.07	(0.01)	<0.001	-0.13	-0.07	(0.004)	<0.001	-0.14	-0.03	(0.01)	<0.001	-0.03
Random Effects												
LA Level Variance	0.64	(0.10)	<0.001		0.41	(0.07)	<0.001		0.54	(0.09)	<0.001	
School Level Variance	Intercept	107.10	(1.85)	<0.001	97.75	(1.72)	<0.001		103.38	(1.88)	<0.001	
	Reading	0.07	(0.004)	<0.001	0.06	(0.004)	<0.001		0.07	(0.004)	<0.001	
	Writing	0.08	(0.01)	<0.001	0.08	(0.01)	<0.001		0.06	(0.01)	<0.001	
	Mathematics	0.06	(0.004)	<0.001	0.06	(0.004)	<0.001		0.08	(0.004)	<0.001	
	Female	1.09	(0.10)	<0.001	0.73	(0.09)	<0.001		0.81	(0.09)	<0.001	
	Free School Meals	2.66	(0.19)	<0.001	2.96	(0.20)	<0.001		2.95	(0.20)	<0.001	
School Level Covariance												
	Intercept	* Reading	-2.00	(0.07)	<0.001	-1.70	(0.06)	<0.001	-1.85	(0.07)	<0.001	
	Intercept	* Writing	-1.08	(0.08)	<0.001	-1.10	(0.07)	<0.001	-0.92	(0.08)	<0.001	
	Intercept	* Mathematics	-1.60	(0.07)	<0.001	-1.54	(0.06)	<0.001	-1.78	(0.07)	<0.001	
	Intercept	* Female	1.04	(0.31)	<0.001	0.27	(0.28)	ns	0.84	(0.31)	0.01	
	Intercept	* Free School Meals	0.97	(0.46)	0.03	0.78	(0.45)	ns	0.03	(0.47)	ns	
	Reading	* Writing	-0.002	(0.004)	ns	-0.01	(0.004)	ns	-0.002	(0.004)	ns	
	Reading	* Mathematics	0.02	(0.003)	<0.001	0.02	(0.003)	<0.001	0.01	(0.003)	ns	
	Reading	* Female	-0.05	(0.01)	<0.001	-0.03	(0.01)	0.02	0.004	(0.02)	ns	
	Reading	* Free School Meals	-0.07	(0.02)	<0.001	-0.03	(0.02)	ns	-0.04	(0.02)	ns	
	Writing	* Mathematics	-0.01	(0.003)	ns	-0.004	(0.003)	ns	0.001	(0.004)	ns	
	Writing	* Female	-0.02	(0.02)	ns	0.01	(0.02)	ns	-0.05	(0.02)	<0.001	
	Writing	* Free School Meals	0.05	(0.02)	0.05	-0.01	(0.03)	ns	0.000	(0.03)	ns	
	Mathematics	* Female	0.03	(0.01)	0.04	0.03	(0.01)	0.05	0.03	(0.01)	0.04	
	Mathematics	* Free School Meals	-0.02	(0.02)	ns	0.003	(0.02)	ns	0.05	(0.02)	0.04	
	Female	* Free School Meals	0.07	(0.10)	ns	-0.05	(0.10)	ns	-0.02	(0.10)	ns	
Pupil Level Variance			66.36	(0.14)	<0.001	65.32	(0.13)	<0.001	66.44	(0.14)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 6d: Results of multilevel model Average: Expanded Complex Value Added Model

Fixed Effects		2002				2003				2004				
		Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept		27.12	(0.26)	<0.001		19.74	(0.26)	<0.001		18.85	(0.26)	<0.001		
Reading		0.89	(0.01)	<0.001	0.94	0.95	(0.01)	<0.001	1.0	0.92	(0.01)	<0.001	0.95	
Writing		0.55	(0.01)	<0.001	0.49	0.56	(0.01)	<0.001	0.5	0.55	(0.01)	<0.001	0.49	
Mathematics		1.44	(0.01)	<0.001	1.35	1.61	(0.01)	<0.001	1.49	1.61	(0.01)	<0.001	1.45	
Science		<Level 1	-1.11	(0.17)	<0.001	-0.13	1.59	(0.16)	<0.001	0.18	2.85	(0.17)	<0.001	0.34
		Level 1	-2.84	(0.05)	<0.001	-0.34	-2.15	(0.05)	<0.001	-0.25	-1.90	(0.05)	<0.001	-0.22
		Level 3+	2.32	(0.04)	<0.001	0.28	2.79	(0.04)	<0.001	0.32	2.97	(0.04)	<0.001	0.35
Age at Start of Academic year ⁺			-0.20	(0.003)	<0.001	-0.16	-0.20	(0.003)	<0.001	-0.16	-0.18	(0.003)	<0.001	-0.15
Female			-1.78	(0.03)	<0.001	-0.21	-1.67	(0.03)	<0.001	-0.19	-1.21	(0.03)	<0.001	-0.14
English as an additional Language			0.98	(0.09)	<0.001	0.12	0.82	(0.09)	<0.001	0.10	1.18	(0.09)	<0.001	0.14
Free School Meal Eligibility (FSM)			-1.43	(0.04)	<0.001	-0.17	-1.46	(0.04)	<0.001	-0.17	-1.47	(0.04)	<0.001	-0.17
SEN			-7.32	(0.10)	<0.001	-0.87	-5.67	(0.10)	<0.001	-0.66	-5.91	(0.10)	<0.001	-0.70
SEN other			-6.49	(0.04)	<0.001	-0.77	-6.54	(0.04)	<0.001	-0.76	-6.31	(0.04)	<0.001	-0.74
Ethnic Group		White other	0.55	(0.14)	<0.001	0.07	1.27	(0.15)	<0.001	0.15	1.83	(0.14)	<0.001	0.22
		Mixed	0.73	(0.67)	ns		0.54	(0.11)	<0.001	0.06	0.36	(0.11)	<0.001	0.04
		Caribbean	-2.24	(0.15)	<0.001	-0.27	-1.92	(0.16)	<0.001	-0.22	-2.31	(0.16)	<0.001	-0.27
		Black African & Black Other	-0.70	(0.14)	<0.001	-0.08	-0.36	(0.16)	0.02	-0.04	-0.78	(0.15)	<0.001	-0.09
<i>(comparison White British and Irish)</i>		Indian	0.15	(0.14)	ns		0.35	(0.15)	0.02	0.04	0.36	(0.15)	0.01	0.04
		Pakistani	-1.05	(0.15)	<0.001	-0.12	-0.62	(0.15)	<0.001	-0.07	-0.96	(0.15)	<0.001	-0.11
		Bangladeshi	0.98	(0.22)	<0.001	0.12	1.63	(0.22)	<0.001	0.19	1.21	(0.21)	<0.001	0.14
		Chinese	4.02	(0.33)	<0.001	0.48	3.91	(0.34)	<0.001	0.45	4.17	(0.33)	<0.001	0.49
		Any other ethnic origin	0.56	(0.13)	<0.001	0.07	1.62	(0.18)	<0.001	0.19	1.63	(0.17)	<0.001	0.19
		Ethnic origin unknown	-0.28	(0.16)	ns		-0.17	(0.10)	ns		-0.17	(0.11)	ns	
Interactions		White other * Female	0.14	(0.18)	ns		0.60	(0.20)	0.003	0.07	-0.10	(0.19)	ns	
		Mixed * Female	0.32	(0.94)	ns		0.21	(0.15)	ns		0.28	(0.15)	0.05	0.03
		Caribbean * Female	1.13	(0.21)	<0.001	0.13	0.96	(0.21)	<0.001	0.11	1.24	(0.21)	<0.001	0.15
		Black African & Black Other * Female	0.62	(0.18)	<0.001	0.07	0.79	(0.21)	<0.001	0.09	1.12	(0.19)	<0.001	0.13
		Indian * Female	0.31	(0.17)	ns		0.25	(0.17)	ns		0.17	(0.17)	ns	
		Pakistani * Female	-0.22	(0.16)	ns		-0.37	(0.16)	0.02	-0.04	-0.15	(0.16)	ns	
		Bangladeshi * Female	0.37	(0.27)	ns		-0.11	(0.26)	ns		-0.40	(0.25)	ns	
		Chinese * Female	1.15	(0.45)	0.01	0.14	0.48	(0.47)	ns		0.72	(0.45)	ns	
		Any other ethnic origin * Female	0.58	(0.17)	<0.001	0.07	-0.02	(0.24)	ns		0.25	(0.23)	ns	
		Ethnic origin unknown * Female	-0.15	(0.21)	ns		-0.05	(0.14)	ns		0.000	(0.15)	ns	
IMD overall			-0.003	(0.002)	ns		0.000	(0.002)	ns		-0.001	(0.002)	ns	
% with no qualifications ^{&}			-0.02	(0.002)	<0.001	-0.07	-0.02	(0.002)	<0.001	-0.07	-0.03	(0.002)	<0.001	-0.08
% of lone parent families ^{&}			-0.01	(0.002)	<0.001	-0.02	-0.01	(0.002)	<0.001	-0.03	-0.01	(0.002)	<0.001	-0.03
% with own household ^{&}			0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.05
% in managerial jobs ^{&}			0.01	(0.003)	<0.001	0.03	0.01	(0.003)	<0.001	0.03	0.01	(0.003)	0.05	0.02

Table 6d: Results of multilevel model Average: Expanded Complex Value Added Model (continued)

Fixed Effects	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}	-0.05	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}	-0.05	(0.00)	<0.001	-0.10	-0.05	(0.00)	<0.001	-0.11	-0.05	(0.00)	<0.001	-0.12
% never worked & long term unemployed ^{&}	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	0.003	-0.02
% of children in school with free meals	-0.04	(0.00)	<0.001	-0.14	-0.05	(0.00)	<0.001	-0.18	-0.05	(0.00)	<0.001	-0.19
% of children in school with SEN	-0.07	(0.01)	<0.001	-0.13	-0.08	(0.01)	<0.001	-0.15	-0.02	(0.01)	ns	
Random Effects												
LA Level Variance	0.91	(0.14)	<0.001		1.12	(0.16)	<0.001		0.99	(0.15)	<0.001	
School Level Variance												
Intercept	111.60	(1.95)	<0.001		100.28	(1.83)	<0.001		109.71	(2.02)	<0.001	
Reading	0.08	(0.00)	<0.001		0.07	(0.00)	<0.001		0.09	(0.01)	<0.001	
Writing	0.09	(0.01)	<0.001		0.09	(0.01)	<0.001		0.08	(0.01)	<0.001	
Mathematics	0.08	(0.00)	<0.001		0.08	(0.00)	<0.001		0.11	(0.01)	<0.001	
Female	1.14	(0.10)	<0.001		1.06	(0.11)	<0.001		1.09	(0.11)	<0.001	
Free School Meals	3.01	(0.21)	<0.001		2.78	(0.21)	<0.001		2.74	(0.21)	<0.001	
School Level Covariance												
Intercept * Reading	-1.98	(0.07)	<0.001		-1.70	(0.07)	<0.001		-1.74	(0.08)	<0.001	
Intercept * Writing	-1.05	(0.08)	<0.001		-0.95	(0.08)	<0.001		-0.88	(0.08)	<0.001	
Intercept * Mathematics	-1.87	(0.07)	<0.001		-1.63	(0.07)	<0.001		-2.09	(0.08)	<0.001	
Intercept * Female	-0.53	(0.33)	ns		-0.59	(0.32)	ns		-0.68	(0.34)	0.04	
Intercept * Free School Meals	-0.84	(0.49)	ns		-0.79	(0.48)	ns		-0.33	(0.50)	ns	
Reading * Writing	-0.01	(0.00)	0.02		-0.01	(0.00)	0.04		-0.01	(0.00)	0.01	
Reading * Mathematics	0.02	(0.00)	<0.001		0.02	(0.00)	<0.001		0.00	(0.00)	ns	
Reading * Female	-0.04	(0.02)	0.02		-0.02	(0.02)	ns		-0.01	(0.02)	ns	
Reading * Free School Meals	-0.07	(0.02)	0.004		0.00	(0.02)	ns		-0.02	(0.02)	ns	
Writing * Mathematics	-0.01	(0.00)	<0.001		-0.01	(0.00)	<0.001		-0.01	(0.00)	ns	
Writing * Female	-0.03	(0.02)	ns		-0.01	(0.02)	ns		-0.04	(0.02)	0.02	
Writing * Free School Meals	0.07	(0.03)	0.01		0.00	(0.03)	ns		-0.01	(0.03)	ns	
Mathematics * Female	0.08	(0.02)	<0.001		0.06	(0.02)	<0.001		0.09	(0.02)	<0.001	
Mathematics * Free School Meals	0.04	(0.02)	ns		0.04	(0.02)	ns		0.03	(0.02)	ns	
Female * Free School Meals	0.00	(0.11)	ns		-0.12	(0.11)	ns		0.00	(0.11)	ns	
Pupil Level Variance	71.52	(0.15)	<0.001		74.71	(0.15)	<0.001		72.08	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Main effects for prior attainment and pupil characteristics

Prior attainment

The effects of KS1 subjects (Reading, Writing and Mathematics) were allowed to vary by school in the expanded complex value added models. Thus allowing each school to have its own measure of progress for each KS1 subject. The interpretation of these random effects is discussed at the end of the results section. In this section, the average effects of the KS1 subjects on the KS2 subjects are discussed after allowing for schools to have different rates of progress and after controlling for pupil, area and school level characteristics.

For KS2 English there is consistency across the three years 2002 – 2004 in the effects upon progress across Key Stage 2 that can be attributed to previous levels of attainment (KS1). KS1 Reading has the most powerful influence in all three years (effect sizes=1.32, 1.34 and 1.28 in 2002, 2003 and 2004 respectively). Followed by KS1 Writing (effect sizes=0.71, 0.77 and 0.80), Mathematics (effect sizes=0.54, 0.57 and 0.53) and Science. Although the effects associated with the different Science categories are not consistent across the three years. In 2002, when compared to the baseline category of Level 2 Science, small positive effects are seen for those pupils who are graded as below Level 1 (effect size=0.29) or at Level 3 or higher (effect size=0.25) and only a negligible effect for those pupils graded at Level 1 (effect size=-0.12). This pattern is repeated in 2003 and 2004, although the size of the effects change.

For all years KS1 Mathematics has the largest effect on KS2 Mathematics scores (effect sizes=1.63, 1.81 and 1.74 in 2002, 2003 and 2004 respectively). The effects of KS1 Reading and Writing are fairly consistent across the three years although their order of importance changes with some of the Science categories which have stronger effects on KS2 Mathematics in 2003 and 2004.

As with KS2 Mathematics, KS1 Mathematics has the largest effect on KS1 Science (effect sizes=0.95, 1.05 and 1.00 in 2002, 2003 and 2004 respectively). KS1 Reading also has a fairly strong and consistent effect on Science across the three years (effect sizes=0.73, 0.72 and 0.75 in 2002, 2003 and 2004 respectively). Writing was found to only have a small effect on Science scores (effect sizes=0.19, 0.19 and 0.17 in 2002, 2003 and 2004 respectively). The effect of the different KS1 Science categories varied slightly across the years. In comparison to the baseline category of Level 2 Science, small negative effects are seen for those pupils who are graded as below Level 1 in 2002 (effect size=-0.38) and 2003 (effect size=-0.25) and only a negligible effect is found in 2004. More consistent findings are found for the other Science Levels, with small negative effects found for Level 1 and small positive effects found for Level 3 or higher.

As with KS2 Mathematics and Science, KS1 Mathematics has the largest effect on the average KS1 score (effect sizes=1.35, 1.49 and 1.45 in 2002, 2003 and 2004 respectively). KS1 Reading also has a strong and consistent effect on the average score across the three years (effect sizes=0.94, 1.00 and 0.95 in 2002, 2003 and 2004 respectively). Writing was found to have a medium effect on the average score (effect sizes=0.49, 0.50 and 0.49 in 2002, 2003 and 2004 respectively). The effect of the different KS1 Science categories varied across the years. In comparison to the baseline category of Level 2 Science, below Level 1 changed from -0.13 in 2002 to 0.34 in 2004. For the other KS1 Science categories fairly consistent results were found for all three years, with small negative effects for pupils attaining Level 1 and small positive effects for Level 3 or higher.

Pupil characteristics

The effects for pupil characteristics from the models shown in Table 6 are summarised in Tables 7 & 8. In Table 7, pupil's age at the start of the academic year, English as an additional Language, free school meal (FSM) eligibility and Special Educational Needs (SEN) are presented. In Table 8, gender and ethnicity, which were found to interact, are presented separately.

Age, Language, FSM and SEN

Although pupils' age at the start of the academic year was found to be significantly related to all the KS2 subject scores across all years, with younger pupils progressing more than older pupils, the effect sizes were fairly small for KS2 Mathematics and only negligible for English, Science and the average KS2 score

Pupils who had English as an additional language scored significantly higher in KS2 English for all three years, however the effect sizes were negligible (effect sizes ≤ 0.10 for all years). Significant differences were also found for KS2 Mathematics with fairly small effect sizes (effect sizes=0.18, 0.15 and 0.18 in 2002, 2003 and 2004 respectively). English as an additional language was found to have no influence on KS2 Science scores in 2002 and 2003, and although significant in 2004, only having a negligible effect. For the average KS2 scores, English as an additional language was found to be significantly related to increased scores but with only negligible effect sizes.

The progress made by children entitled to FSM was allowed to differ between schools. So the effects reported here are the effects associated with a child attending an average school. A consistent relationship was found between free school meals status and the KS2 scores across the three years for all subjects. Pupils entitled to free school meals scored significantly lower, however the effect sizes were fairly small.

SEN status was found to be significantly related to all the KS2 subject scores for all years although the effect sizes varied by subject. For KS2 English, fairly large negative effect sizes were found for statemented pupils (effect sizes=-0.76, -0.67 and -0.61 in 2002, 2003 and 2004 respectively) and partially statemented pupils (effect sizes=-0.78, -0.77 and -0.72 in 2002, 2003 and 2004 respectively). Medium effects were found for KS2 Mathematics: -0.58, -0.34, -0.40 for statemented pupils and -0.64, -0.59, -0.61 for partially statemented pupils in 2002, 2003 and 2004 respectively. Smaller effects were found for KS2 Science: -0.28, -0.24, -0.27 for statemented pupils and -0.42, -0.42, -0.40 for partially statemented pupils in 2002, 2003 and 2004 respectively.

Table 7: A summary of the effects of pupil characteristics on progress from Key Stage 1 to Key Stage 2

Key Stage 2 Subject	Pupil Characteristics	Year		
		2002	2003	2004
English	Age	Younger pupils improved more***	Younger pupils improved more***	Younger pupils improved more***
	English as an additional Language	Native speakers improved less***	Native speakers improved less***	Native speakers improved less***
	Free School Meal Eligibility	Improved less***	Improved less***	Improved less***
	Special Educational Needs	Improved less***	Improved less***	Improved less***
Mathematics	Age	Younger pupils improved more***	Younger pupils improved more***	Younger pupils improved more***
	English as an additional Language	Native speakers improved less***	Native speakers improved less***	Native speakers improved less***
	Free School Meal Eligibility	Improved less***	Improved less***	Improved less***
	Special Educational Needs	Improved less	Improved less***	Improved less***
Science	Age	Younger pupils improved more***	Younger pupils improved more***	Younger pupils improved more***
	English as an additional Language	Non-significant	Non-significant	Native speakers improved less***
	Free School Meal Eligibility	Improved less***	Improved less***	Improved less***
	Special Educational Needs	Improved less***	Improved less***	Improved less***
Average	Age	Younger pupils improved more***	Younger pupils improved more***	Younger pupils improved more***
	English as an additional Language	Native speakers improved less***	Native speakers improved less***	Native speakers improved less***
	Free School Meal Eligibility	Improved less***	Improved less***	Improved less***
	Special Educational Needs	Improved less***	Improved less***	Improved less***

*** p < 0.001

** p < 0.01

* p < 0.05

Gender, Ethnicity and Ethnicity by Gender Interactions

The effect sizes from the expanded complex value added models presented in Tables 6a-d are summarised in Table 8. In Table 8a the effects sizes for each of the ethnic groups in comparison to the baseline category of White British and Irish by gender are shown. In Table 8b, for each ethnic group the effect size for girls compare to boys are shown. Significant variation was found between schools for gender, so the effects reported are for children attending a school that has an average gender effect.

In English, the small effects sizes in Table 8a show that Bangladeshi boys (effect sizes=0.20, 0.25 and 0.20 for 2002, 2003 and 2004 respectively) and Chinese boys (effect sizes=0.28, 0.28 and 0.22 for 2002, 2003 and 2004 respectively) do better than WBI boys. This is also true for girls (effect sizes for Bangladeshi girls=0.25, 0.28, 0.20 and for Chinese girls=0.41, 0.34, 0.29 in 2002, 2003 and 2004 respectively). White other boys in 2004 and girls in 2003 and 2004 also do better than their WBI counterparts. Small effect sizes were observed for all other ethnic groups and years.

In Mathematics, medium effect sizes were observed for Chinese boys (effect sizes=0.61, 0.61 and 0.62 for 2002, 2003 and 2004 respectively) and girls (effect sizes=0.67, 0.63 and 0.71 for 2002, 2003 and 2004 respectively). In 2003 Bangladeshi children did better (effect size for boys=0.20 and girls=0.19) but this was not observed in either 2002 or 2004. Children in the any other ethnic group category did better than WBI children in 2003 and 2004 (effect sizes for boys=0.09, 0.26, 0.27 and for girls=0.13, 0.26, 0.26 for 2002, 2003 and 2004 respectively). Caribbean boys did worse than WBI boys in all three years (effect sizes=-0.22, -0.23 and -0.26 for 2002, 2003 and 2004 respectively).

In Science, as in English and Mathematic, Chinese boys and girls did better than WBI boys and girls, although the effect size in 2003 was fairly small for boys (effect sizes for boys=0.23, 0.15, 0.26 and for girls=0.40, 0.23, 0.33 for 2002, 2003 and 2004 respectively). White other girls in 2003 and 2004 also tend to do better than WBI girls. Caribbean boys, as in Mathematics do worse than WBI boys in all three years (effect sizes=-0.26, -0.23 and -0.27 for 2002, 2003 and 2004 respectively). Only in Science do the Pakistani children score lower than WBI children (effect sizes for boys=-0.30, -0.25, -0.28 and for girls=-0.28, -0.27, -0.25 for 2002, 2003 and 2004 respectively).

When girls are compared to boys in their own ethnic group, in English (see Table 8b), a pattern on increasing effect sizes over the three years for all ethnic groups (except White Other, where the small effect seen in 2003 is slightly lower in 2004) can be seen over time. In 2002, the effect sizes are negligible, with the exception of Chinese and Caribbean girls, by 2003 and 2004 small effect sizes are seen for all ethnic groups. In Mathematics, girls do worse in all ethnic groups in comparison to boys. In Science, the pattern of effects varied by ethnic group. WBI, Pakistani, Bangladeshi and girls with ethnic origin unknown all did worse than the boys in their ethnic group for all three years. In 2002, small effect sizes can be seen for White Other, Mixed and Indian girls who scored lower than the boys in their ethnic group but this was not seen in 2003 or 2004.

Table 8a: Estimated effect sizes – comparing all ethnic groups to White British & Irish by gender

Subject	Ethnic Group	Boys			Girls		
		2002	2003	2004	2002	2003	2004
English	White other	0.08	0.14	0.19	0.10	0.20	0.18
	Mixed	0.14	0.11	0.09	0.08	0.13	0.12
	Caribbean	-0.18	-0.08	-0.12	-0.09	-0.05	-0.03
	Black African & Black Other	-0.03	0.09	0.06	0.00	0.08	0.13
	Indian	-0.02	0.02	0.07	-0.01	0.04	0.09
	Pakistani	-0.04	0.01	0.02	-0.05	0.00	0.03
	Bangladeshi	0.20	0.25	0.20	0.25	0.28	0.20
	Chinese	0.28	0.28	0.22	0.41	0.34	0.29
	Any other ethnic origin	0.07	0.18	0.12	0.11	0.17	0.17
Ethnic origin unknown	-0.03	-0.04	-0.03	-0.04	-0.02	-0.01	
Mathematics	White other	0.05	0.12	0.18	0.05	0.16	0.14
	Mixed	0.01	0.03	0.01	0.11	0.04	0.02
	Caribbean	-0.22	-0.23	-0.26	-0.13	-0.08	-0.13
	Black African & Black Other	-0.07	-0.04	-0.11	-0.01	0.07	0.01
	Indian	0.14	0.15	0.14	0.17	0.17	0.13
	Pakistani	0.01	0.04	-0.03	-0.06	-0.02	-0.09
	Bangladeshi	0.13	0.20	0.15	0.14	0.19	0.09
	Chinese	0.61	0.61	0.62	0.67	0.63	0.71
	Any other ethnic origin	0.09	0.26	0.27	0.13	0.26	0.26
Ethnic origin unknown	-0.03	0.00	-0.02	-0.04	-0.03	-0.03	
Science	White other	0.02	0.10	0.14	0.07	0.19	0.18
	Mixed	0.10	0.03	0.02	0.10	0.06	0.07
	Caribbean	-0.26	-0.23	-0.27	-0.11	-0.14	-0.14
	Black African & Black Other	-0.13	-0.14	-0.17	-0.02	-0.03	-0.03
	Indian	-0.12	-0.12	-0.13	-0.06	-0.07	-0.08
	Pakistani	-0.30	-0.25	-0.28	-0.28	-0.27	-0.25
	Bangladeshi	-0.04	0.00	-0.01	0.00	-0.04	-0.08
	Chinese	0.23	0.15	0.26	0.40	0.23	0.33
	Any other ethnic origin	0.00	0.01	0.05	0.09	0.01	0.11
Ethnic origin unknown	-0.03	-0.01	-0.01	-0.03	-0.01	-0.01	
Average	White other	0.07	0.15	0.22	0.09	0.22	0.21
	Mixed	0.09	0.06	0.04	0.13	0.09	0.07
	Caribbean	-0.27	-0.22	-0.27	-0.14	-0.11	-0.12
	Black African & Black Other	-0.08	-0.04	-0.09	-0.01	0.05	0.04
	Indian	0.02	0.04	0.04	0.06	0.07	0.06
	Pakistani	-0.12	-0.07	-0.11	-0.15	-0.11	-0.13
	Bangladeshi	0.12	0.19	0.14	0.16	0.18	0.09
	Chinese	0.48	0.45	0.49	0.62	0.51	0.58
	Any other ethnic origin	0.07	0.19	0.19	0.14	0.19	0.22
Ethnic origin unknown	-0.03	-0.02	-0.02	-0.05	-0.03	-0.02	

Table 8b: Estimated effect sizes – for girls compared to boys by ethnic group

Subject	Ethnic Group	Effect Sizes for Girls		
		2002	2003	2004
English	White British & Irish	0.12	0.24	0.30
	White other	0.14	0.30	0.29
	Mixed	0.06	0.26	0.33
	Caribbean	0.21	0.27	0.39
	Black African & Black Other	0.15	0.23	0.37
	Indian	0.13	0.26	0.32
	Pakistani	0.11	0.23	0.31
	Bangladeshi	0.17	0.27	0.30
	Chinese	0.25	0.30	0.37
	Any other ethnic origin	0.16	0.23	0.35
	Ethnic origin unknown	0.11	0.26	0.32
Mathematics	White British & Irish	-0.32	-0.41	-0.31
	White other	-0.32	-0.37	-0.50
	Mixed	-0.22	-0.40	-0.30
	Caribbean	-0.23	-0.26	-0.18
	Black African & Black Other	-0.26	-0.30	-0.19
	Indian	-0.29	-0.39	-0.32
	Pakistani	-0.39	-0.47	-0.37
	Bangladeshi	-0.31	-0.42	-0.37
	Chinese	-0.26	-0.39	-0.22
	Any other ethnic origin	-0.28	-0.41	-0.32
	Ethnic origin unknown	-0.33	-0.44	-0.32
Science	White British & Irish	-0.25	-0.20	-0.22
	White other	-0.20	-0.11	-0.18
	Mixed	-0.25	-0.17	-0.17
	Caribbean	-0.10	-0.11	-0.09
	Black African & Black Other	-0.14	-0.09	-0.08
	Indian	-0.19	-0.15	-0.17
	Pakistani	-0.23	-0.22	-0.19
	Bangladeshi	-0.21	-0.24	-0.29
	Chinese	-0.08	-0.12	-0.15
	Any other ethnic origin	-0.16	-0.20	-0.16
	Ethnic origin unknown	-0.25	-0.20	-0.22
Average	White British & Irish	-0.21	-0.19	-0.14
	White other	-0.19	-0.12	-0.15
	Mixed	-0.17	-0.16	-0.11
	Caribbean	-0.08	-0.08	0.01
	Black African & Black Other	-0.14	-0.10	-0.01
	Indian	-0.17	-0.16	-0.12
	Pakistani	-0.24	-0.23	-0.16
	Bangladeshi	-0.17	-0.20	-0.19
	Chinese	-0.07	-0.13	-0.05
	Any other ethnic origin	-0.14	-0.19	-0.11
	Ethnic origin unknown	-0.23	-0.20	-0.14

Area of Child Residence

In looking at the possible influence of the characteristics of where a child lives, a wide range of variables was initially considered. The variables included in the models here are the overall Index of Multiple Deprivation (IMD) plus a range of census variables indicating the percentage of the population who are lone parents, owner-occupiers, or in various occupational classifications.

The effects were similar for all subjects. The IMD did not produce any significant effects, except for a very small, marginally significant effect for Science progress in 2004 only, this reflects the fact that census-derived variables were having a stronger effect and therefore suppressed any IMD effect. All of the other variables (derived from the census) produced small size significant effects. All of these variables in some way reflect aspects of a continuum of deprivation for an area. The pattern of all the effects is consistent with an explanation that the more deprived the area in which a child resides the less progress will be made. All of these variables are correlated with each other and the sum of their small individual effects will be greater than that indicated for each individual variable.

School composition

In the expanded complex value-added models, the variables reflecting school composition are the percentage of children eligible for free school meals (FSM), percentage of children with special educational needs (SEN). In all subjects both of these variables show significant effects. The greater the percentage of children eligible for FSM, or having SEN within a school the poorer children's progress will be.

In English both % FSM and % SEN are statistically significant, however the effect sizes for % FSM are fairly small (effect sizes=-0.17, -0.15, -0.15 for 2002, 2003 and 2004 respectively) and negligible for % SEN (effect sizes=-0.06, -0.10, -0.02 for 2002, 2003 and 2004 respectively). In Mathematics a similar pattern is repeated, except that % SEN is non-significant in 2004. A slightly different pattern is shown in Science. The level of statistical significance is consistent for both school level variables across the years, however the effect sizes are not. The size of the effect for % FSM increases over time from negligible until it approaches small (effect sizes=-0.08, -0.13, -0.15 for 2002, 2003 and 2004 respectively), while % SEN reduces from a fairly small effect size in 2002 and 2003 to negligible in 2004 (effect sizes=-0.13, -0.14, -0.03 for 2002, 2003 and 2004 respectively)

Interpretation of random effects in the final models

Consider a simplified model containing just an intercept and the Reading variable, with the intercept random across LA and school and the slope of the Reading variable also random across schools. Algebraically this would be written as

$$y_{ijk} = \beta_0 + \beta_1 \text{reading}_{ijk} + v_{0k} + u_{0jk} + u_{1jk} \text{reading}_{ijk} + e_{0ijk}$$

where y_{ijk} is the KS2 result for pupil i , in school j , in LA k .

At the school level there are two residuals. u_{0jk} is the overall school effect – the residual from the overall intercept. u_{1jk} is the deviation from the slope for school j in LA k ; the change in outcome for a unit increase in the Reading score for a pupil in this school is given by $\beta_1 + u_{1jk}$.

The residuals u_{0jk} and u_{1jk} have corresponding variances σ_{u0}^2 and σ_{u1}^2 respectively. These indicate the distribution of the intercepts and slopes for each school around the averages. But the two residuals for each school are also related through a covariance σ_{u01} . The covariance indicates the tendency for the slope to be steeper when the intercept is higher (a positive covariance – diversion) or for the slope to be shallower when the intercept is higher (a negative

covariance – conversion). The third possibility is for there to be no covariance – the relationship between intercepts and slopes is random.

In the example for Key Stage 2 English in 2002 (see Table 6a):

- The significant effect of school level variance associated with KS1 reading, Writing, and Mathematics, as well as FSM and gender indicates that schools vary in their effects depending upon how pupils vary on these characteristics.
- The intercept corresponds to the KS2 English scores for a pupil with average KS1 scores (after eliminating the effects for all other variables in the model). Considering the school level covariances between the intercept and pupil characteristics, the mean intercept is 24.64 with variance 79.17 (i.e. s.d.= 8.90), and the mean slope is 1.25 with variance 0.07 (s.d. = SD 0.26). So 95% of schools have intercepts somewhere between 7.20 and 42.08, and 95% have slopes between 0.73 and 1.77.

Figure 5: Examples of relationships for KS1 Reading and KS2 outcomes for schools

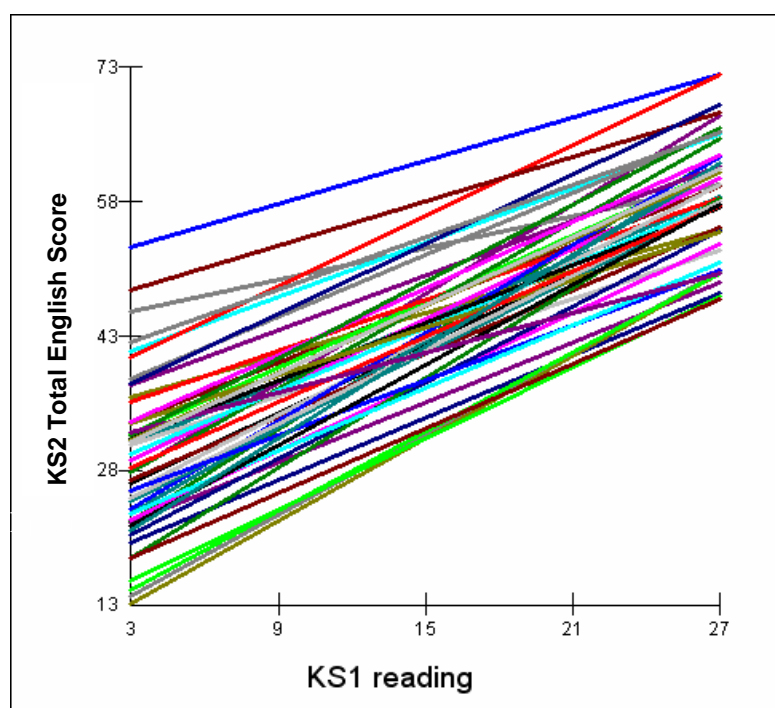


Figure 5 above is illustrative (for 50 schools) of the nature of differential effectiveness within schools for children of different levels of initial (KS1) ability. Each line represents the relationship within a school of KS1 score to KS2 score (eliminating the effects for all variables in the model) for the pupils of that school.

- The covariance between the residuals for the intercept and Reading is -1.62. This equates to a correlation of $-1.62/\sqrt{(79.17*0.07)} = -0.69$. So schools with higher intercepts tend to have shallower slopes, whilst those with lower intercepts tend to have higher slopes. Figure 5 above illustrates how this relationship might look for 50 schools generated from these parameters. Each line represents the mean performance for a school for a given Reading level. The negative covariance results in there being less variation between schools when pupils' Reading scores are high than when they are low. The fact that the lines tend to cross each other suggests that the relative position of schools – which achieve “better” results – will vary according to the pupil's initial ability (in this case measured by the KS1 Reading score). The schools that do better for pupils with lower Reading scores (schools with high intercepts) do not necessarily perform as well for pupils with higher Reading scores. The shallower slope means that the effect of the Reading score on the outcome tends to be smaller at schools with high intercepts (schools that do better for pupils with low Reading scores).

- Similar patterns emerge for the covariances between intercept and other pupil characteristics, except that involving FSM is non-significant.
- Similar patterns emerge for KS2 English in 2003 and 2004.

This is a simplification since in the fitted models there is evidence of the relationship between a further 4 individual level variables (Writing, Mathematics, female and free school meals) varying at random across schools. This makes for a further 4 variances and another 14 covariances.

Looking at models across years for Key Stage 2 Mathematics and Key Stage 2 Science similar patterns emerge involving the covariance between school level intercept and KSI reading, Writing, Mathematics and average score, but for covariance involving FSM and gender significant effects are intermittent.

What does this mean for school effectiveness?

The shallow slopes of the highly effective schools could be brought about by either a relative boosting of KS2 scores of low ability (low KS1 score) pupils or a relative suppression of the KS2 scores of high ability (high KS1 scores) pupils. The correlation between a schools average KS2 attainment and the school effectiveness scores derived from the models in this report are 0.44 - 0.55 for English, 0.47 – 0.53 for Mathematics and 0.52 - 0.63 for Science. Hence it is clear that more effective schools achieved higher KS2 results. This is consistent with the view that if such schools were suppressing pupils' scores then they would not be highly effective. Hence, the conclusion is that they are highly effective through their relatively greater boosting of the KS2 achievement of lower ability pupils. Conversely, the steeper slopes of the less effective schools could be brought about by the relative suppression of the KS2 scores of low ability pupils or the relative boosting of the KS2 scores of high ability children. If such schools were boosting (relative to other schools) pupils' achievement they would not be less effective. Hence the conclusion is that they are producing a relative suppression of the ability of the low ability pupils. Overall, the message is that being in a highly effective versus an ineffective schools matters much more to low ability pupils than high ability pupils, and that differential effects for low ability pupils is a major factor in differences in effectiveness.

Comparisons of school effectiveness across subjects

The correlations between school residuals derived from the expanded complex value added model for English, Mathematics, Science and average score are shown in Table 9 by year.

Table 9: Correlations of school residuals by subject within each year

	2002	2003	2004
English with maths	0.66	0.57	0.56
English with Science	0.62	0.54	0.53
Maths with Science	0.72	0.72	0.74
English with average	0.82	0.79	0.78
Maths with average	0.91	0.91	0.91
Science with average	0.89	0.87	0.88

There is a clear tendency in all years for schools that are effective in one subject to also be effective in the other two subjects. The correlations between Mathematics and Science are clearly greater (0.72 – 0.74) than those between English and either Mathematics (0.56 – 0.66) or Science (0.53 – 0.62). Unsurprisingly all individual subjects show substantial correlations with the average score, of which they are components. Mathematics shows the strongest association with average score (0.91 in all years) followed by Science (0.87 – 0.89) and then English (0.78 – 0.82).

The degree of association between effectiveness in the three subjects does indicate that primary schools vary substantially in their relative effectiveness, as measured in the models in this report, in different subjects.

Stability of school effectiveness across years

The degree of stability of school effectiveness across years was measured with correlations between school residuals for each subject across years. These correlations are shown in Table 10.

Table 10: Stability of school residuals across years by subject

English	2003	2004
2002	0.37	0.29
2003	-	0.32
Mathematics		
2002	0.55	0.42
2003	-	0.56
Science		
2002	0.54	0.45
2003	-	0.55
Average score		
2002	0.56	0.44
2003	-	0.56

The stability across years is always weaker for English than other subjects. The stability across 1 year is always better than across 2 years, which is unsurprising as more change will have occurred. For English stability across 1 year is 0.32-0.37 and across 2 years 0.29. For Mathematics, Science and average score the stability is very similar, being 0.54-0.56 for one year and 0.42 to 0.45 for 2 years. However this level of stability does indicate that in all subjects, but particularly in English, there is considerable instability in primary schools' levels of effectiveness.

Distribution of school level residuals (effectiveness)

From the final models derived in this report, the school level residuals have been extracted for each school as a measure of school effectiveness for English, Mathematics, Science and average score for 2002, 2003 and 2004. These school effectiveness scores are on a CD ROM – taken from the models in Appendix 3, Table 13. The school effectiveness scores shown normal distributions and histograms of examples of these school effectiveness scores are shown in Appendix 4.

Summary and Discussion

This report concerns the development of value-added models for children's progress over Key Stage 2 in primary schools in England. The analyses used answer the question 'What affects pupils' progress over Key Stage 2 in primary school?'

In analysing progress, predictor variables are used that might explain progress in addition to measures of children's ability at the start of Key Stage 2, i.e. measures of their Key Stage 1 attainment. There are consequences of this strategy for value added models of progress.

- The child's level of functioning as measured by Key Stage 1 attainment will absorb the effects of several child, parent, family, home and area factors, where their effects do not persist additively over the Key Stage 2 period. Hence the relative importance of these factors may appear substantially less than would be the case in analysis of attainment at the end of Key Stage 2, where Key Stage 1 scores are not used in the models.
- Where children are not showing high levels of attainment in relation to their age in Key Stage 1 assessments, there is more scope for progress for such children. Hence such children may show bigger progress effects, without necessarily showing high attainment at the end of Key Stage 2.

In all the models developed, regardless of subject or year, the prior attainment of the pupils, as measured by Key Stage 1 assessments, is an important contributor to their performance in Key Stage 2 assessments. With one Key Stage 1 subject having the greatest contribution for each subject consistently across the years. Key Stage 1 performance in Reading is most important for predicting Key Stage 2 English performance, but for Mathematics, Science and the average score, Key Stage 1 performance on Mathematics is the most powerful predictor. Relative to Key Stage 1 Reading, Writing and Mathematics, the effect of Key Stage 1 Science was inconsistent across the years and tended to have lower effect sizes, even for Science itself. The Key Stage 1 Science assessment is entirely a teacher rating and possibly the unstandardised nature of the assessment contributes to its lack of consistency and predictive power. Alternatively, the Science undertaken in Key Stage 1 may be too little or fragmented to produce a more useful assessment at the end of Key Stage 1.

The powerful effects of prior attainment in predicting Key Stage 2 attainment will have consequences for the effects to be attributed to other variables such as pupil characteristics. In this report the effects for other variables can be regarded as effects on progress across the Key Stage 2 period as Key Stage 1 attainment is included in the models. As Key Stage 1 attainment will absorb much of the effects of other variables upon school attainment the effects of other variables is likely to be substantially less than if the models focussed on the contribution of other variables in predicting *attainment* at Key Stage 2 rather than *progress* across Key Stage 2.

With regard to other pupil characteristics, pupils who are younger in their school year consistently, across subjects and years, show better progress, although the effect sizes indicate that there is only a small effect in Mathematics and a negligible effect in all other subjects. It would appear that the younger pupils are narrowing the gap with their older classmates.

Pupils for whom English is an additional language (EAL), consistently for English, Mathematics, and the average score, show significantly better progress than native speakers of English. However, the effect sizes are negligible for English and the average score and only small for English. For Science this effect is only significant for one year with a negligible effect, indicating that the effect is much weaker for Science. As these pupils may well be starting from a lower base, and are not reaching higher attainment at KS2, this finding reflects a narrowing of the gap between EAL pupils and native speakers. This interpretation is congruent with results produced by DfES (2005c, 2006).

Whether pupils are eligible for free school meals can be regarded as a marker for family poverty. The effect on children who are eligible for free school meals varied significantly between schools, with the effect of FSM status being reported for a child attending an average school. This marker for poverty consistently predicts poorer progress in Key Stage 2 for all subjects across years. These effects are not large (range -0.10 to -0.17 in effect size) being slightly less for Mathematics than for the other subjects. The pupils eligible for free school meals are attaining lower KS2 attainment so the gap is widening. These results are congruent with results produced by DfES (2005c, 2006), and also consistent with KS2 attainment shown in Table 4.

Where pupils have a special educational need (SEN) they show substantially less progress across all subjects in all years, and this result is also reported by DfES (2005c, 2006) for 2004 and 2005. The effect is greater for English and the average score but is very substantial for all subjects. Thus the gap between SEN pupils and non-SEN pupils is widening.

There are consistent gender effects in Key Stage 2 attainment, as shown in Tables 4a-d, whereby girls attain better in English overall and girls also do better than boys when compared across different pupil characteristics (age, EAL FSM, SEN and ethnicity). While in Mathematics boys attain better except for the two Black ethnic groups where girls are better or equal to boys. In Science there is no clear pattern of gender difference in attainment.

The progress girls made from Key Stage 1 to 2 varied significantly between schools for all subjects and for all years. In English, over the three years girls did increasingly better than boys in each ethnic group. Small effect sizes for the Bangladeshi and Chinese boys and girls indicate that they are progressing more than WBI boys and girls, respectively, in all years, and White Other children show small effects in 2003 and 2004. The children in the Caribbean, Black African and Black Other, Indian, Pakistani, Mixed, any other ethnic origin and ethnic origin unknown groups were, in general, comparable to the WBI children of the same gender.

In Mathematics, the effect sizes show that boys do better than girls consistently for all three years and in all ethnic groups. Chinese children do better than WBI children in all three years, children in the any other ethnic origin group do better than in 2003 and 2004 and Bangladeshi children only do better in 2003. Caribbean boys do worse than WBI boys, while Caribbean girls are comparable to WBI girls. The children in the other ethnic groups were found to be comparable to the WBI children of the same gender.

In Science the pattern for girls compared to boys within ethnic group was not so consistent. WBI, Pakistani, Bangladeshi and girls with ethnic origin unknown had effect sizes showing that their progression was below that of the boys in the same ethnic group for all three years. In 2002, White Other, Mixed and Indian girls all did worse. The effect sizes for the other ethnic groups and years when comparing girls' progress to boys was negligible. Chinese pupils also tended to do better in science than WBI pupils, as did the Pakistani pupils in all three years. White Other girls did better than WBI girls in the last two years. Caribbean boys did worse than WBI boys in all three years.

The gender effects are consistent across years and in the moderate to large effect size range, being most powerful in Mathematics, indicating that they are important in understanding pupils' educational performance. Similar gender differences in progress have been reported in other research. An example is Strand (1999) who considered pupil progress for the baseline to Key Stage 1 period and found that girls showed more progress in Reading and Writing and boys more progress in Mathematics. Also the effects reported here are consistent with the gender differences in Key Stage 2 attainment reported by DfES (2005a, 2005b) for 2002 through to 2005 where girls consistently do better overall in English and related subjects, boys do better in Mathematics and the genders are equivalent for Science. However, when considering progress from Key Stage 1 to Key Stage 2 rather than attainment, the effects of gender do vary between ethnic groups, and also sometimes by subject, as indicated by the ethnic group by gender interactions.

Overall the results for ethnic group differences are compatible with data on attainment. DfES (2005c) have summarised the educational achievement of different ethnic groups in England for 2003/4 for Key Stages 1, 2, 3, and 4 (ages 7, 11, 14 and 16). Pupils of Chinese and Indian origin show high levels of attainment relative to the average. However, pupils of Black Caribbean, Pakistani and Bangladeshi origin do worse than the average. In terms of progress across the Key Stages, the same report indicates that progress for Bangladeshi and Black African pupils is greater than the average across Key Stage 2 and across Key Stage 4. Pakistani pupils also show greater improvement across Key Stage 4. Pupils from Chinese, Indian and "Any other ethnic origin" backgrounds show greater improvement across each of the Key Stages. However, pupils from White, Black Caribbean and Black Other ethnic backgrounds show lower progress than the national average.

The results associated with the interactions between gender and ethnic background lead to qualifications being placed upon the differences in progress associated with ethnic group. Note that in all ethnic groups Key Stage 2 attainment in English is better for girls than boys, whereas attainment in Mathematics and Science is very similar. This report has analysed progress rather than attainment. For some ethnic groups there are significant differences between the performance of girls and boys. DfES (2006) refers to girls consistently outperforming boys in all of the minority ethnic groups over Key Stages 1 to 4. Currently this is certainly true for GCSE overall attainment. The results reported here, which are for progress rather than attainment, partially confirm such a view but indicate that the nature of ethnic by gender interactions require a rather more nuanced approach. Also possibly the effects associated with ethnic groups may be changing with different cohorts of children working their way through school.

Most research on ethnic differences in educational attainment has focussed on secondary schooling, and suggests possible reasons for the observed effects. Wilson, Burgess and Briggs (2005) find evidence that all ethnic minorities are making greater progress in secondary schools than White students. The explanations of the differences associated with ethnic background are various. Bradley & Taylor (2004) find that non-school factors may be important. For example, they find that the performance of Non-White pupils is more adversely affected by living in a single-parent household. Modood (2003) has argued that gender norms and cultural expectations play an important role and that many South Asians have high educational aspirations that are not constrained by social class in the way that they are in traditional White British culture. Yet other factors discussed by Cook and Ludwig (1998) and Modood (2003) refer to the fear of "acting white" that may discourage academically able black pupils from putting much effort into school work. Further exploration of the interactions between ethnicity and area characteristics using national data on school achievement may be one way to investigate some alternative explanations for ethnic group differences in educational achievement. Different cultural norms for gender, as suggested by Modood (2003, 2005), may partly explain the differential gender effects for the Black, Indian and Pakistani ethnic groups. Black ethnic groups show fairly consistent better progress for girls, Indian girls show better progress for Science yet Pakistani boys show better progress for Mathematics.

Gender differences may well vary by social class groups. Further investigation of interactions between gender and eligibility for free school meals, or between gender and area characteristics may throw further light on this issue.

There are consistent small effects associated with the characteristics of the area in which a pupil resides. These effects of area of residence indicate the effects of level of deprivation. Primary schools typically have distinct catchment areas hence the school composition effects can also be interpreted as reflecting the effect of area deprivation. Often the measure used in analyses of school effectiveness is the overall Index of Multiple Deprivation (IMD) or the Index of Deprivation Applied to Children (IDAC). Analyses using these indicators were undertaken and they showed similar effects (but less powerful) of area deprivation to those described in this report. However this report also tested census-derived measures of area deprivation and these revealed slightly stronger effects than the IMD or IDAC measures. When census-derived deprivation measures and the overall IMD index are used in the same models, the lack of effect for the overall IMD

index may well be a consequence of its co-linearity with the census-derived measures of area relative affluence, and also possibly with the school composition measures. Further exploration of the contribution of the component domains of the Index of Multiple Deprivation; i.e. income, employment, health, education, housing, environment and crime may further elucidate possible area effects upon educational achievement. Newer, commercially derived descriptions of area types, e.g. ACORN and MOSAIC may also be worth using in further exploration of area effects, and some work using ACORN has been indicated by DfES (2006). These latter types of area classification include cultural as well as economic and disadvantage aspects of communities and may provide a perspective on area influences rather different from deprivation-based measures of communities. Also the data and technology are now available to investigate the possible impact of Area-Based Initiatives, e.g. Education Action Zones either individually or in concert upon school effectiveness, and further research is needed here.

When considering these area/community level measures of deprivation it is not entirely clear whether this is deprivation at the individual family level or deprivation at the community level that is influencing the individual pupil. While the data analytic models include individual pupil characteristics there is much variation in family circumstance that is not captured. Hence the area measures may reflect aspects of the individual pupil's family as well as aspects of the area of residence because particular types of family are more likely to live in particular types of area.

The analysis of school level measures of effectiveness across subjects and across years indicates some consistency and stability but also that there is considerable variation and change amongst schools in their degree of effectiveness across subjects and across years. In particular measures involving English seem open to most variation and instability.

The analysis of random effects within the expanded complex value added models reveals that there are marked differences in the amount of progress that schools produce dependent upon the level of initial ability of pupils. The difference in the consequences for level of progress of being in a school that is dependent upon the initial level of ability of a pupil can be termed differential effectiveness. The level of differential effectiveness is markedly different for different primary schools. This phenomenon has been described and discussed in the literature on secondary schools (e.g. Goldstein & Thomas, 1996; Sammons, 1996; Thomas, Sammons, Mortimore & Smees, 1996) but not in the literature on primary schools. In this sense the description of differential effectiveness for primary schools is a first for this report. The analysis reveals that overall measures of school effectiveness (value-added) are associated with the differential effectiveness within a school. This comes about because those schools with higher overall effectiveness produce a relatively greater boost to low ability pupils than to high ability pupils and that this differential boost is greater for the overall more effective schools. This is not a tautology. Rather it indicates that effective schools are particularly successful with their lower ability pupils than are less effective schools. While differences are also present between relatively effective and ineffective schools for high ability pupils they are less marked than for the low ability pupils. The consequences of differential effectiveness are that while all children benefit from being in an effective primary school rather than an ineffective one (in terms of contextualised pupil progress), the consequences are considerably greater for low ability children than for high ability children.

The differential effectiveness in theory could be the consequence of a ceiling effect upon the KS2 scores which limits the amount of progress measurable for high ability pupils. However while there is some skew in the KS2 scores suggesting lower differentiation of scores at the top end, this skew does not seem adequate to explain the differential effectiveness results. Also the differential effectiveness applies in comparisons of low ability with average ability (on basis of KS1 scores). The ceiling effect explanation cannot account for this. Hence this would not seem to be an adequate explanation of the differential effectiveness phenomenon.

The analysis of differential effectiveness for primary schools strongly suggests, but does not prove, that a major differentiating feature between effective and ineffective schools (in terms of contextualised pupil progress) resides in their degree of success with low ability children in

particular. In a perfect world with perfectly effective primary schools, initial differences in pupil ability would be overcome by the end of primary school as far as inherent pupil constitution and potential would allow, i.e. initial differences would “wash out”. The most effective schools are moving in this direction. However this report cannot distinguish what characteristics produce differences in effectiveness between schools, as it was not designed for this purpose.

Appendix I

The KS1 subject levels were converted into points using values assigned by the DfES. These values are shown in the table below and are described on the government website: http://www.dfes.gov.uk/performance/tables/primary_03/p5.shtml.

Table 11: Conversion Table - Key Stage 1 Point Scores

Subject	Level	Points
Reading	Working towards Level 1	3
	Level 1	9
	Level 2c	13
	Level 2b	15
	Level 2a	17
	Level 3	21
	Level 4+	27
	Not required to take test	missing
	Absent	missing
Disapplied	missing	
Writing	Working towards Level 1	3
	Level 1	9
	Level 2c	13
	Level 2b	15
	Level 2a	17
	Level 3	21
	Level 4+	27
	Absent	missing
	Disapplied	missing
Mathematics	Working towards Level 1	3
	Level 1	9
	Level 2c	13
	Level 2b	15
	Level 2a	17
	Level 3	21
	Level 4+	27
	Absent	missing
	Disapplied	missing

Appendix 2: The results of the four models for each subject for each year.

The results are presented in Table 12 as follows:

Table 12ai:	Results of all models	English: 2002
Table 12aii:	Results of all models	English: 2003
Table 12aiii:	Results of all models	English: 2004
Table 12bi:	Results of all models	Mathematics: 2002
Table 12bii:	Results of all models	Mathematics: 2003
Table 12biii:	Results of all models	Mathematics: 2004
Table 12ci:	Results of all models	Science: 2002
Table 12cii:	Results of all models	Science: 2003
Table 12ciii:	Results of all models	Science: 2004
Table 12di:	Results of all models	Average: 2002
Table 12dii:	Results of all models	Average: 2003
Table 12diii:	Results of all models	Average: 2004

KS1 Subjects

English

In 2002, in the simple value added model all the KS1 subjects significantly predict KS2 English scores. Reading at KS1 has the largest influence on KS2 English scores (effect size=1.47), followed by writing (effect size=0.83), mathematics (effect size=0.54) and science. The effect sizes for each of the science grades are small compared to those of reading and writing. In the complex value added models, the influence of the KS1 subjects remain significant and the order of influence of individual subjects remains the same. In the expanded complex value added model, all the KS1 subjects remain significant but the effect size of writing becomes negligible. In 2003 and 2004, the same pattern is repeated, with large effect sizes for KS1 reading and writing, medium effect size for mathematics and smaller effects for science in the simple and complex value added models. However, unlike for 2002, in the expanded complex value added model the effect of writing remains as influential. In this final model the effect of KS1 reading, writing and mathematics is allowed to vary between schools. This means that pupils entering different schools with the same KS1 scores are not assumed to have the same progression in their KS2 subjects. For all three KS1 subjects and in all three years this was found to be true.

Mathematics

In 2002, all KS1 subjects significantly predict outcome in mathematics score at KS2. In the simple value added model, KS1 mathematics has the largest effect (effect size=1.6) with a moderate effect for reading (effect size=0.53) and a smaller effect for writing (0.34). The influence of science varies, with effects sizes of 0.09 for pupils assessed at scoring below level 1 in science (compared to those assessed at level 2), -0.31 for pupils assessed at Level 1 and 0.21 for pupils assessed Level 3 or higher. In the complex value added model the pattern of effect sizes remains the same for mathematics, reading and writing, with all the science effect sizes increasing or decreasing to 0.2. The same pattern remains in the expanded complex value added model with the exception of the influence of KS1 science scored below level 1 which has a negligible effect size (effect size 0.14). In 2003 and 2004, a similar pattern was observed with KS1 mathematics

having the strongest influence on KS2 mathematics scores, followed by the smaller effects of reading and writing, and with the effect sizes of science varying slightly depending on the model type. As with KS2 English, the effects of KS1 reading, writing and mathematics were found to vary between schools.

Science

In 2002, all KS1 subjects were significantly related to KS2 science scores, with mathematics having the strongest influence (effect size=0.98, in the simple value added model) in all models. Reading also had a strong influence (effect size=0.78, in the simple value added model). Writing was found to only have a small effect (effect size=0.20 in the simple value added model). The effect of KS1 science was consistently stronger for KS2 science than it had been for either English or mathematics. In 2003, the same order of effect sizes were found in all three models. This was also found in 2004, with the exception of pupils scoring below level 1 in KS1 science which was found not to be related to KS2 science scores in the complex and expanded complex value added models. The effects of KS1 reading, writing and mathematics were found to significantly vary between schools in their influence on KS2 science scores.

Average

In 2002, all KS1 subjects significantly predict the average score. The effect of mathematics is the strongest predictor followed by reading and writing. The science categories have a moderate to negligible effect on the average score depending on model type and category. In 2003 and 2004, the same pattern of effects were found, with the science categories varying between small to moderate effects. The influence of the KS1 subjects were found to vary between schools for reading, writing and mathematics.

Pupil Characteristics

In this section, the influence of pupil characteristics in the complex value added models are considered. The description of these characteristics in the expanded complex value added models are in the results section.

English

All of the pupil characteristics, with the exception of some of the ethnic groups, were found to be significantly related to KS2 English scores in 2002, 2003 and 2004. The effect sizes for the pupil characteristics were much smaller in magnitude in comparison to the majority of those estimated for prior achievement. SEN status was found to have the largest influence on English scores, with pupils receiving lower scores if they were statemented (effect size=-0.77 in 2002) or partially statemented (effect size=-0.75 in 2002) in all three years. Small effect sizes were found for pupils receiving free school meals (effect size=-0.19 in 2002) in all three years. The effect size relating to being female increased over time from 0.12 in 2002 to 0.30 in 2004. The effects of age at the start of the academic year and English as an additional language were negligible. Compared to the white British and Irish pupils, only the Bangladeshi (effect size=0.21 in 2002) and Chinese (effect size=0.34 in 2002) pupils had small to moderate effect sizes in all three years. The effect size for the white other category increased from negligible in 2002 (effect size=0.10) to small in 2004 (effect size=0.19). While the effect sizes are negligible for the black African and other black pupils in comparison to white British and Irish pupils, there was a change over time. In 2002, black African and other black pupils did significantly worse than white British and Irish pupils ($p=0.01$), while in 2003 and 2004 these pupils did significantly better ($p<0.001$ for both years). This same pattern was also found for the Indian and Pakistani pupils in comparison to the white

British and Irish pupils although significant differences were not always found for each year. Pupils in the mixed, Caribbean or ethnic origin unknown categories were found to be statistically significantly different from the white British and Irish pupils, with negligible effect sizes of the same magnitude across the three years, with only the pupils with mixed ethnicity scoring higher.

It should be noted that the parameter estimates of pupil characteristics change in magnitude over time, even though many of the effect sizes are comparable in magnitude and this would influence the value of the intercept over time.

Mathematics

As for English, all the pupil characteristics were statistically significant, with the exception of a couple of ethnicity categories. SEN status had the largest effect sizes, -0.58 for statemented pupils and -0.63 for partially statement pupils in 2002. Whilst for KS2 English female pupils had done significantly better than males and with increasing effect sizes over time, females can be seen to be doing significantly and consistently worse over time with small effect sizes estimated. Small effect sizes were also shown for those pupils who have English as an additional language (effect size=0.18 in 2002) with these pupils consistently scoring higher over the three years. Although statistically significant, age at the start of the academic year and free school meal eligibility only had negligible effect sizes. Chinese pupils scores significantly and consistently higher than the white British and Irish pupils with moderate effect sizes (effect size=0.6 all three years). The effect size for the white other category increased from negligible in 2002 (effect size=0.06) to small in 2004 (effect size=0.17). In all three years, pupils with any other ethnic origin scored significantly better than white British and Irish pupils, however, only a negligible effect size was observed in 2002 (effect size=0.10) and only small effect sizes in 2003 and 2004 (effect size=0.25 both years). Pupils in the Caribbean ethnic group were found to score significantly lower than the white British and Irish pupils, with small effect sizes of the same magnitude across the three years (effect size=-0.19 in 2002). The Indian pupils scored consistently higher in all three years (effect size=0.15 in 2002) with a fairly small effect size observed. Black African and other black, Pakistani, Bangladeshi, mixed and ethnic origin unknown pupils had negligible effect sizes in all three years.

Science

All the pupil characteristics were statistically significant, with the exception of English as an additional language in 2002 and 2003 and for all years some ethnicity categories. SEN status had the largest effect sizes, -0.41 for statemented pupils and -0.29 for partially statement pupils in 2002. As with KS2 Mathematics, female pupils do significantly worse than males in KS2 Science with small effect sizes estimated for all three years (effect size=-0.24 in 2002). A small negative effect was found for those pupils who receive free school meals for all three years (effect size=-0.21 in 2002). Although statistically significant, age at the start of the academic year only had negligible effect sizes for all three years. Chinese pupils scores significantly higher than the white British and Irish pupils in all three years, small effect sizes are only observed in 2002 and 2004 (effect size=0.3, 0.12, 0.28 in 2002, 2003 and 2004 respectively). The effect size for the white other category increased from negligible in 2002 (effect size=0.05) to approaching a small effect in 2004 (effect size=0.16). Pupils in the Caribbean and Pakistani ethnic groups were found to score significantly lower than the white British and Irish pupils, with small effect sizes of the same magnitude across the three years (effect sizes=-0.19 for the Caribbean group and -0.30 for the Pakistani group in 2002). Black African and other black, Indian, Bangladeshi, mixed, any other ethnic origin and ethnic origin unknown pupils had negligible effect sizes in all three years.

Average

All the pupil characteristics were statistically significant, with the exception of an ethnicity category in 2002 and 2003. SEN status had the largest effect sizes, -0.88 for statemented pupils and -0.74 for partially statement pupils in 2002. Female pupils do significantly worse than males for the average KS2 score with a small effect sizes reducing over time (effect sizes=-0.20 in 2002, -0.14 in 2004). A small negative effect was found for those pupils who receive free school meals for all three years (effect size=-0.22 in all three years). Although statistically significant, age at the start of the academic year and English as an additional language only had negligible effect sizes for all three years. Chinese pupils score significantly and consistently higher than white British and Irish pupils in all three years (effect size=0.52 in 2002). The effect size for the white other category increased from negligible in 2002 (effect size=0.08) to a small effect in 2003 and 2004 (effect sizes=0.19 and 0.22 respectively). Pupils in the Caribbean ethnic group were found to score significantly lower than the white British and Irish pupils, with small effect sizes of the same magnitude across the three years (effect size=-0.20 in 2002). The effect size for the any other ethnic origin category increased from negligible in 2002 (effect size=0.09) to small in 2004 (effect size=0.19). Black African and other black, Indian, Pakistani, Bangladeshi, mixed and ethnic origin unknown pupils had negligible effect sizes in all three years.

Table 12ai: Results of all models English: 2002

Fixed Effects				Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
				Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept				59.74	(0.18)	<0.001		13.89	(0.13)	<0.001		21.38	(0.14)	<0.001		24.64	(0.25)	<0.001	
Reading								1.48	(0.01)	<0.001	1.47	1.27	(0.01)	<0.001	1.31	1.25	(0.01)	<0.001	1.32
Writing								0.98	(0.01)	<0.001	0.83	0.78	(0.01)	<0.001	0.69	0.79	(0.01)	<0.001	0.10
Mathematics								0.62	(0.01)	<0.001	0.54	0.6	(0.01)	<0.001	0.54	0.58	(0.01)	<0.001	0.54
Science				<Level 1				2.48	(0.19)	<0.001	0.27	2.86	(0.19)	<0.001	0.33	2.45	(0.20)	<0.001	0.29
				Level 1				-1.8	(0.05)	<0.001	-0.2	-0.95	(0.05)	<0.001	-0.11	-0.99	(0.05)	<0.001	-0.12
				Level 3+				1.55	(0.04)	<0.001	0.17	2.25	(0.04)	<0.001	0.26	2.12	(0.04)	<0.001	0.25
Age at Start of Academic year [†]												-0.14	(0.00)	<0.001	-0.11	-0.13	(0.00)	<0.001	-0.11
Female												1.08	(0.03)	<0.001	0.12	1.05	(0.03)	<0.001	0.12
English as an additional Language												0.73	(0.09)	<0.001	0.08	0.64	(0.09)	<0.001	0.08
Free School Meal Eligibility (FSM)												-1.69	(0.04)	<0.001	-0.19	-1.23	(0.04)	<0.001	-0.15
SEN												-6.68	(0.11)	<0.001	-0.77	-6.44	(0.11)	<0.001	-0.76
SEN other												-6.54	(0.04)	<0.001	-0.75	-6.60	(0.04)	<0.001	-0.78
Ethnic Group				White other								0.88	(0.10)	<0.001	0.1	0.70	(0.14)	<0.001	0.08
				Mixed								0.74	(0.48)	ns	0.09	1.15	(0.67)	ns	0.14
				Caribbean								-1.24	(0.11)	<0.001	-0.14	-1.50	(0.16)	<0.001	-0.18
				Black African & Black Other								-0.29	(0.11)	<0.01	-0.03	-0.24	(0.14)	ns	-0.03
<i>(comparison and Irish)</i>				White British								-0.17	(0.12)	ns	-0.02	-0.17	(0.15)	ns	-0.02
				Indian								-0.38	(0.13)	<0.01	-0.04	-0.31	(0.15)	0.04	-0.04
				Pakistani								1.86	(0.18)	<0.001	0.21	1.65	(0.23)	<0.001	0.20
				Bangladeshi								2.94	(0.24)	<0.001	0.34	2.36	(0.33)	<0.001	0.28
				Chinese								0.7	(0.10)	<0.001	0.08	0.61	(0.13)	<0.001	0.07
				Any other ethnic origin								-0.35	(0.13)	<0.01	-0.04	-0.24	(0.17)	ns	-0.03
				Ethnic origin unknown															
Interactions				White other	*	Female									0.13	(0.18)	ns	0.02	
				Mixed	*	Female									-0.49	(0.94)	ns	-0.06	
				Caribbean	*	Female									0.78	(0.21)	<0.001	0.09	
				Black African & Black Other	*	Female									0.25	(0.18)	ns	0.03	
				Indian	*	Female									0.07	(0.17)	ns	0.01	
				Pakistani	*	Female									-0.06	(0.17)	ns	-0.01	
				Bangladeshi	*	Female									0.44	(0.27)	ns	0.05	
				Chinese	*	Female									1.11	(0.45)	0.01	0.13	
				Any other ethnic origin	*	Female									0.33	(0.18)	ns	0.04	
				Ethnic origin unknown	*	Female									-0.08	(0.21)	ns	-0.01	
IMD overall															-0.002	(0.002)	ns	-0.01	
% with no qualifications ^{&}															-0.02	(0.002)	<0.001	-0.07	
% of lone parent families ^{&}															-0.01	(0.002)	0.01	-0.01	
% with own household ^{&}															0.004	(0.001)	<0.001	0.02	
% in managerial jobs ^{&}															0.01	(0.003)	<0.001	0.04	

Table 12ai: Results of all models English 2002 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0.003)	<0.001	-0.10
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.03
% of children in school with free meals													-0.05	(0.002)	<0.001	-0.17
% of children in school with SEN													-0.03	(0.01)	<0.001	-0.06
	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
Random Effects																
LA Level Variance	4.1	(0.55)	<0.001	0.017	1.2	(0.17)	<0.001	0.012	1.26	(0.18)	<0.001	0.013	0.64	(0.1)	<0.001	
School Level Variance																
Intercept	31.91	(0.46)	<0.001	0.134	16.63	(0.23)	<0.001	0.167	15.72	(0.22)	<0.001	0.17	79.17	(1.6)	<0.001	
Reading													0.07	(0.004)	<0.001	
Writing													0.09	(0.01)	<0.001	
Mathematics													0.04	(0.004)	<0.001	
Female													1.07	(0.1)	<0.001	
Free School Meals													2.30	(0.2)	<0.001	
School Level Covariance																
Intercept * Reading			*										-1.62	(0.06)	<0.001	
Intercept * Writing			*										-1.31	(0.08)	<0.001	
Intercept * Mathematics			*										-0.68	(0.06)	<0.001	
Intercept * Female			*										-2.29	(0.3)	<0.001	
Intercept * Free School Meals			*										-0.83	(0.44)	ns	
Reading * Writing			*										-0.004	(0.004)	ns	
Reading * Mathematics			*										0.01	(0.003)	0.004	
Reading * Female			*										0.03	(0.02)	ns	
Reading * Free School Meals			*										-0.04	(0.02)	ns	
Writing * Mathematics			*										-0.01	(0.004)	0.03	
Writing * Female			*										0.02	(0.02)	ns	
Writing * Free School Meals			*										0.06	(0.03)	0.04	
Mathematics * Female			*										0.03	(0.01)	0.02	
Mathematics * Free School Meals			*										0.02	(0.02)	ns	
Female * Free School Meals			*										-0.02	(0.11)	ns	
Pupil Level Variance																
	201.84	(0.40)	<0.001	0.849	81.79	(0.16)	<0.001	0.821	75.68	(0.15)	<0.001	0.817	72.14	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12a(ii): Results of all models English: 2003

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	56.13	(0.19)	<0.001		4.94	(0.15)	<0.001		11.97	(0.15)	<0.001		15.28	(0.27)	<0.001	
Reading					1.57	(0.01)	<0.001	1.48	1.36	(0.01)	<0.001	1.33	1.34	(0.01)	<0.001	1.34
Writing					1.14	(0.01)	<0.001	0.92	0.9	(0.01)	<0.001	0.74	0.91	(0.01)	<0.001	0.77
Mathematics					0.66	(0.01)	<0.001	0.54	0.66	(0.01)	<0.001	0.57	0.64	(0.01)	<0.001	0.57
Science	<Level 1				4.23	(0.19)	<0.001	0.44	4.47	(0.19)	<0.001	0.48	3.97	(0.20)	<0.001	0.44
	Level 1				-1.46	(0.05)	<0.001	-0.15	-0.68	(0.05)	<0.001	-0.07	-0.73	(0.05)	<0.001	-0.08
	Level 3+				1.71	(0.04)	<0.001	0.18	2.64	(0.04)	<0.001	0.28	2.55	(0.04)	<0.001	0.28
Age at Start of Academic year [†]									-0.13	(0.00)	<0.001	-0.10	-0.12	(0.00)	<0.001	-0.09
Female									2.19	(0.03)	<0.001	0.24	2.15	(0.03)	<0.001	0.24
English as an additional Language									0.69	(0.10)	<0.001	0.07	0.66	(0.10)	<0.001	0.07
Free School Meal Eligibility (FSM)									-1.79	(0.04)	<0.001	-0.19	-1.35	(0.04)	<0.001	-0.15
SEN									-6.27	(0.11)	<0.001	-0.68	-6.04	(0.12)	<0.001	-0.67
SEN other									-6.93	(0.04)	<0.001	-0.75	-7.01	(0.04)	<0.001	-0.77
Ethnic Group	White other								1.7	(0.12)	<0.001	0.18	1.30	(0.16)	<0.001	0.14
	Mixed								0.96	(0.08)	<0.001	0.1	0.96	(0.11)	<0.001	0.11
	Caribbean								-0.77	(0.12)	<0.001	-0.08	-0.71	(0.17)	<0.001	-0.08
	Black African & Black Other								0.56	(0.13)	<0.001	0.06	0.83	(0.17)	<0.001	0.09
(comparison and Irish)	White British								0.31	(0.13)	0.01	0.03	0.16	(0.16)	ns	0.02
	Indian								0.05	(0.14)	ns	0.01	0.10	(0.16)	ns	0.01
	Pakistani								2.3	(0.19)	<0.001	0.25	2.24	(0.23)	<0.001	0.25
	Bangladeshi								2.74	(0.26)	<0.001	0.3	2.52	(0.36)	<0.001	0.28
	Chinese								1.54	(0.15)	<0.001	0.17	1.60	(0.19)	<0.001	0.18
	Any other ethnic origin								-0.32	(0.08)	<0.001	-0.04	-0.34	(0.11)	0.002	-0.04
	Ethnic origin unknown															
Interactions	White other * Female												0.56	(0.22)	0.01	0.06
	Mixed * Female												0.18	(0.16)	ns	0.02
	Caribbean * Female												0.28	(0.23)	ns	0.03
	Black African & Black Other * Female												-0.06	(0.22)	ns	-0.01
	Indian * Female												0.19	(0.18)	ns	0.02
	Pakistani * Female												-0.11	(0.17)	ns	-0.01
	Bangladeshi * Female												0.27	(0.28)	ns	0.03
	Chinese * Female												0.50	(0.49)	ns	0.06
	Any other ethnic origin * Female												-0.12	(0.26)	ns	-0.01
	Ethnic origin unknown * Female												0.20	(0.15)	ns	0.02
IMD overall													-0.001	(0.002)	ns	-0.002
% with no qualifications ^{&}													-0.03	(0.002)	<0.001	-0.08
% of lone parent families ^{&}													-0.008	(0.002)	<0.001	-0.02
% with own household ^{&}													0.005	(0.001)	<0.001	0.03
% in managerial jobs ^{&}													0.01	(0.003)	<0.001	0.03

Table 12a: Results of all models English 2003 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0.003)	<0.001	-0.10
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.02
% of children in school with free meals													-0.04	(0.003)	<0.001	-0.15
% of children in school with SEN													-0.05	(0.01)	<0.001	-0.01
Random Effects	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
LA Level Variance	4.49	(0.60)	<0.001	0.016	1.87	(0.26)	<0.001	0.016	1.77	(0.25)	<0.001	0.016	1.36	(0.20)	<0.001	
School Level Variance																
Intercept	40.29	(0.57)	<0.001	0.144	22.95	(0.31)	<0.001	0.194	21.95	(0.30)	<0.001	0.199	89.13	(1.82)	<0.001	
Reading													0.08	(0.01)	<0.001	
Writing													0.11	(0.01)	<0.001	
Mathematics													0.05	(0.004)	<0.001	
Female													1.42	(0.12)	<0.001	
Free School Meals													2.19	(0.22)	<0.001	
School Level Covariance																
Intercept * Reading													-1.75	(0.07)	<0.001	
Intercept * Writing													-1.58	(0.09)	<0.001	
Intercept * Mathematics													-0.67	(0.07)	<0.001	
Intercept * Female													-2.11	(0.34)	<0.001	
Intercept * Free School Meals													-1.47	(0.49)	0.003	
Reading * Writing													0.004	(0.01)	ns	
Reading * Mathematics													0.01	(0.003)	0.004	
Reading * Female													0.04	(0.02)	0.01	
Reading * Free School Meals													0.00	(0.03)	ns	
Writing * Mathematics													-0.02	(0.004)	<0.001	
Writing * Female													0.00	(0.02)	ns	
Writing * Free School Meals													0.03	(0.03)	ns	
Mathematics * Female													0.01	(0.02)	ns	
Mathematics * Free School Meals													0.02	(0.02)	ns	
Female * Free School Meals													-0.05	(0.12)	ns	
Pupil Level Variance	235.96	(0.46)	<0.001	0.84	93.56	(0.18)	<0.001	0.79	86.39	(0.17)	<0.001	0.785	82.16	(0.17)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12aiii: Results of all models English: 2004

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	53.62	(0.16)	<0.001		5.01	(0.14)	<0.001		11.36	(0.14)	<0.001		14.09	(0.26)	<0.001	
Reading					1.44	(0.01)	<0.001	1.40	1.24	(0.01)	<0.001	1.26	1.23	(0.01)	<0.001	1.28
Writing					1.12	(0.01)	<0.001	0.95	0.87	(0.01)	<0.001	0.76	0.88	(0.01)	<0.001	0.80
Mathematics					0.59	(0.01)	<0.001	0.50	0.59	(0.01)	<0.001	0.53	0.58	(0.01)	<0.001	0.53
Science	<Level 1				6.14	(0.20)	<0.001	0.69	5.83	(0.19)	<0.001	0.68	5.33	(0.20)	<0.001	0.64
	Level 1				-0.61	(0.05)	<0.001	-0.07	0.01	(0.05)	ns	0	-0.08	(0.05)	ns	-0.01
	Level 3+				1.87	(0.04)	<0.001	0.21	2.76	(0.04)	<0.001	0.32	2.66	(0.04)	<0.001	0.32
Age at Start of Academic year ⁺									-0.09	(0.00)	<0.001	-0.07	-0.08	(0.003)	<0.001	-0.07
Female									2.57	(0.03)	<0.001	0.3	2.52	(0.03)	<0.001	0.30
English as an additional Language									0.87	(0.09)	<0.001	0.1	0.80	(0.09)	<0.001	0.10
Free School Meal Eligibility (FSM)									-1.57	(0.04)	<0.001	-0.18	-1.20	(0.04)	<0.001	-0.14
SEN									-5.07	(0.11)	<0.001	-0.59	-5.11	(0.11)	<0.001	-0.61
SEN other									-5.97	(0.04)	<0.001	-0.7	-6.00	(0.04)	<0.001	-0.72
Ethnic Group	White other								1.63	(0.11)	<0.001	0.19	1.54	(0.14)	<0.001	0.19
	Mixed								0.75	(0.08)	<0.001	0.09	0.71	(0.11)	<0.001	0.09
	Caribbean								-0.76	(0.11)	<0.001	-0.09	-1.04	(0.16)	<0.001	-0.12
	Black African & Black Other								0.62	(0.11)	<0.001	0.07	0.52	(0.15)	<0.001	0.06
	Indian								0.63	(0.12)	<0.001	0.07	0.56	(0.14)	<0.001	0.07
	Pakistani								0.16	(0.12)	ns	0.02	0.14	(0.15)	ns	0.02
	Bangladeshi								1.63	(0.17)	<0.001	0.19	1.68	(0.21)	<0.001	0.20
	Chinese								2.06	(0.24)	<0.001	0.24	1.84	(0.32)	<0.001	0.22
	Any other ethnic origin								1.16	(0.13)	<0.001	0.14	1.00	(0.17)	<0.001	0.12
	Ethnic origin unknown								-0.26	(0.08)	<0.010	-0.03	-0.24	(0.11)	0.03	-0.03
Interactions	White other * Female												-0.05	(0.19)	ns	-0.01
	Mixed * Female												0.25	(0.15)	ns	0.03
	Caribbean * Female												0.79	(0.21)	<0.001	0.09
	Black African & Black Other * Female												0.55	(0.19)	0.004	0.07
	Indian * Female												0.19	(0.17)	ns	0.02
	Pakistani * Female												0.10	(0.16)	ns	0.01
	Bangladeshi * Female												0.02	(0.25)	ns	0.00
	Chinese * Female												0.56	(0.44)	ns	0.07
	Any other ethnic origin * Female												0.43	(0.23)	ns	0.05
	Ethnic origin unknown * Female												0.14	(0.15)	ns	0.02
IMD overall													-0.002	(0.002)	ns	-0.008
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.07
% of lone parent families ^{&}													-0.004	(0.002)	0.04	-0.01
% with own household ^{&}													0.006	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.01	(0.003)	0.002	0.03

Table 12aiii: Results of all models English 2004 (continued)

	Null				Simple Value Added				Complex Value Added			Expanded Complex Value Added				
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.04	(0.003)	<0.001	-0.01
% never worked & long term unemployed ^{&}													-0.01	(0.01)	0.02	-0.01
% of children in school with free meals													-0.04	(0.003)	<0.001	-0.15
% of children in school with SEN													-0.02	(0.01)	0.04	-0.02
Random Effects																
LA Level Variance	3.01	(0.42)	<0.001	0.013	1.31	(0.19)	<0.001	0.013	1.16	(0.18)	<0.001	0.012	1.04	(0.16)	<0.001	
School Level Variance	34.14	(0.49)	<0.001	0.147	21.79	(0.29)	<0.001	0.212	21	(0.28)	<0.001	0.219	83.44	(1.74)	<0.001	
Intercept																
Reading													0.09	(0.01)	<0.001	
Writing													0.11	(0.01)	<0.001	
Mathematics													0.06	(0.004)	<0.001	
Female													1.55	(0.11)	<0.001	
Free School Meals													1.48	(0.19)	<0.001	
School Level Covariance																
Intercept * Reading													-1.57	(0.07)	<0.001	
Intercept * Writing													-1.46	(0.08)	<0.001	
Intercept * Mathematics													-0.81	(0.07)	<0.001	
Intercept * Female													-2.67	(0.32)	<0.001	
Intercept * Free School Meals													0.28	(0.43)	ns	
Reading * Writing													-0.001	(0.004)	ns	
Reading * Mathematics													0.00	(0.003)	ns	
Reading * Female													0.05	(0.02)	0.002	
Reading * Free School Meals													-0.03	(0.02)	ns	
Writing * Mathematics													-0.01	(0.004)	ns	
Writing * Female													-0.01	(0.02)	ns	
Writing * Free School Meals													-0.02	(0.03)	ns	
Mathematics * Female													0.05	(0.02)	0.002	
Mathematics * Free School Meals													0.00	(0.02)	ns	
Female * Free School Meals													0.01	(0.11)	ns	
Pupil Level Variance	195.65	(0.39)	<0.001	0.84	79.87	(0.16)	<0.001	0.775	73.75	(0.15)	<0.001	0.769	69.80	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12bi: Results of all models Mathematics: 2002

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	63.02	(0.20)	<0.001		3.81	(0.17)	<0.001		12.55	(0.18)	<0.001		16.33	(0.35)	<0.001	
Reading					0.75	(0.01)	<0.001	0.53	0.62	(0.01)	<0.001	0.45	0.59	(0.01)	<0.001	0.44
Writing					0.56	(0.01)	<0.001	0.34	0.5	(0.01)	<0.001	0.31	0.49	(0.01)	<0.001	0.31
Mathematics					2.63	(0.01)	<0.001	1.63	2.49	(0.01)	<0.001	1.60	2.47	(0.01)	<0.001	1.63
Science	<Level 1				1.19	(0.26)	<0.001	0.09	2.45	(0.25)	<0.001	0.2	1.68	(0.26)	<0.001	0.14
	Level 1				-3.92	(0.07)	<0.001	-0.31	-2.45	(0.07)	<0.001	-0.2	-2.60	(0.07)	<0.001	-0.22
	Level 3+				2.64	(0.06)	<0.001	0.21	2.75	(0.05)	<0.001	0.22	2.53	(0.05)	<0.001	0.21
Age at Start of Academic year [†]									-0.29	(0.01)	<0.001	-0.17	-0.29	(0.01)	<0.001	-0.17
Female									-3.87	(0.04)	<0.001	-0.32	-3.87	(0.04)	<0.001	-0.32
English as an additional Language									2.26	(0.12)	<0.001	0.18	2.16	(0.12)	<0.001	0.18
Free School Meal Eligibility (FSM)									-1.78	(0.05)	<0.001	-0.14	-1.30	(0.06)	<0.001	-0.11
SEN									-7.09	(0.14)	<0.001	-0.58	-6.91	(0.15)	<0.001	-0.58
SEN other									-7.68	(0.05)	<0.001	-0.63	-7.74	(0.05)	<0.001	-0.64
Ethnic Group	White other								0.77	(0.15)	<0.001	0.06	0.62	(0.19)	0.001	0.05
	Mixed								0.45	(0.68)	ns	0.04	0.09	(0.95)	ns	0.01
	Caribbean								-2.28	(0.16)	<0.001	-0.19	-2.67	(0.22)	<0.001	-0.22
	Black African & Black Other								-0.66	(0.15)	<0.001	-0.05	-0.80	(0.20)	<0.001	-0.07
(comparison White British and Irish)	Indian								1.81	(0.17)	<0.001	0.15	1.66	(0.20)	<0.001	0.14
	Pakistani								-0.4	(0.18)	0.03	-0.03	0.08	(0.21)	ns	0.01
	Bangladeshi								1.67	(0.25)	<0.001	0.14	1.61	(0.32)	<0.001	0.13
	Chinese								7.58	(0.34)	<0.001	0.62	7.27	(0.46)	<0.001	0.61
	Any other ethnic origin								1.22	(0.14)	<0.001	0.1	1.02	(0.18)	<0.001	0.09
	Ethnic origin unknown								-0.57	(0.18)	<0.010	-0.05	-0.38	(0.23)	ns	-0.03
Interactions	White other * Female												-0.02	(0.25)	ns	0.00
	Mixed * Female												1.20	(1.34)	ns	0.10
	Caribbean * Female												1.02	(0.29)	<0.001	0.09
	Black African & Black Other * Female												0.67	(0.26)	0.01	0.06
	Indian * Female												0.38	(0.24)	ns	0.03
	Pakistani * Female												-0.89	(0.23)	<0.001	-0.07
	Bangladeshi * Female												0.16	(0.38)	ns	0.01
	Chinese * Female												0.72	(0.64)	ns	0.06
	Any other ethnic origin * Female												0.50	(0.25)	0.04	0.04
	Ethnic origin unknown * Female												-0.17	(0.30)	ns	-0.01
IMD overall													-0.004	(0.002)	ns	-0.01
% with no qualifications ^{&}													-0.02	(0.003)	<0.001	-0.05
% of lone parent families ^{&}													-0.007	(0.003)	0.01	-0.01
% with own household ^{&}													0.008	(0.001)	<0.001	0.03
% in managerial jobs ^{&}													0.01	(0.004)	0.002	0.03

Table 12bi: Results of all models Mathematics 2002 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}													-0.05	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0.004)	<0.001	-0.08
% never worked & long term unemployed ^{&}													-0.01	(0.01)	ns	-0.007
% of children in school with free meals													-0.05	(0.00)	<0.001	-0.13
% of children in school with SEN													-0.05	(0.01)	<0.001	-0.07
Random Effects	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
LA Level Variance	5.13	(0.71)	<0.001	0.012	1.97	(0.3)	<0.001	0.01	1.94	(0.29)	<0.001	0.01	1.65	(0.25)	<0.001	
School Level Variance	54.04	(0.79)	<0.001	0.127	34.41	(0.48)	<0.001	0.173	32.57	(0.45)	<0.001	0.176	173.32	(3.33)	<0.001	
Intercept																
Reading													0.11	(0.01)	<0.001	
Writing													0.12	(0.01)	<0.001	
Mathematics													0.21	(0.01)	<0.001	
Female													1.97	(0.21)	<0.001	
Free School Meals													4.03	(0.39)	<0.001	
School Level Covariance																
Intercept * Reading			*										-2.29	(0.12)	<0.001	
Intercept * Writing			*										-1.03	(0.14)	<0.001	
Intercept * Mathematics			*										-4.18	(0.14)	<0.001	
Intercept * Female			*										-0.96	(0.60)	ns	
Intercept * Free School Meals			*										-1.74	(0.88)	0.05	
Reading * Writing			*										-0.010	(0.01)	ns	
Reading * Mathematics			*										0.01	(0.01)	0.03	
Reading * Female			*										-0.06	(0.03)	ns	
Reading * Free School Meals			*										-0.06	(0.04)	ns	
Writing * Mathematics			*										-0.04	(0.01)	<0.001	
Writing * Female			*										-0.08	(0.03)	0.02	
Writing * Free School Meals			*										0.05	(0.05)	ns	
Mathematics * Female			*										0.17	(0.03)	<0.001	
Mathematics * Free School Meals			*										0.07	(0.05)	ns	
Female * Free School Meals			*										0.04	(0.21)	ns	
Pupil Level Variance	364.87	(0.71)	<0.001	0.861	162.79	(0.32)	<0.001	0.817	151.04	(0.30)	<0.001	0.814	144.43	(0.30)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12bii: Results of all models Mathematics: 2003

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	60.6	(0.21)	<0.001		-5.71	(0.18)	<0.001		1.33	(0.19)	<0.001		4.91	(0.37)	<0.001	
Reading					0.82	(0.01)	<0.001	0.56	0.75	(0.01)	<0.001	0.53	0.72	(0.01)	<0.001	0.52
Writing					0.45	(0.01)	<0.001	0.26	0.47	(0.01)	<0.001	0.28	0.47	(0.01)	<0.001	0.29
Mathematics					3.02	(0.01)	<0.001	1.81	2.86	(0.01)	<0.001	1.78	2.85	(0.01)	<0.001	1.81
Science	<Level 1				5.21	(0.26)	<0.001	0.39	6.61	(0.25)	<0.001	0.52	5.76	(0.26)	<0.001	0.46
	Level 1				-2.92	(0.07)	<0.001	-0.22	-1.36	(0.07)	<0.001	-0.11	-1.55	(0.07)	<0.001	-0.12
	Level 3+				3.68	(0.06)	<0.001	0.28	3.61	(0.05)	<0.001	0.28	3.40	(0.06)	<0.001	0.27
Age at Start of Academic year [†]									-0.33	(0.01)	<0.001	-0.18	-0.33	(0.01)	<0.001	-0.18
Female									-5.19	(0.04)	<0.001	-0.4	-5.21	(0.04)	<0.001	-0.41
English as an additional Language									1.86	(0.13)	<0.001	0.15	1.83	(0.13)	<0.001	0.15
Free School Meal Eligibility (FSM)									-1.7	(0.05)	<0.001	-0.13	-1.26	(0.06)	<0.001	-0.10
SEN									-4.54	(0.15)	<0.001	-0.35	-4.24	(0.15)	<0.001	-0.34
SEN other									-7.37	(0.06)	<0.001	-0.57	-7.47	(0.06)	<0.001	-0.59
Ethnic Group	White other								1.82	(0.16)	<0.001	0.14	1.46	(0.22)	<0.001	0.12
	Mixed								0.27	(0.11)	0.02	0.02	0.31	(0.16)	0.05	0.03
	Caribbean								-2.12	(0.17)	<0.001	-0.17	-2.87	(0.23)	<0.001	-0.23
	Black African & Black Other								-0.08	(0.18)	ns	-0.01	-0.52	(0.23)	0.02	-0.04
	(comparison White British and Irish)								2.11	(0.18)	<0.001	0.16	1.95	(0.21)	<0.001	0.15
	Indian								0.12	(0.19)	ns	0.01	0.51	(0.22)	0.02	0.04
	Pakistani								2.34	(0.26)	<0.001	0.18	2.47	(0.32)	<0.001	0.20
	Bangladeshi								7.77	(0.36)	<0.001	0.6	7.63	(0.49)	<0.001	0.61
	Chinese								3.27	(0.2)	<0.001	0.25	3.29	(0.26)	<0.001	0.26
	Any other ethnic origin								-0.31	(0.11)	<0.01	-0.02	-0.05	(0.15)	ns	0.00
	Ethnic origin unknown															
Interactions	White other	* Female											0.47	(0.30)	ns	0.04
	Mixed	* Female											0.13	(0.22)	ns	0.01
	Caribbean	* Female											1.85	(0.31)	<0.001	0.15
	Black African & Black Other	* Female											1.32	(0.30)	<0.001	0.11
	Indian	* Female											0.22	(0.25)	ns	0.02
	Pakistani	* Female											-0.78	(0.24)	0.001	-0.06
	Bangladeshi	* Female											-0.11	(0.39)	ns	-0.01
	Chinese	* Female											0.29	(0.68)	ns	0.02
	Any other ethnic origin	* Female											-0.01	(0.35)	ns	0.00
	Ethnic origin unknown	* Female											-0.31	(0.20)	ns	-0.03
IMD overall													0.000	(0.003)	ns	-0.001
% with no qualifications ^{&}													-0.02	(0.003)	<0.001	-0.04
% of lone parent families ^{&}													-0.009	(0.003)	<0.001	-0.02
% with own household ^{&}													0.009	(0.001)	<0.001	0.03
% in managerial jobs ^{&}													0.02	(0.004)	<0.001	0.04

Table 12bii: Results of all models Mathematics 2003 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.05	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.05	(0.01)	<0.001	-0.02
% in routine jobs ^{&}													-0.05	(0.004)	<0.001	-0.07
% never worked & long term unemployed ^{&}													-0.01	(0.01)	ns	-0.005
% of children in school with free meals													-0.06	(0.004)	<0.001	-0.14
% of children in school with SEN													-0.08	(0.01)	<0.001	-0.11
	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
Random Effects																
LA Level Variance	5.57	(0.78)	<0.001	0.011	2.02	(0.31)	<0.001	0.009	1.95	(0.3)	<0.001	0.01	2.06	(0.30)	<0.001	
School Level Variance	61.16	(0.89)	<0.001	0.125	37.96	(0.52)	<0.001	0.174	36.44	(0.5)	<0.001	0.179	164.22	(3.33)	<0.001	
Intercept																
Reading													0.10	(0.01)	<0.001	
Writing													0.08	(0.01)	<0.001	
Mathematics													0.20	(0.01)	<0.001	
Female													2.33	(0.23)	<0.001	
Free School Meals													3.75	(0.42)	<0.001	
School Level Covariance																
Intercept * Reading													-2.12	(0.13)	<0.001	
Intercept * Writing													-0.86	(0.15)	<0.001	
Intercept * Mathematics													-3.83	(0.15)	<0.001	
Intercept * Female													-1.51	(0.63)	0.02	
Intercept * Free School Meals													-2.77	(0.91)	0.002	
Reading * Writing													-0.004	(0.01)	ns	
Reading * Mathematics													0.01	(0.01)	ns	
Reading * Female													-0.06	(0.03)	ns	
Reading * Free School Meals													0.03	(0.05)	ns	
Writing * Mathematics													-0.02	(0.01)	0.004	
Writing * Female													0.02	(0.04)	ns	
Writing * Free School Meals													-0.05	(0.05)	ns	
Mathematics * Female													0.13	(0.03)	<0.001	
Mathematics * Free School Meals													0.13	(0.05)	0.01	
Female * Free School Meals													0.00	(0.23)	ns	
Pupil Level Variance	422.11	(0.82)	<0.001	0.864	178.7	(0.35)	<0.001	0.817	165.2	(0.32)	<0.001	0.811	158.96	(0.32)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12biii: Results of all models Mathematics: 2004

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	64.56	(0.21)	<0.001		-5.17	(0.19)	<0.001		3.2	(0.19)	<0.001		7.44	(0.38)	<0.001	
Reading					0.82	(0.01)	<0.001	0.53	0.69	(0.01)	<0.001	0.46	0.66	(0.01)	<0.001	0.45
Writing					0.49	(0.01)	<0.001	0.28	0.48	(0.01)	<0.001	0.28	0.47	(0.01)	<0.001	0.28
Mathematics					3.05	(0.01)	<0.001	1.75	2.88	(0.01)	<0.001	1.71	2.88	(0.01)	<0.001	1.74
Science	<Level 1				7.58	(0.28)	<0.001	0.57	8.29	(0.27)	<0.001	0.64	7.17	(0.29)	<0.001	0.57
	Level 1				-2.76	(0.08)	<0.001	-0.21	-1.3	(0.08)	<0.001	-0.1	-1.52	(0.08)	<0.001	-0.12
	Level 3+				3.61	(0.06)	<0.001	0.27	3.77	(0.05)	<0.001	0.29	3.47	(0.05)	<0.001	0.27
Age at Start of Academic year [†]									-0.29	(0.01)	<0.001	-0.16	-0.29	(0.01)	<0.001	-0.16
Female									-3.93	(0.04)	<0.001	-0.3	-3.91	(0.04)	<0.001	-0.31
English as an additional Language									2.41	(0.13)	<0.001	0.19	2.31	(0.13)	<0.001	0.18
Free School Meal Eligibility (FSM)									-2.03	(0.05)	<0.001	-0.16	-1.50	(0.06)	<0.001	-0.12
SEN									-4.91	(0.16)	<0.001	-0.38	-5.08	(0.16)	<0.001	-0.40
SEN other									-7.7	(0.06)	<0.001	-0.59	-7.79	(0.06)	<0.001	-0.61
Ethnic Group	White other								2.22	(0.16)	<0.001	0.17	2.32	(0.22)	<0.001	0.18
	Mixed								0.13	(0.11)	ns	0.01	0.18	(0.16)	ns	0.01
	Caribbean								-2.66	(0.17)	<0.001	-0.21	-3.32	(0.23)	<0.001	-0.26
	Black African & Black Other								-0.8	(0.17)	<0.001	-0.06	-1.33	(0.22)	<0.001	-0.11
	Indian								1.74	(0.18)	<0.001	0.13	1.79	(0.22)	<0.001	0.14
	Pakistani								-0.85	(0.19)	<0.001	-0.07	-0.39	(0.22)	ns	-0.03
	Bangladeshi								1.48	(0.25)	<0.001	0.11	1.92	(0.32)	<0.001	0.15
	Chinese								8.22	(0.35)	<0.001	0.63	7.82	(0.48)	<0.001	0.62
	Any other ethnic origin								3.26	(0.2)	<0.001	0.25	3.38	(0.26)	<0.001	0.27
	Ethnic origin unknown								-0.45	(0.12)	<0.001	-0.03	-0.30	(0.16)	ns	-0.02
Interactions	White other * Female												-0.48	(0.29)	ns	-0.04
	Mixed * Female												0.14	(0.22)	ns	0.01
	Caribbean * Female												1.62	(0.31)	<0.001	0.13
	Black African & Black Other * Female												1.51	(0.29)	<0.001	0.12
	Indian * Female												-0.17	(0.25)	ns	-0.01
	Pakistani * Female												-0.77	(0.23)	<0.001	-0.06
	Bangladeshi * Female												-0.74	(0.38)	0.05	-0.06
	Chinese * Female												1.08	(0.67)	ns	0.09
	Any other ethnic origin * Female												-0.11	(0.34)	ns	-0.01
	Ethnic origin unknown * Female												-0.06	(0.23)	ns	-0.01
IMD overall													-0.004	(0.003)	ns	-0.01
% with no qualifications ^{&}													-0.03	(0.004)	<0.001	-0.06
% of lone parent families ^{&}													-0.013	(0.003)	<0.001	-0.03
% with own household ^{&}													0.009	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.01	(0.004)	ns	0.01

Table 12biii: Results of all models Mathematics 2004 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.04	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}													-0.05	(0.01)	<0.001	-0.02
% in routine jobs ^{&}													-0.06	(0.004)	<0.001	-0.09
% never worked & long term unemployed ^{&}													0.00	(0.01)	ns	-0.003
% of children in school with free meals													-0.06	(0.004)	<0.001	-0.15
% of children in school with SEN													-0.02	(0.01)	ns	-0.01
	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
Random Effects																
LA Level Variance	5.55	(0.77)	<0.001	0.011	2.15	(0.32)	<0.001	0.01	1.89	(0.29)	<0.001	0.009	1.50	(0.23)	<0.001	
School Level Variance	57.41	(0.85)	<0.001	0.12	36.38	(0.51)	<0.001	0.167	34.59	(0.48)	<0.001	0.169	197.60	(3.98)	<0.001	
Intercept																
Reading													0.13	(0.01)	<0.001	
Writing													0.09	(0.01)	<0.001	
Mathematics													0.27	(0.01)	<0.001	
Female													2.40	(0.24)	<0.001	
Free School Meals													4.72	(0.44)	<0.001	
School Level Covariance																
Intercept * Reading													-2.14	(0.15)	<0.001	
Intercept * Writing													-1.13	(0.16)	<0.001	
Intercept * Mathematics													-5.09	(0.18)	<0.001	
Intercept * Female													-0.15	(0.70)	ns	
Intercept * Free School Meals													-1.76	(1.02)	ns	
Reading * Writing													-0.009	(0.01)	ns	
Reading * Mathematics													-0.03	(0.01)	0.003	
Reading * Female													-0.08	(0.04)	0.03	
Reading * Free School Meals													0.01	(0.05)	ns	
Writing * Mathematics													-0.01	(0.01)	ns	
Writing * Female													-0.04	(0.04)	ns	
Writing * Free School Meals													0.01	(0.06)	ns	
Mathematics * Female													0.17	(0.04)	<0.001	
Mathematics * Free School Meals													0.07	(0.06)	ns	
Female * Free School Meals													-0.11	(0.24)	ns	
Pupil Level Variance	415.36	(0.82)	<0.001	0.869	179.77	(0.35)	<0.001	0.823	168.12	(0.33)	<0.001	0.822	161.12	(0.33)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12ci: Results of all models Science: 2002

Fixed Effects	Null			Simple Value Added			Complex Value Added				Expanded Complex Value Added					
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	57.15	(0.14)	<0.001		26.93	(0.12)	<0.001		31.38	(0.12)	<0.001		33.98	(0.24)	<0.001	
Reading					0.74	(0.00)	<0.001	0.78	0.68	(0.00)	<0.001	0.72	0.67	(0.01)	<0.001	0.73
Writing					0.23	(0.01)	<0.001	0.20	0.21	(0.01)	<0.001	0.19	0.20	(0.01)	<0.001	0.19
Mathematics					1.06	(0.00)	<0.001	0.98	0.99	(0.00)	<0.001	0.93	0.98	(0.01)	<0.001	0.95
Science	<Level 1				-3.42	(0.16)	<0.001	-0.4	-2.7	(0.16)	<0.001	-0.32	-3.09	(0.16)	<0.001	-0.38
	Level 1				-3.66	(0.05)	<0.001	-0.43	-2.86	(0.05)	<0.001	-0.34	-2.93	(0.05)	<0.001	-0.36
	Level 3+				2.22	(0.04)	<0.001	0.26	2.17	(0.04)	<0.001	0.26	2.08	(0.04)	<0.001	0.26
Age at Start of Academic year [†]									-0.13	(0.00)	<0.001	-0.11	-0.13	(0.003)	<0.001	-0.11
Female									-1.98	(0.02)	<0.001	-0.24	-2.02	(0.03)	<0.001	-0.25
English as an additional Language									0.06	(0.08)	ns	0.01	0.01	(0.08)	ns	0.00
Free School Meal Eligibility (FSM)									-1.74	(0.03)	<0.001	-0.21	-1.36	(0.04)	<0.001	-0.17
SEN									-2.46	(0.09)	<0.001	-0.29	-2.30	(0.10)	<0.001	-0.28
SEN other									-3.43	(0.03)	<0.001	-0.41	-3.45	(0.04)	<0.001	-0.42
Ethnic Group	White other								0.42	(0.10)	<0.001	0.05	0.17	(0.13)	ns	0.02
	Mixed								0.63	(0.46)	ns	0.08	0.83	(0.64)	ns	0.10
	Caribbean								-1.55	(0.11)	<0.001	-0.19	-2.09	(0.15)	<0.001	-0.26
	Black African & Black Other								-0.81	(0.10)	<0.001	-0.1	-1.07	(0.13)	<0.001	-0.13
	Indian								-0.75	(0.11)	<0.001	-0.09	-0.98	(0.14)	<0.001	-0.12
	Pakistani								-2.51	(0.12)	<0.001	-0.3	-2.47	(0.14)	<0.001	-0.30
	Bangladeshi								-0.27	(0.17)	ns	-0.03	-0.36	(0.21)	ns	-0.04
	Chinese								2.53	(0.23)	<0.001	0.3	1.84	(0.31)	<0.001	0.23
	Any other ethnic origin								0.3	(0.09)	<0.010	0.04	-0.02	(0.12)	ns	0.00
	Ethnic origin unknown								-0.36	(0.13)	<0.010	-0.04	-0.27	(0.16)	ns	-0.03
Interactions	White other * Female												0.38	(0.17)	0.03	0.05
	Mixed * Female												-0.01	(0.90)	ns	0.00
	Caribbean * Female												1.21	(0.20)	<0.001	0.15
	Black African & Black Other * Female												0.86	(0.18)	<0.001	0.11
	Indian * Female												0.52	(0.16)	0.001	0.06
	Pakistani * Female												0.18	(0.16)	ns	0.02
	Bangladeshi * Female												0.30	(0.26)	ns	0.04
	Chinese * Female												1.36	(0.43)	0.002	0.17
	Any other ethnic origin * Female												0.74	(0.17)	<0.001	0.09
	Ethnic origin unknown * Female												-0.04	(0.20)	ns	0.00
IMD overall													-0.001	(0.002)	ns	-0.006
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.06
% of lone parent families ^{&}													-0.007	(0.002)	<0.001	-0.02
% with own household ^{&}													0.006	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.01	(0.003)	0.01	0.02

Table 12ci: Results of all models Science 2002 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.02	(0.004)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.04	(0.003)	<0.001	-0.09
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.02
% of children in school with free meals													-0.02	(0.003)	<0.001	-0.08
% of children in school with SEN													-0.07	(0.01)	<0.001	-0.13
Random Effects	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
LA Level Variance	2.17	(0.31)	<0.001	0.013	0.85	(0.14)	<0.001	0.01	0.9	(0.14)	<0.001	0.01	0.64	(0.10)	<0.001	
School Level Variance	31.85	(0.43)	<0.001	0.186	20.78	(0.28)	<0.001	0.219	20.02	(0.27)	<0.001	0.22	107.10	(1.85)	<0.001	
Intercept																
Reading													0.07	(0.004)	<0.001	
Writing													0.08	(0.01)	<0.001	
Mathematics													0.06	(0.004)	<0.001	
Female													1.09	(0.10)	<0.001	
Free School Meals													2.66	(0.19)	<0.001	
School Level Covariance																
Intercept * Reading													-2.00	(0.07)	<0.001	
Intercept * Writing													-1.08	(0.08)	<0.001	
Intercept * Mathematics													-1.60	(0.07)	<0.001	
Intercept * Female													1.04	(0.31)	<0.001	
Intercept * Free School Meals													0.97	(0.46)	0.03	
Reading * Writing													-0.002	(0.004)	ns	
Reading * Mathematics													0.02	(0.003)	<0.001	
Reading * Female													-0.05	(0.01)	<0.001	
Reading * Free School Meals													-0.07	(0.02)	<0.001	
Writing * Mathematics													-0.01	(0.003)	ns	
Writing * Female													-0.02	(0.02)	ns	
Writing * Free School Meals													0.05	(0.02)	0.05	
Mathematics * Female													0.03	(0.01)	ns	
Mathematics * Free School Meals													-0.02	(0.02)	ns	
Female * Free School Meals													0.07	(0.10)	ns	
Pupil Level Variance	136.83	(0.27)	<0.001	0.801	73.01	(0.14)	<0.001	0.771	70.24	(0.14)	<0.001	0.77	66.36	(0.14)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12cii: Results of all models Science: 2003

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	56.83	(0.15)	<0.001		25.03	(0.11)	<0.001		28.87	(0.12)	<0.001		32.04	(0.23)	<0.001	
Reading					0.71	(0.00)	<0.001	0.77	0.66	(0.00)	<0.001	0.72	0.64	(0.01)	<0.001	0.72
Writing					0.23	(0.01)	<0.001	0.21	0.21	(0.01)	<0.001	0.19	0.20	(0.01)	<0.001	0.19
Mathematics					1.14	(0.00)	<0.001	1.08	1.08	(0.00)	<0.001	1.04	1.06	(0.01)	<0.001	1.05
Science	<Level 1				-2.39	(0.15)	<0.001	-0.28	-1.7	(0.15)	<0.001	-0.2	-2.02	(0.15)	<0.001	-0.25
	Level 1				-3.34	(0.05)	<0.001	-0.4	-2.58	(0.05)	<0.001	-0.31	-2.63	(0.05)	<0.001	-0.33
	Level 3+				2.13	(0.04)	<0.001	0.25	2.16	(0.04)	<0.001	0.26	2.06	(0.04)	<0.001	0.26
Age at Start of Academic year [†]									-0.13	(0.00)	<0.001	-0.11	-0.12	(0.003)	<0.001	-0.11
Female									-1.57	(0.02)	<0.001	-0.19	-1.58	(0.03)	<0.001	-0.20
English as an additional Language									-0.09	(0.08)	ns	-0.01	-0.09	(0.08)	ns	-0.01
Free School Meal Eligibility (FSM)									-1.79	(0.03)	<0.001	-0.22	-1.38	(0.04)	<0.001	-0.17
SEN									-2.1	(0.09)	<0.001	-0.25	-1.93	(0.09)	<0.001	-0.24
SEN other									-3.32	(0.04)	<0.001	-0.4	-3.36	(0.04)	<0.001	-0.42
Ethnic Group	White other								1.2	(0.10)	<0.001	0.14	0.78	(0.14)	<0.001	0.10
	Mixed								0.28	(0.07)	<0.001	0.03	0.22	(0.10)	0.03	0.03
	Caribbean								-1.63	(0.11)	<0.001	-0.2	-1.82	(0.15)	<0.001	-0.23
	Black African & Black Other								-0.83	(0.11)	<0.001	-0.1	-1.13	(0.15)	<0.001	-0.14
<i>(comparison White British and Irish)</i>	Indian								-0.75	(0.11)	<0.001	-0.1	-0.98	(0.14)	<0.001	-0.12
	Pakistani								-2.17	(0.12)	<0.001	-0.26	-2.01	(0.14)	<0.001	-0.25
	Bangladeshi								-0.24	(0.16)	ns	-0.03	0.00	(0.20)	ns	0.00
	Chinese								1.51	(0.23)	<0.001	0.118	1.20	(0.31)	<0.001	0.15
	Any other ethnic origin								0.1	(0.13)	ns	0.01	0.07	(0.17)	ns	0.01
	Ethnic origin unknown								-0.19	(0.07)	<0.01	-0.02	-0.11	(0.09)	ns	-0.01
Interactions	White other * Female												0.71	(0.19)	<0.001	0.09
	Mixed * Female												0.27	(0.14)	0.05	0.03
	Caribbean * Female												0.69	(0.20)	<0.001	0.09
	Black African & Black Other * Female												0.92	(0.19)	<0.001	0.11
	Indian * Female												0.39	(0.16)	0.01	0.05
	Pakistani * Female												-0.19	(0.15)	ns	-0.02
	Bangladeshi * Female												-0.30	(0.25)	ns	-0.04
	Chinese * Female												0.60	(0.43)	ns	0.08
	Any other ethnic origin * Female												0.02	(0.23)	ns	0.00
	Ethnic origin unknown * Female												-0.02	(0.13)	ns	0.00
IMD overall													0.000	(0.002)	ns	0.00
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.06
% of lone parent families ^{&}													-0.010	(0.002)	<0.001	-0.03
% with own household ^{&}													0.006	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.01	(0.003)	0.04	0.02

Table 12cii: Results of all models Science 2003 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.004)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.02	(0.01)	<0.001	-0.02
% in routine jobs ^{&}													-0.05	(0.003)	<0.001	-0.11
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.02
% of children in school with free meals													-0.03	(0.002)	<0.001	-0.13
% of children in school with SEN													-0.07	(0.004)	<0.001	-0.14
Random Effects																
LA Level Variance	2.84	(0.39)	<0.001	0.017	0.8	(0.13)	<0.001	0.009	0.66	(0.11)	<0.001	0.008	0.41	(0.07)	<0.001	
School Level Variance	29.79	(0.41)	<0.001	0.174	17.62	(0.24)	<0.001	0.197	16.91	(0.23)	<0.001	0.195	97.75	(1.72)	<0.001	
Intercept																
Reading													0.06	(0.004)	<0.001	
Writing													0.08	(0.01)	<0.001	
Mathematics													0.06	(0.004)	<0.001	
Female													0.73	(0.09)	<0.001	
Free School Meals													2.96	(0.20)	<0.001	
School Level Covariance																
Intercept * Reading													-1.70	(0.06)	<0.001	
Intercept * Writing													-1.10	(0.07)	<0.001	
Intercept * Mathematics													-1.54	(0.06)	<0.001	
Intercept * Female													0.27	(0.28)	ns	
Intercept * Free School Meals													0.78	(0.45)	ns	
Reading * Writing													-0.006	(0.004)	ns	
Reading * Mathematics													0.02	(0.003)	<0.001	
Reading * Female													-0.03	(0.01)	0.02	
Reading * Free School Meals													-0.03	(0.02)	ns	
Writing * Mathematics													0.00	(0.003)	ns	
Writing * Female													0.01	(0.02)	ns	
Writing * Free School Meals													-0.01	(0.03)	ns	
Mathematics * Female													0.03	(0.01)	0.05	
Mathematics * Free School Meals													0.00	(0.02)	ns	
Female * Free School Meals													-0.05	(0.10)	ns	
Pupil Level Variance	137.95	(0.27)	<0.001	0.809	71.23	(0.14)	<0.001	0.794	68.98	(0.13)	<0.001	0.797	65.32	(0.13)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12ciii: Results of all models Science: 2004

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	55.54	(0.14)	<0.001		22.23	(0.12)	<0.001		26.24	(0.12)	<0.001		29.45	(0.24)	<0.001	
Reading					0.77	(0.01)	<0.001	0.78	0.71	(0.01)	<0.001	0.74	0.70	(0.01)	<0.001	0.75
Writing					0.2	(0.01)	<0.001	0.17	0.2	(0.01)	<0.001	0.18	0.19	(0.01)	<0.001	0.17
Mathematics					1.14	(0.01)	<0.001	1.03	1.06	(0.01)	<0.001	0.98	1.06	(0.01)	<0.001	1.0
Science	<Level 1				-0.4	(0.16)	0.01	-0.05	0.12	(0.16)	ns	0.01	-0.27	(0.17)	ns	-0.03
	Level 1				-3.03	(0.05)	<0.001	-0.36	-2.29	(0.05)	<0.001	-0.27	-2.35	(0.05)	<0.001	-0.29
	Level 3+				2.52	(0.04)	<0.001	0.30	2.53	(0.04)	<0.001	0.3	2.40	(0.04)	<0.001	0.30
Age at Start of Academic year ⁺									-0.14	(0.00)	<0.001	-0.12	-0.14	(0.003)	<0.001	-0.12
Female									-1.72	(0.02)	<0.001	-0.21	-1.76	(0.03)	<0.001	-0.22
English as an additional Language									0.31	(0.09)	<0.001	0.04	0.27	(0.08)	0.001	0.03
Free School Meal Eligibility (FSM)									-1.74	(0.03)	<0.001	-0.21	-1.34	(0.04)	<0.001	-0.17
SEN									-2	(0.09)	<0.001	-0.24	-2.17	(0.10)	<0.001	-0.27
SEN other									-3.22	(0.04)	<0.001	-0.38	-3.23	(0.04)	<0.001	-0.40
Ethnic Group	White other								1.35	(0.10)	<0.001	0.16	1.15	(0.14)	<0.001	0.14
	Mixed								0.24	(0.07)	<0.01	0.03	0.13	(0.1)	ns	0.02
	Caribbean								-1.77	(0.11)	<0.001	-0.21	-2.20	(0.15)	<0.001	-0.27
	Black African & Black Other								-0.98	(0.11)	<0.001	-0.12	-1.37	(0.14)	<0.001	-0.17
	Indian								-0.83	(0.11)	<0.001	-0.1	-1.04	(0.14)	<0.001	-0.13
	Pakistani								-2.33	(0.12)	<0.001	-0.28	-2.30	(0.14)	<0.001	-0.28
	Bangladeshi								-0.46	(0.16)	<0.01	-0.06	-0.07	(0.20)	ns	-0.01
	Chinese								2.35	(0.23)	<0.001	0.28	2.15	(0.31)	<0.001	0.26
	Any other ethnic origin								0.55	(0.13)	<0.001	0.07	0.38	(0.17)	0.02	0.05
	Ethnic origin unknown								-0.1	(0.08)	ns	-0.01	-0.04	(0.11)	ns	-0.01
Interactions	White other * Female												0.30	(0.19)	ns	0.04
	Mixed * Female												0.39	(0.14)	0.01	0.05
	Caribbean * Female												1.09	(0.20)	<0.001	0.13
	Black African & Black Other * Female												1.17	(0.18)	<0.001	0.14
	Indian * Female												0.41	(0.16)	0.01	0.05
	Pakistani * Female												0.26	(0.15)	ns	0.03
	Bangladeshi * Female												-0.55	(0.24)	0.02	-0.07
	Chinese * Female												0.58	(0.43)	ns	0.07
	Any other ethnic origin * Female												0.45	(0.22)	0.04	0.06
	Ethnic origin unknown * Female												0.01	(0.15)	ns	0.00
IMD overall													0.004	(0.002)	0.04	0.02
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.08
% of lone parent families ^{&}													-0.009	(0.002)	<0.001	-0.03
% with own household ^{&}													0.006	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.002	(0.003)	ns	0.01

Table 12cii: Results of all models Science 2004 (continued)

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
% in intermediate jobs ^{&}													-0.04	(0.004)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.03	(0.01)	<0.001	-0.02
% in routine jobs ^{&}													-0.05	(0.003)	<0.001	-0.11
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.03
% of children in school with free meals													-0.04	(0.002)	<0.001	-0.15
% of children in school with SEN													-0.03	(0.01)	<0.001	-0.03
Random Effects	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
LA Level Variance	2.57	(0.35)	<0.001	0.015	0.79	(0.13)	<0.001	0.009	0.72	(0.12)	<0.001	0.008	0.54	(0.09)	<0.001	
School Level Variance	27.15	(0.38)	<0.001	0.162	17.66	(0.24)	<0.001	0.194	16.84	(0.23)	<0.001	0.192	103.38	(1.88)	<0.001	
Intercept																
Reading													0.07	(0.004)	<0.001	
Writing													0.06	(0.01)	<0.001	
Mathematics													0.08	(0.004)	<0.001	
Female													0.81	(0.09)	<0.001	
Free School Meals													2.95	(0.20)	<0.001	
School Level Covariance																
Intercept * Reading													-1.85	(0.07)	<0.001	
Intercept * Writing													-0.92	(0.08)	<0.001	
Intercept * Mathematics													-1.78	(0.07)	<0.001	
Intercept * Female													0.84	(0.31)	0.005	
Intercept * Free School Meals													0.03	(0.47)	ns	
Reading * Writing													-0.002	(0.004)	ns	
Reading * Mathematics													0.01	(0.003)	0.05	
Reading * Female													0.00	(0.02)	ns	
Reading * Free School Meals													-0.04	(0.02)	ns	
Writing * Mathematics													0.00	(0.004)	ns	
Writing * Female													-0.05	(0.02)	<0.001	
Writing * Free School Meals													0.00	(0.03)	ns	
Mathematics * Female													0.03	(0.01)	0.04	
Mathematics * Free School Meals													0.05	(0.02)	0.04	
Female * Free School Meals													-0.02	(0.10)	ns	
Pupil Level Variance	138.36	(0.27)	<0.001	0.823	72.51	(0.14)	<0.001	0.797	70.15	(0.14)	<0.001	0.8	66.44	(0.14)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12di: Results of all models Average: 2002

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	64.16	(0.19)	<0.001		15.76	(0.13)	<0.001		23.64	(0.14)	<0.001		27.12	(0.26)	<0.001	
Reading					1.06	(0.01)	<0.001	1.05	0.91	(0.01)	<0.001	0.94	0.89	(0.01)	<0.001	0.94
Writing					0.66	(0.01)	<0.001	0.56	0.55	(0.01)	<0.001	0.49	0.55	(0.01)	<0.001	0.50
Mathematics					1.55	(0.01)	<0.001	1.35	1.45	(0.01)	<0.001	1.32	1.44	(0.01)	<0.001	1.35
Science	<Level 1				-2.02	(0.16)	<0.001	-0.22	-0.66	(0.16)	<0.001	-0.08	-1.11	(0.17)	<0.001	-0.13
	Level 1				-3.97	(0.05)	<0.001	-0.44	-2.75	(0.05)	<0.001	-0.32	-2.84	(0.05)	<0.001	-0.34
	Level 3+				2.14	(0.04)	<0.001	0.24	2.45	(0.04)	<0.001	0.28	2.32	(0.04)	<0.001	0.28
Age at Start of Academic year [†]									-0.20	(0.00)	<0.001	-0.16	-0.20	(0.003)	<0.001	-0.16
Female									-1.75	(0.02)	<0.001	-0.20	-1.78	(0.03)	<0.001	-0.21
English as an additional Language									1.07	(0.09)	<0.001	0.12	0.98	(0.09)	<0.001	0.12
Free School Meal Eligibility (FSM)									-1.9	(0.04)	<0.001	-0.22	-1.43	(0.04)	<0.001	-0.17
SEN									-7.64	(0.10)	<0.001	-0.88	-7.32	(0.10)	<0.001	-0.87
SEN other									-6.44	(0.04)	<0.001	-0.74	-6.49	(0.04)	<0.001	-0.77
Ethnic Group	White other								0.74	(0.10)	<0.001	0.08	0.55	(0.14)	<0.001	0.07
	Mixed								0.69	(0.48)	ns	0.08	0.73	(0.67)	ns	0.09
	Caribbean								-1.78	(0.11)	<0.001	-0.20	-2.24	(0.15)	<0.001	-0.27
	Black African & Black Other								-0.58	(0.10)	<0.001	-0.07	-0.70	(0.14)	<0.001	-0.08
<i>(comparison White and Irish)</i>	Indian								0.27	(0.12)	0.02	0.03	0.15	(0.14)	ns	0.02
	Pakistani								-1.26	(0.13)	<0.001	-0.14	-1.05	(0.15)	<0.001	-0.12
	Bangladeshi								1.12	(0.18)	<0.001	0.13	0.98	(0.22)	<0.001	0.12
	Chinese								4.57	(0.24)	<0.001	0.52	4.02	(0.33)	<0.001	0.48
	Any other ethnic origin								0.79	(0.10)	<0.001	0.09	0.56	(0.13)	<0.001	0.07
	Ethnic origin unknown								-0.46	(0.13)	<0.001	-0.05	-0.28	(0.16)	ns	-0.03
Interactions	White other * Female												0.14	(0.18)	ns	0.02
	Mixed * Female												0.32	(0.94)	ns	0.04
	Caribbean * Female												1.13	(0.21)	<0.001	0.13
	Black African & Black Other * Female												0.62	(0.18)	<0.001	0.07
	Indian * Female												0.31	(0.17)	ns	0.04
	Pakistani * Female												-0.22	(0.16)	ns	-0.03
	Bangladeshi * Female												0.37	(0.27)	ns	0.04
	Chinese * Female												1.15	(0.45)	0.01	0.14
	Any other ethnic origin * Female												0.58	(0.17)	<0.001	0.07
	Ethnic origin unknown * Female												-0.15	(0.21)	ns	-0.02
IMD overall													-0.003	(0.002)	ns	-0.01
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.07
% of lone parent families ^{&}													-0.007	(0.002)	<0.001	-0.02
% with own household ^{&}													0.007	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.01	(0.003)	<0.001	0.03

Table 12di: Results of all models Average: 2002 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.03	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.05	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0.00)	<0.001	-0.10
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.02
% of children in school with free meals													-0.04	(0.00)	<0.001	-0.14
% of children in school with SEN													-0.07	(0.01)	<0.001	-0.13
Random Effects																
LA Level Variance	4.37	(0.60)	<0.001		1.33	(0.20)	<0.001		1.34	(0.20)	<0.001		0.91	(0.14)	<0.001	
School Level Variance																
Intercept	46.5	(0.65)	<0.001		23.06	(0.31)	<0.001		21.47	(0.29)	<0.001		111.60	(1.95)	<0.001	
Reading													0.08	(0.00)	<0.001	
Writing													0.09	(0.01)	<0.001	
Mathematics													0.08	(0.00)	<0.001	
Female													1.14	(0.10)	<0.001	
Free School Meals													3.01	(0.21)	<0.001	
School Level Covariance																
Intercept * Reading													-1.98	(0.07)	<0.001	
Intercept * Writing													-1.05	(0.08)	<0.001	
Intercept * Mathematics													-1.87	(0.07)	<0.001	
Intercept * Female													-0.53	(0.33)	ns	
Intercept * Free School Meals													-0.84	(0.49)	ns	
Reading * Writing													-0.009	(0.00)	0.02	
Reading * Mathematics													0.02	(0.00)	<0.001	
Reading * Female													-0.04	(0.02)	0.02	
Reading * Free School Meals													-0.07	(0.02)	0.004	
Writing * Mathematics													-0.01	(0.00)	<0.001	
Writing * Female													-0.03	(0.02)	ns	
Writing * Free School Meals													0.07	(0.03)	0.01	
Mathematics * Female													0.08	(0.02)	<0.001	
Mathematics * Free School Meals													0.04	(0.02)	ns	
Female * Free School Meals													0.000	(0.11)	ns	
Pupil Level Variance	228.64	(0.45)	<0.001		82.45	(0.16)	<0.001		75.92	(0.15)	<0.001		71.52	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12dii: Results of all models Average: 2003

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	62.07	(0.20)	<0.001		9.16	(0.14)	<0.001		16.04	(0.14)	<0.001		19.74	(0.26)	<0.001	
Reading					1.10	(0.01)	<0.001	1.09	0.97	(0.01)	<0.001	0.10	0.95	(0.01)	<0.001	1.00
Writing					0.67	(0.01)	<0.001	0.56	0.57	(0.01)	<0.001	0.50	0.56	(0.01)	<0.001	0.50
Mathematics					1.71	(0.01)	<0.001	1.49	1.63	(0.01)	<0.001	1.47	1.61	(0.01)	<0.001	1.50
Science	<Level 1				1.00	(0.16)	<0.001	0.11	2.14	(0.15)	<0.001	0.24	1.59	(0.16)	<0.001	0.18
	Level 1				-3.26	(0.05)	<0.001	-0.35	-2.05	(0.05)	<0.001	-0.23	-2.15	(0.05)	<0.001	-0.25
	Level 3+				2.57	(0.04)	<0.001	0.28	2.93	(0.04)	<0.001	0.33	2.79	(0.04)	<0.001	0.32
Age at Start of Academic year ⁺									-0.21	(0.00)	<0.001	-0.17	-0.20	(0.003)	<0.001	-0.16
Female									-1.65	(0.03)	<0.001	-0.19	-1.67	(0.03)	<0.001	-0.19
English as an additional Language									0.86	(0.09)	<0.001	0.10	0.82	(0.09)	<0.001	0.10
Free School Meal Eligibility (FSM)									-1.91	(0.04)	<0.001	-0.22	-1.46	(0.04)	<0.001	-0.17
SEN									-5.94	(0.10)	<0.001	-0.67	-5.67	(0.10)	<0.001	-0.66
SEN other									-6.47	(0.04)	<0.001	-0.73	-6.54	(0.04)	<0.001	-0.76
Ethnic Group	White other								1.69	(0.11)	<0.001	0.19	1.27	(0.15)	<0.001	0.15
	Mixed								0.54	(0.08)	<0.001	0.06	0.54	(0.11)	<0.001	0.06
	Caribbean								-1.61	(0.12)	<0.001	-0.18	-1.92	(0.16)	<0.001	-0.22
	Black African & Black Other								-0.19	(0.12)	ns	-0.02	-0.36	(0.16)	0.02	-0.04
(comparison White and Irish)	Indian								0.53	(0.12)	<0.001	0.06	0.35	(0.15)	0.02	0.04
	Pakistani								-0.85	(0.13)	<0.001	-0.10	-0.62	(0.15)	<0.001	-0.07
	Bangladeshi								1.47	(0.18)	<0.001	0.17	1.63	(0.22)	<0.001	0.19
	Chinese								4.13	(0.25)	<0.001	0.47	3.91	(0.34)	<0.001	0.45
	Any other ethnic origin								1.60	(0.14)	<0.001	0.18	1.62	(0.18)	<0.001	0.19
	Ethnic origin unknown								-0.30	(0.08)	<0.001	-0.03	-0.17	(0.10)	ns	-0.02
Interactions	White other * Female												0.60	(0.20)	0.003	0.07
	Mixed * Female												0.21	(0.15)	ns	0.03
	Caribbean * Female												0.96	(0.21)	<0.001	0.11
	Black African & Black Other * Female												0.79	(0.21)	<0.001	0.09
	Indian * Female												0.25	(0.17)	ns	0.03
	Pakistani * Female												-0.37	(0.16)	0.02	-0.04
	Bangladeshi * Female												-0.11	(0.26)	ns	-0.01
	Chinese * Female												0.48	(0.47)	ns	0.06
	Any other ethnic origin * Female												-0.02	(0.24)	ns	0.00
	Ethnic origin unknown * Female												-0.05	(0.14)	ns	-0.01
IMD overall													0.000	(0.002)	ns	0.00
% with no qualifications ^{&}													-0.02	(0.002)	<0.001	-0.07
% of lone parent families ^{&}													-0.01	(0.002)	<0.001	-0.03
% with own household ^{&}													0.007	(0.001)	<0.001	0.04
% in managerial jobs ^{&}													0.010	(0.003)	<0.001	0.03

Table 12dii: Results of all models Average: 2003 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0)	<0.001	-0.11
% never worked & long term unemployed ^{&}													-0.02	(0.01)	<0.001	-0.02
% of children in school with free meals													-0.05	(0)	<0.001	-0.18
% of children in school with SEN													-0.08	(0.01)	<0.001	-0.15
Random Effects																
LA Level Variance	5	(0.68)	<0.001		1.41	(0.21)	<0.001		1.36	(0.20)	<0.001		1.12	(0.16)	<0.001	
School Level Variance																
Intercept	48.19	(0.67)	<0.001		23.09	(0.31)	<0.001		21.76	(0.29)	<0.001		100.28	(1.83)	<0.001	
Reading													0.07	(0.00)	<0.001	
Writing													0.09	(0.01)	<0.001	
Mathematics													0.08	(0.00)	<0.001	
Female													1.06	(0.11)	<0.001	
Free School Meals													2.78	(0.21)	<0.001	
School Level Covariance																
Intercept * Reading													-1.70	(0.07)	<0.001	
Intercept * Writing													-0.95	(0.08)	<0.001	
Intercept * Mathematics													-1.63	(0.07)	<0.001	
Intercept * Female													-0.59	(0.32)	ns	
Intercept * Free School Meals													-0.79	(0.48)	ns	
Reading * Writing													-0.009	(0.00)	0.04	
Reading * Mathematics													0.02	(0.00)	<0.001	
Reading * Female													-0.02	(0.02)	ns	
Reading * Free School Meals													0.001	(0.02)	ns	
Writing * Mathematics													-0.01	(0.00)	<0.001	
Writing * Female													-0.01	(0.02)	ns	
Writing * Free School Meals													-0.004	(0.03)	ns	
Mathematics * Female													0.06	(0.02)	<0.001	
Mathematics * Free School Meals													0.04	(0.02)	ns	
Female * Free School Meals													-0.12	(0.11)	ns	
Pupil Level Variance	250.41	(0.48)	<0.001		84.76	(0.16)	<0.001		78.79	(0.15)	<0.001		74.71	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 12diii: Results of all models Average: 2004

Fixed Effects	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept	62.05	(0.18)	<0.001		7.93	(0.14)	<0.001		15.19	(0.14)	<0.001		18.85	(0.26)	<0.001	
Reading					1.09	(0.01)	<0.001	1.05	0.94	(0.01)	<0.001	0.94	0.92	(0.01)	<0.001	0.95
Writing					0.67	(0.01)	<0.001	0.55	0.56	(0.01)	<0.001	0.48	0.55	(0.01)	<0.001	0.50
Mathematics					1.71	(0.01)	<0.001	1.45	1.61	(0.01)	<0.001	1.42	1.61	(0.01)	<0.001	1.50
Science	<Level 1				2.86	(0.17)	<0.001	0.32	3.54	(0.16)	<0.001	0.41	2.85	(0.17)	<0.001	0.34
	Level 1				-2.91	(0.05)	<0.001	-0.32	-1.78	(0.05)	<0.001	-0.20	-1.90	(0.05)	<0.001	-0.22
	Level 3+				2.73	(0.04)	<0.001	0.30	3.15	(0.04)	<0.001	0.36	2.97	(0.04)	<0.001	0.35
Age at Start of Academic year [†]									-0.19	(0.00)	<0.001	-0.15	-0.18	(0.003)	<0.001	-0.15
Female									-1.19	(0.03)	<0.001	-0.14	-1.21	(0.03)	<0.001	-0.14
English as an additional Language									1.27	(0.09)	<0.001	0.15	1.18	(0.09)	<0.001	0.14
Free School Meal Eligibility (FSM)									-1.93	(0.04)	<0.001	-0.22	-1.47	(0.04)	<0.001	-0.17
SEN									-5.83	(0.10)	<0.001	-0.67	-5.91	(0.10)	<0.001	-0.70
SEN other									-6.27	(0.04)	<0.001	-0.72	-6.31	(0.04)	<0.001	-0.74
Ethnic Group	White other								1.88	(0.11)	<0.001	0.22	1.83	(0.14)	<0.001	0.22
	Mixed								0.4	(0.08)	<0.001	0.05	0.36	(0.11)	<0.001	0.04
	Caribbean								-1.82	(0.12)	<0.001	-0.21	-2.31	(0.16)	<0.001	-0.27
	Black African & Black Other								-0.44	(0.11)	<0.001	-0.05	-0.78	(0.15)	<0.001	-0.09
(comparison White and Irish)	Indian								0.46	(0.12)	<0.001	0.05	0.36	(0.15)	0.01	0.04
	Pakistani								-1.13	(0.12)	<0.001	-0.13	-0.96	(0.15)	<0.001	-0.11
	Bangladeshi								0.93	(0.17)	<0.001	0.11	1.21	(0.21)	<0.001	0.14
	Chinese								4.41	(0.24)	<0.001	0.50	4.17	(0.33)	<0.001	0.49
	Any other ethnic origin								1.69	(0.13)	<0.001	0.19	1.63	(0.17)	<0.001	0.19
	Ethnic origin unknown								-0.27	(0.08)	0.001	-0.03	-0.17	(0.11)	ns	-0.02
Interactions	White other * Female												-0.10	(0.19)	ns	-0.01
	Mixed * Female												0.28	(0.15)	0.05	0.03
	Caribbean * Female												1.24	(0.21)	<0.001	0.15
	Black African & Black Other * Female												1.12	(0.19)	<0.001	0.13
	Indian * Female												0.17	(0.17)	ns	0.02
	Pakistani * Female												-0.15	(0.16)	ns	-0.02
	Bangladeshi * Female												-0.40	(0.25)	ns	-0.05
	Chinese * Female												0.72	(0.45)	ns	0.09
	Any other ethnic origin * Female												0.25	(0.23)	ns	0.03
	Ethnic origin unknown * Female												0.00	(0.15)	ns	0.00
IMD overall													-0.001	(0.002)	ns	0.00
% with no qualifications ^{&}													-0.03	(0.002)	<0.001	-0.08
% of lone parent families ^{&}													-0.009	(0.002)	<0.001	-0.03
% with own household ^{&}													0.008	(0.001)	<0.001	0.05
% in managerial jobs ^{&}													0.01	(0.003)	ns	0.02

Table 12diii: Results of all models Average: 2004 (continued)

	Null				Simple Value Added				Complex Value Added				Expanded Complex Value Added			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects																
% in intermediate jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}													-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}													-0.05	(0.00)	<0.001	-0.12
% never worked & long term unemployed ^{&}													-0.02	(0.01)	0.003	-0.02
% of children in school with free meals													-0.05	(0.00)	<0.001	-0.19
% of children in school with SEN													-0.02	(0.01)	0.02	-0.02
	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	ICC	Parameter Estimate	(SE)	p-value	
Random Effects																
LA Level Variance	4.25	(0.58)	<0.001		1.39	(0.21)	<0.001		1.28	(0.19)	<0.001		0.99	(0.15)	<0.001	
School Level Variance																
Intercept	40.75	(0.58)	<0.001		22.33	(0.30)	<0.001		21.03	(0.28)	<0.001		109.71	(2.02)	<0.001	
Reading													0.09	(0.01)	<0.001	
Writing													0.08	(0.01)	<0.001	
Mathematics													0.11	(0.01)	<0.001	
Female													1.09	(0.11)	<0.001	
Free School Meals													2.74	(0.21)	<0.001	
School Level Covariance																
Intercept * Reading													-1.74	(0.08)	<0.001	
Intercept * Writing													-0.88	(0.08)	<0.001	
Intercept * Mathematics													-2.09	(0.08)	<0.001	
Intercept * Female													-0.68	(0.34)	0.04	
Intercept * Free School Meals													-0.33	(0.50)	ns	
Reading * Writing													-0.011	(0.00)	0.01	
Reading * Mathematics													-0.001	(0.00)	ns	
Reading * Female													-0.01	(0.02)	ns	
Reading * Free School Meals													-0.02	(0.02)	ns	
Writing * Mathematics													-0.01	(0.00)	ns	
Writing * Female													-0.04	(0.02)	0.02	
Writing * Free School Meals													-0.01	(0.03)	ns	
Mathematics * Female													0.09	(0.02)	<0.001	
Mathematics * Free School Meals													0.03	(0.02)	ns	
Female * Free School Meals													-0.004	(0.11)	ns	
Pupil Level Variance	237.9	(0.47)	<0.001		81.89	(0.16)	<0.001		76.36	(0.15)	<0.001		72.08	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Appendix 3: Expanded complex value added models without random effects.

These models were used to provide a single school residual as a measure of school effectiveness for English, Mathematics, Science and average score. These results are available for 2002, 2003 and 2004 on a CD-ROM. The results for these models are presented in Table 13. The underlying distributions of attainment are skewed, however, the residuals at the LEA, school and pupil levels are normally distributed for all subjects and all years. The school effects produced by these models are, therefore, assumed to be valid estimates of school effectiveness.

Table 13a: Results of expanded complex value added models (no random effects): English

Fixed Effects			2002				2003				2004				
			Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept			24.61	(0.24)	<0.001		15.34	(0.27)	<0.001		14.24	(0.25)	<0.001		
Reading			1.26	(0.01)	<0.001	1.30	1.35	(0.01)	<0.001	1.32	1.23	(0.01)	<0.001	1.26	
Writing			0.77	(0.01)	<0.001	0.68	0.88	(0.01)	<0.001	0.73	0.86	(0.01)	<0.001	0.75	
Mathematics			0.59	(0.01)	<0.001	0.54	0.65	(0.01)	<0.001	0.56	0.59	(0.01)	<0.001	0.53	
Science			<Level 1	2.80	(0.19)	<0.001	0.32	4.36	(0.19)	<0.001	0.47	5.69	(0.19)	<0.001	0.66
			Level 1	-0.93	(0.05)	<0.001	-0.11	-0.67	(0.05)	<0.001	-0.07	0.01	(0.05)	ns	0.002
			Level 3+	2.16	(0.04)	<0.001	0.25	2.55	(0.04)	<0.001	0.28	2.69	(0.04)	<0.001	0.31
Age at Start of Academic year ⁺			-0.13	(0.004)	<0.001	-0.10	-0.12	(0.004)	<0.001	-0.09	-0.08	(0.003)	<0.001	-0.06	
Female			1.11	(0.03)	<0.001	0.13	2.22	(0.03)	<0.001	0.24	2.59	(0.03)	<0.001	0.30	
English as an additional Language			0.75	(0.09)	<0.001	0.09	0.73	(0.1)	<0.001	0.08	0.90	(0.09)	<0.001	0.11	
Free School Meal Eligibility (FSM)			-1.25	(0.04)	<0.001	-0.14	-1.34	(0.04)	<0.001	-0.15	-1.18	(0.04)	<0.001	-0.14	
SEN			-6.59	(0.11)	<0.001	-0.76	-6.11	(0.12)	<0.001	-0.66	-5.14	(0.11)	<0.001	-0.60	
SEN other			-6.52	(0.04)	<0.001	-0.75	-6.92	(0.04)	<0.001	-0.75	-5.95	(0.04)	<0.001	-0.70	
Ethnic Group			White other	0.86	(0.14)	<0.001	0.10	1.41	(0.16)	<0.001	0.15	1.65	(0.14)	<0.001	0.19
			Mixed	1.10	(0.68)	ns	0.13	1.02	(0.12)	<0.001	0.11	0.75	(0.11)	<0.001	0.09
			Caribbean	-1.42	(0.16)	<0.001	-0.16	-0.59	(0.17)	<0.001	-0.06	-0.91	(0.16)	<0.001	-0.11
			Black African & Black Other	-0.14	(0.14)	ns	-0.02	0.93	(0.17)	<0.001	0.10	0.64	(0.15)	<0.001	0.08
<i>(comparison White and Irish)</i>			Indian	-0.21	(0.15)	ns	-0.02	0.18	(0.16)	ns	0.02	0.52	(0.14)	<0.001	0.06
			Pakistani	-0.26	(0.15)	ns	-0.03	0.14	(0.16)	ns	0.02	0.15	(0.15)	ns	0.02
			Bangladeshi	1.93	(0.22)	<0.001	0.22	2.37	(0.23)	<0.001	0.26	1.87	(0.21)	<0.001	0.22
			Chinese	2.36	(0.33)	<0.001	0.27	2.42	(0.36)	<0.001	0.26	1.81	(0.33)	<0.001	0.21
			Any other ethnic origin	0.66	(0.13)	<0.001	0.08	1.70	(0.19)	<0.001	0.18	1.07	(0.17)	<0.001	0.13
			Ethnic origin unknown	-0.31	(0.16)	ns	-0.04	-0.33	(0.11)	0.002	-0.04	-0.27	(0.11)	0.01	-0.03
Interactions			White other * Female	-0.05	(0.18)	ns	-0.01	0.46	(0.22)	0.03	0.05	-0.16	(0.19)	ns	-0.02
			Mixed * Female	-0.50	(0.95)	ns	-0.06	0.06	(0.16)	ns	0.01	0.14	(0.15)	ns	0.02
			Caribbean * Female	0.67	(0.21)	0.001	0.08	0.01	(0.23)	ns	0.001	0.55	(0.21)	0.01	0.07
			Black African & Black Other * Female	0.06	(0.18)	ns	0.01	-0.34	(0.22)	ns	-0.04	0.29	(0.19)	ns	0.03
			Indian * Female	-0.01	(0.17)	ns	-0.001	0.07	(0.18)	ns	0.01	0.07	(0.17)	ns	0.01
			Pakistani * Female	-0.21	(0.16)	ns	-0.02	-0.18	(0.17)	ns	-0.02	-0.02	(0.15)	ns	-0.002
			Bangladeshi * Female	0.12	(0.27)	ns	0.01	0.09	(0.28)	ns	0.01	-0.32	(0.25)	ns	-0.04
			Chinese * Female	1.00	(0.45)	0.03	0.12	0.43	(0.49)	ns	0.05	0.39	(0.45)	ns	0.05
			Any other ethnic origin * Female	0.23	(0.18)	ns	0.03	-0.29	(0.26)	ns	-0.03	0.21	(0.23)	ns	0.02
			Ethnic origin unknown * Female	-0.01	(0.21)	ns	-0.001	0.16	(0.14)	ns	0.02	0.17	(0.15)	ns	0.02
IMD overall			-0.003	(0.002)	ns	-0.01	0.000	(0.002)	ns	-0.001	-0.001	(0.002)	ns	-0.01	
% with no qualifications ^{&}			-0.02	(0.002)	<0.001	-0.07	-0.03	(0.003)	<0.001	-0.08	-0.02	(0.002)	<0.001	-0.07	
% of lone parent families ^{&}			-0.004	(0.002)	0.04	-0.01	-0.01	(0.002)	<0.001	-0.02	-0.004	(0.002)	0.04	-0.01	
% with own household ^{&}			0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.04	
% in managerial jobs ^{&}			0.01	(0.003)	<0.001	0.04	0.01	(0.003)	<0.001	0.03	0.01	(0.003)	0.002	0.03	

Table 13a: Results of expanded complex value added models (no random effects): English (continued)

	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects												
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.02	-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}	-0.05	(0.003)	<0.001	-0.11	-0.05	(0.003)	<0.001	-0.10	-0.05	(0.003)	<0.001	-0.10
% never worked & long term unemployed ^{&}	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.02	-0.01	(0.01)	ns	-0.01
% of children in school with free meals	-0.04	(0.003)	<0.001	-0.14	-0.04	(0.003)	<0.001	-0.13	-0.04	(0.003)	<0.001	-0.13
% of children in school with SEN	-0.03	(0.01)	<0.001	-0.06	-0.05	(0.01)	<0.001	-0.09	-0.02	(0.01)	ns	-0.02
Random Effects												
LA Level Variance	0.84	(0.13)	<0.001		1.59	(0.22)	<0.001		1.10	(0.17)	<0.001	
School Level Variance	14.08	(0.2)	<0.001		20.16	(0.27)	<0.001		19.64	(0.27)	<0.001	
Pupil Level Variance	75.25	(0.15)	<0.001		85.90	(0.17)	<0.001		73.36	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 13b: Results of expanded complex value added models (no random effects): Mathematics

Fixed Effects				2002				2003				2004			
				Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Intercept				15.92	(0.35)	<0.001		4.58	(0.36)	<0.001		7.27	(0.37)	<0.001	
Reading				0.61	(0.01)	<0.001	0.45	0.74	(0.01)	<0.001	0.52	0.68	(0.01)	<0.001	0.46
Writing				0.49	(0.01)	<0.001	0.30	0.46	(0.01)	<0.001	0.27	0.46	(0.01)	<0.001	0.27
Mathematics				2.48	(0.01)	<0.001	1.60	2.85	(0.01)	<0.001	1.78	2.87	(0.01)	<0.001	1.71
Science															
<Level 1				2.41	(0.25)	<0.001	0.20	6.54	(0.25)	<0.001	0.51	8.11	(0.27)	<0.001	0.63
Level 1				-2.42	(0.07)	<0.001	-0.20	-1.35	(0.07)	<0.001	-0.11	-1.30	(0.08)	<0.001	-0.10
Level 3+				2.65	(0.05)	<0.001	0.22	3.52	(0.05)	<0.001	0.27	3.66	(0.05)	<0.001	0.28
Age at Start of Academic year [†]				-0.28	(0.01)	<0.001	-0.16	-0.32	(0.01)	<0.001	-0.18	-0.28	(0.01)	<0.001	-0.15
Female				-3.85	(0.04)	<0.001	-0.31	-5.17	(0.04)	<0.001	-0.40	-3.89	(0.04)	<0.001	-0.30
English as an additional Language				2.26	(0.13)	<0.001	0.18	1.88	(0.13)	<0.001	0.15	2.44	(0.13)	<0.001	0.19
Free School Meal Eligibility (FSM)				-1.30	(0.05)	<0.001	-0.11	-1.23	(0.05)	<0.001	-0.10	-1.47	(0.06)	<0.001	-0.11
SEN				-6.92	(0.15)	<0.001	-0.56	-4.27	(0.15)	<0.001	-0.33	-5.01	(0.16)	<0.001	-0.39
SEN other				-7.66	(0.05)	<0.001	-0.62	-7.35	(0.06)	<0.001	-0.57	-7.68	(0.06)	<0.001	-0.59
Ethnic Group															
White other				0.74	(0.19)	<0.001	0.06	1.54	(0.22)	<0.001	0.12	2.41	(0.22)	<0.001	0.19
Mixed				-0.02	(0.95)	ns	-0.002	0.31	(0.16)	ns	0.02	0.19	(0.16)	ns	0.01
Caribbean				-2.60	(0.22)	<0.001	-0.21	-2.79	(0.23)	<0.001	-0.22	-3.21	(0.23)	<0.001	-0.25
Black African & Black Other				-0.74	(0.2)	<0.001	-0.06	-0.45	(0.23)	ns	-0.04	-1.23	(0.22)	<0.001	-0.10
<i>(comparison White and Irish)</i> Indian				1.59	(0.2)	<0.001	0.13	1.92	(0.21)	<0.001	0.15	1.75	(0.22)	<0.001	0.14
Pakistani				0.04	(0.21)	ns	0.003	0.49	(0.22)	0.02	0.04	-0.48	(0.22)	0.03	-0.04
Bangladeshi				1.80	(0.32)	<0.001	0.15	2.55	(0.32)	<0.001	0.20	2.06	(0.32)	<0.001	0.16
Chinese				7.13	(0.47)	<0.001	0.58	7.51	(0.49)	<0.001	0.59	7.67	(0.49)	<0.001	0.59
Any other ethnic origin				1.07	(0.18)	<0.001	0.09	3.31	(0.27)	<0.001	0.26	3.36	(0.26)	<0.001	0.26
Ethnic origin unknown				-0.45	(0.23)	ns	-0.04	-0.08	(0.15)	ns	-0.01	-0.31	(0.17)	ns	-0.02
Interactions															
White other * Female				-0.08	(0.25)	ns	-0.01	0.40	(0.3)	ns	0.03	-0.56	(0.29)	ns	-0.04
Mixed * Female				1.20	(1.35)	ns	0.10	0.09	(0.22)	ns	0.01	0.08	(0.22)	ns	0.01
Caribbean * Female				0.96	(0.29)	0.001	0.08	1.71	(0.31)	<0.001	0.13	1.47	(0.31)	<0.001	0.11
Black African & Black Other * Female				0.52	(0.26)	0.04	0.04	1.17	(0.3)	<0.001	0.09	1.33	(0.29)	<0.001	0.10
Indian * Female				0.30	(0.23)	ns	0.03	0.14	(0.25)	ns	0.01	-0.25	(0.25)	ns	-0.02
Pakistani * Female				-0.98	(0.23)	<0.001	-0.08	-0.88	(0.23)	<0.001	-0.07	-0.87	(0.23)	<0.001	-0.07
Bangladeshi * Female				-0.06	(0.38)	ns	-0.01	-0.24	(0.38)	ns	-0.02	-0.94	(0.37)	0.01	-0.07
Chinese * Female				0.77	(0.64)	ns	0.06	0.33	(0.68)	ns	0.03	0.98	(0.67)	ns	0.08
Any other ethnic origin * Female				0.43	(0.25)	ns	0.04	-0.06	(0.35)	ns	-0.01	-0.19	(0.34)	ns	-0.02
Ethnic origin unknown * Female				-0.17	(0.29)	ns	-0.01	-0.33	(0.2)	ns	-0.03	-0.10	(0.23)	ns	-0.01
IMD overall				-0.01	(0.002)	ns	-0.01	0.000	(0.003)	ns	-0.001	-0.003	(0.003)	ns	-0.01
% with no qualifications ^{&}				-0.02	(0.003)	<0.001	-0.05	-0.02	(0.003)	<0.001	-0.05	-0.03	(0.004)	<0.001	-0.06
% of lone parent families ^{&}				-0.01	(0.003)	0.02	-0.01	-0.01	(0.003)	<0.001	-0.02	-0.01	(0.003)	<0.001	-0.03
% with own household ^{&}				0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.04
% in managerial jobs ^{&}				0.01	(0.004)	0.004	0.02	0.02	(0.004)	<0.001	0.04	0.01	(0.004)	ns	0.01

Table 13b: Results of complex models with interactions: Mathematics (continued)

	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects												
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.02	-0.05	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.02
% in lower supervisory & technical jobs ^{&}	-0.05	(0.01)	<0.001	-0.03	-0.05	(0.01)	<0.001	-0.02	-0.05	(0.01)	<0.001	-0.02
% in routine jobs ^{&}	-0.05	(0.004)	<0.001	-0.08	-0.05	(0.004)	<0.001	-0.07	-0.06	(0.004)	<0.001	-0.09
% never worked & long term unemployed ^{&}	-0.01	(0.01)	ns	-0.01	-0.01	(0.01)	ns	-0.003	-0.002	(0.01)	ns	-0.001
% of children in school with free meals	-0.04	(0.004)	<0.001	-0.10	-0.04	(0.004)	<0.001	-0.10	-0.05	(0.004)	<0.001	-0.11
% of children in school with SEN	-0.05	(0.01)	<0.001	-0.06	-0.07	(0.01)	<0.001	-0.09	-0.01	(0.01)	ns	-0.01
Random Effects												
LA Level Variance	2.09	(0.31)	<0.001		2.29	(0.33)	<0.001		2.20	(0.32)	<0.001	
School Level Variance	30.85	(0.43)	<0.001		34.30	(0.47)	<0.001		32.42	(0.46)	<0.001	
Pupil Level Variance	150.49	(0.29)	<0.001		164.64	(0.32)	<0.001		167.42	(0.33)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 13c: Results of expanded complex value added models (no random effects): Science

Fixed Effects		2002				2003				2004				
		Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept		34.13	(0.24)	<0.001		32.03	(0.23)	<0.001		29.50	(0.24)	<0.001		
Reading		0.67	(0.01)	<0.001	0.72	0.65	(0.01)	<0.001	0.71	0.70	(0.01)	<0.001	0.73	
Writing		0.20	(0.01)	<0.001	0.18	0.20	(0.01)	<0.001	0.18	0.18	(0.01)	<0.001	0.17	
Mathematics		0.98	(0.01)	<0.001	0.93	1.07	(0.01)	<0.001	1.03	1.06	(0.01)	<0.001	0.97	
Science		<Level 1	-2.63	(0.16)	<0.001	-0.32	-1.70	(0.15)	<0.001	-0.21	0.02	(0.16)	ns	0.003
		Level 1	-2.84	(0.05)	<0.001	-0.34	-2.56	(0.05)	<0.001	-0.31	-2.29	(0.05)	<0.001	-0.27
		Level 3+	2.10	(0.04)	<0.001	0.25	2.08	(0.04)	<0.001	0.25	2.45	(0.04)	<0.001	0.29
Age at Start of Academic year ⁺			-0.13	(0.003)	<0.001	-0.10	-0.12	(0.003)	<0.001	-0.10	-0.14	(0.003)	<0.001	-0.11
Female			-2.02	(0.03)	<0.001	-0.24	-1.58	(0.03)	<0.001	-0.19	-1.75	(0.03)	<0.001	-0.21
English as an additional Language			0.06	(0.09)	ns	0.01	-0.06	(0.08)	ns	-0.01	0.34	(0.09)	<0.001	0.04
Free School Meal Eligibility (FSM)			-1.38	(0.04)	<0.001	-0.17	-1.39	(0.04)	<0.001	-0.17	-1.34	(0.04)	<0.001	-0.16
SEN			-2.23	(0.1)	<0.001	-0.27	-1.88	(0.09)	<0.001	-0.23	-2.07	(0.09)	<0.001	-0.25
SEN other			-3.41	(0.04)	<0.001	-0.41	-3.31	(0.04)	<0.001	-0.40	-3.20	(0.04)	<0.001	-0.38
Ethnic Group		White other	0.22	(0.13)	ns	0.03	0.79	(0.14)	<0.001	0.10	1.13	(0.14)	<0.001	0.14
		Mixed	0.85	(0.65)	ns	0.10	0.23	(0.1)	0.03	0.03	0.11	(0.1)	ns	0.01
		Caribbean	-2.04	(0.15)	<0.001	-0.24	-1.77	(0.15)	<0.001	-0.21	-2.16	(0.15)	<0.001	-0.26
		Black African & Black Other	-1.09	(0.13)	<0.001	-0.13	-1.10	(0.15)	<0.001	-0.13	-1.37	(0.14)	<0.001	-0.16
<i>(comparison White and Irish)</i>		Indian	-1.07	(0.14)	<0.001	-0.13	-1.02	(0.14)	<0.001	-0.12	-1.13	(0.14)	<0.001	-0.14
		Pakistani	-2.62	(0.14)	<0.001	-0.31	-2.09	(0.14)	<0.001	-0.25	-2.49	(0.14)	<0.001	-0.30
		Bangladeshi	-0.34	(0.21)	ns	-0.04	0.03	(0.2)	ns	0.004	-0.07	(0.2)	ns	-0.01
		Chinese	1.80	(0.32)	<0.001	0.22	1.06	(0.32)	<0.001	0.13	1.98	(0.32)	<0.001	0.24
		Any other ethnic origin	-0.01	(0.12)	ns	-0.001	0.10	(0.17)	ns	0.01	0.36	(0.17)	0.03	0.04
		Ethnic origin unknown	-0.28	(0.16)	ns	-0.03	-0.13	(0.09)	ns	-0.02	-0.04	(0.11)	ns	-0.004
Interactions		White other * Female	0.31	(0.17)	ns	0.04	0.71	(0.19)	<0.001	0.09	0.31	(0.19)	ns	0.04
		Mixed * Female	-0.27	(0.91)	ns	-0.03	0.26	(0.14)	ns	0.03	0.39	(0.14)	ns	0.05
		Caribbean * Female	1.19	(0.2)	<0.001	0.14	0.62	(0.2)	0.002	0.08	1.06	(0.2)	<0.001	0.13
		Black African & Black Other * Female	0.86	(0.18)	<0.001	0.10	0.93	(0.19)	<0.001	0.11	1.11	(0.18)	<0.001	0.13
		Indian * Female	0.54	(0.16)	<0.001	0.07	0.39	(0.16)	0.01	0.05	0.46	(0.16)	0.004	0.06
		Pakistani * Female	0.18	(0.15)	ns	0.02	-0.17	(0.15)	ns	-0.02	0.34	(0.15)	0.02	0.04
		Bangladeshi * Female	0.25	(0.25)	ns	0.03	-0.32	(0.24)	ns	-0.04	-0.56	(0.24)	0.02	-0.07
		Chinese * Female	1.34	(0.44)	0.002	0.16	0.74	(0.44)	ns	0.09	0.65	(0.43)	ns	0.08
		Any other ethnic origin * Female	0.72	(0.17)	<0.001	0.09	0.03	(0.23)	ns	0.003	0.40	(0.22)	ns	0.05
		Ethnic origin unknown * Female	-0.08	(0.2)	ns	-0.01	-0.002	(0.13)	ns	0.000	-0.01	(0.15)	ns	-0.001
IMD overall			-0.003	(0.002)	ns	-0.01	-0.001	(0.002)	ns	-0.01	0.003	(0.002)	ns	0.01
% with no qualifications ^{&}			-0.02	(0.002)	<0.001	-0.06	-0.02	(0.002)	<0.001	-0.06	-0.02	(0.002)	<0.001	-0.07
% of lone parent families ^{&}			-0.01	(0.002)	0.001	-0.02	-0.01	(0.002)	<0.001	-0.03	-0.01	(0.002)	<0.001	-0.03
% with own household ^{&}			0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.03	0.01	(0.001)	<0.001	0.04
% in managerial jobs ^{&}			0.01	(0.003)	0.03	0.02	0.01	(0.003)	ns	0.01	0.003	(0.003)	ns	0.01

Table 13c: Results of complex models with interactions: Science (continued)

	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects												
% in intermediate jobs ^{&}	-0.02	(0.01)	<0.001	-0.02	-0.03	(0.004)	<0.001	-0.02	-0.04	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}	-0.04	(0.01)	<0.001	-0.03	-0.02	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.02
% in routine jobs ^{&}	-0.04	(0.003)	<0.001	-0.09	-0.05	(0.003)	<0.001	-0.11	-0.05	(0.003)	<0.001	-0.11
% never worked & long term unemployed ^{&}	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.02	-0.02	(0.01)	<0.001	-0.03
% of children in school with free meals	-0.02	(0.003)	<0.001	-0.08	-0.03	(0.003)	<0.001	-0.13	-0.04	(0.003)	<0.001	-0.14
% of children in school with SEN	-0.06	(0.004)	<0.001	-0.12	-0.05	(0.004)	<0.001	-0.11	-0.02	(0.01)	0.03	-0.02
Random Effects												
LA Level Variance	1.08	(0.16)	<0.001		0.63	(0.1)	<0.001		0.87	(0.13)	<0.001	
School Level Variance	18.92	(0.25)	<0.001		15.39	(0.21)	<0.001		15.55	(0.21)	<0.001	
Pupil Level Variance	69.87	(0.14)	<0.001		68.61	(0.13)	<0.001		69.78	(0.14)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Table 13d: Results of expanded complex value added models (no random effects): Average

Fixed Effects		2002				2003				2004				
		Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	
Intercept		27.04	(0.25)	<0.001		19.60	(0.25)	<0.001		18.84	(0.26)	<0.001		
Reading		0.90	(0.01)	<0.001	0.93	0.96	(0.01)	<0.001	0.99	0.93	(0.01)	<0.001	0.93	
Writing		0.54	(0.01)	<0.001	0.48	0.55	(0.01)	<0.001	0.48	0.54	(0.01)	<0.001	0.47	
Mathematics		1.45	(0.01)	<0.001	1.32	1.62	(0.01)	<0.001	1.46	1.60	(0.01)	<0.001	1.42	
Science		<Level 1	-0.59	(0.16)	<0.001	-0.07	2.14	(0.15)	<0.001	0.24	3.40	(0.16)	<0.001	0.39
		Level 1	-2.72	(0.05)	<0.001	-0.31	-2.04	(0.05)	<0.001	-0.23	-1.78	(0.05)	<0.001	-0.20
		Level 3+	2.36	(0.04)	<0.001	0.27	2.84	(0.04)	<0.001	0.32	3.05	(0.04)	<0.001	0.35
Age at Start of Academic year ⁺			-0.20	(0.003)	<0.001	-0.16	-0.20	(0.004)	<0.001	-0.16	-0.18	(0.003)	<0.001	-0.15
Female			-1.76	(0.03)	<0.001	-0.20	-1.64	(0.03)	<0.001	-0.19	-1.18	(0.03)	<0.001	-0.14
English as an additional Language			1.07	(0.09)	<0.001	0.12	0.88	(0.09)	<0.001	0.10	1.30	(0.09)	<0.001	0.15
Free School Meal Eligibility (FSM)			-1.45	(0.04)	<0.001	-0.17	-1.45	(0.04)	<0.001	-0.16	-1.46	(0.04)	<0.001	-0.17
SEN			-7.39	(0.1)	<0.001	-0.85	-5.70	(0.1)	<0.001	-0.64	-5.92	(0.1)	<0.001	-0.68
SEN other			-6.42	(0.04)	<0.001	-0.74	-6.46	(0.04)	<0.001	-0.73	-6.25	(0.04)	<0.001	-0.72
Ethnic Group		White other	0.67	(0.14)	<0.001	0.08	1.34	(0.15)	<0.001	0.15	1.88	(0.14)	<0.001	0.22
		Mixed	0.74	(0.67)	ns	0.09	0.55	(0.11)	<0.001	0.06	0.37	(0.11)	<0.001	0.04
		Caribbean	-2.16	(0.16)	<0.001	-0.25	-1.83	(0.16)	<0.001	-0.21	-2.22	(0.16)	<0.001	-0.26
		Black African & Black Other	-0.66	(0.14)	<0.001	-0.08	-0.32	(0.16)	0.05	-0.04	-0.71	(0.15)	<0.001	-0.08
		Indian	0.07	(0.14)	ns	0.01	0.32	(0.15)	0.03	0.04	0.30	(0.15)	0.04	0.03
		Pakistani	-1.14	(0.15)	<0.001	-0.13	-0.67	(0.15)	<0.001	-0.08	-1.08	(0.15)	<0.001	-0.12
		Bangladeshi	1.12	(0.22)	<0.001	0.13	1.67	(0.22)	<0.001	0.19	1.33	(0.21)	<0.001	0.15
		Chinese	3.94	(0.33)	<0.001	0.45	3.76	(0.34)	<0.001	0.42	4.03	(0.33)	<0.001	0.46
		Any other ethnic origin	0.60	(0.13)	<0.001	0.07	1.66	(0.18)	<0.001	0.19	1.64	(0.17)	<0.001	0.19
		Ethnic origin unknown	-0.35	(0.16)	0.03	-0.04	-0.20	(0.1)	0.05	-0.02	-0.18	(0.11)	ns	-0.02
Interactions		White other * Female	0.03	(0.18)	ns	0.003	0.55	(0.2)	0.01	0.06	-0.14	(0.2)	ns	-0.02
		Mixed * Female	0.13	(0.95)	ns	0.01	0.16	(0.15)	ns	0.02	0.23	(0.15)	ns	0.03
		Caribbean * Female	1.07	(0.21)	<0.001	0.12	0.80	(0.21)	<0.001	0.09	1.11	(0.21)	<0.001	0.13
		Black African & Black Other * Female	0.52	(0.18)	0.004	0.06	0.68	(0.21)	<0.001	0.08	0.93	(0.19)	<0.001	0.11
		Indian * Female	0.28	(0.17)	ns	0.03	0.20	(0.17)	ns	0.02	0.12	(0.17)	ns	0.01
		Pakistani * Female	-0.27	(0.16)	ns	-0.03	-0.42	(0.16)	0.01	-0.05	-0.17	(0.15)	ns	-0.02
		Bangladeshi * Female	0.17	(0.26)	ns	0.02	-0.20	(0.26)	ns	-0.02	-0.59	(0.25)	0.02	-0.07
		Chinese * Female	1.12	(0.45)	0.01	0.13	0.56	(0.47)	ns	0.06	0.66	(0.45)	ns	0.08
		Any other ethnic origin * Female	0.52	(0.17)	0.003	0.06	-0.09	(0.24)	ns	-0.01	0.12	(0.23)	ns	0.01
		Ethnic origin unknown * Female	-0.13	(0.2)	ns	-0.02	-0.05	(0.14)	ns	-0.01	-0.02	(0.15)	ns	-0.003
IMD overall			-0.004	(0.002)	0.02	-0.02	-0.001	(0.002)	ns	0.00	-0.001	(0.002)	ns	-0.003
% with no qualifications ^{&}			-0.03	(0.002)	<0.001	-0.07	-0.03	(0.002)	<0.001	-0.08	-0.03	(0.002)	<0.001	-0.08
% of lone parent families ^{&}			-0.01	(0.002)	0.002	-0.02	-0.01	(0.002)	<0.001	-0.03	-0.01	(0.002)	<0.001	-0.03
% with own household ^{&}			0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.04	0.01	(0.001)	<0.001	0.05
% in managerial jobs ^{&}			0.01	(0.003)	<0.001	0.03	0.01	(0.003)	<0.001	0.03	0.01	(0.003)	0.05	0.02

Table 13d: Results of complex models with interactions: Average (continued)

	2002				2003				2004			
	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size	Parameter Estimate	(SE)	p-value	Effect Size
Fixed Effects												
% in intermediate jobs ^{&}	-0.03	(0.01)	<0.001	-0.02	-0.03	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03
% in lower supervisory & technical jobs ^{&}	-0.05	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03	-0.04	(0.01)	<0.001	-0.03
% in routine jobs ^{&}	-0.05	(0.003)	<0.001	-0.11	-0.05	(0.003)	<0.001	-0.11	-0.06	(0.003)	<0.001	-0.12
% never worked & long term unemployed ^{&}	-0.02	(0.01)	0.001	-0.02	-0.02	(0.01)	<0.001	-0.02	-0.01	(0.01)	0.01	-0.02
% of children in school with free meals	-0.04	(0.003)	<0.001	-0.13	-0.04	(0.003)	<0.001	-0.15	-0.04	(0.003)	<0.001	-0.16
% of children in school with SEN	-0.06	(0.004)	<0.001	-0.12	-0.06	(0.004)	<0.001	-0.12	-0.02	(0.01)	0.08	-0.01
Random Effects												
LA Level Variance	1.35	(0.19)	<0.001		1.41	(0.2)	<0.001		1.48	(0.21)	<0.001	
School Level Variance	19.59	(0.26)	<0.001		19.56	(0.26)	<0.001		19.17	(0.26)	<0.001	
Pupil Level Variance	75.40	(0.15)	<0.001		78.26	(0.15)	<0.001		75.83	(0.15)	<0.001	

+ centred around mean value of 126 months

& derived from census data

Appendix 4: Examples of histograms of school effectiveness scores.

Figure 6: Histogram of School Effects from English Complex Value Added Model with Categorical KS1 Variables

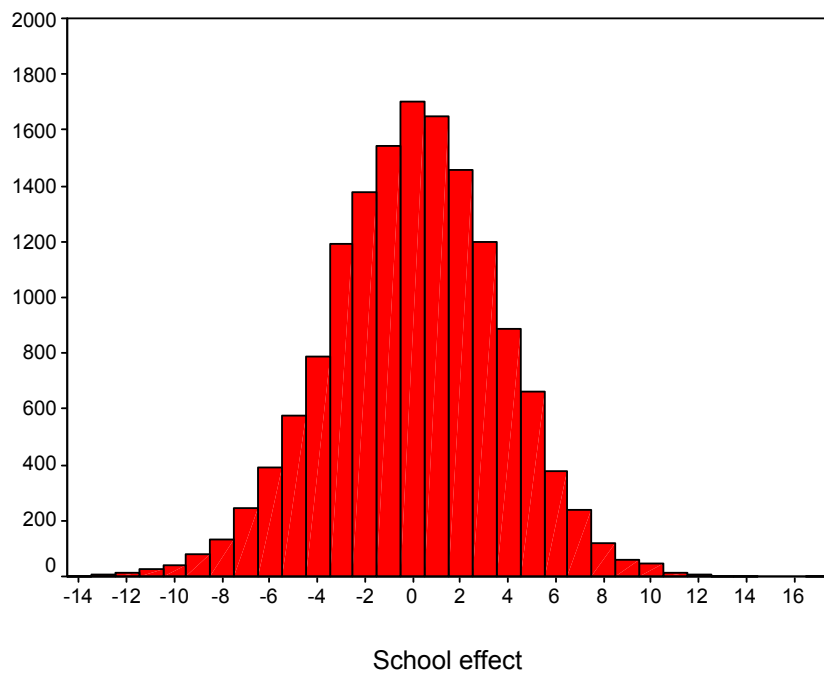


Figure 7: Histogram of School Effects from Mathematics Complex Value Added Model with Categorical KS1 Variables

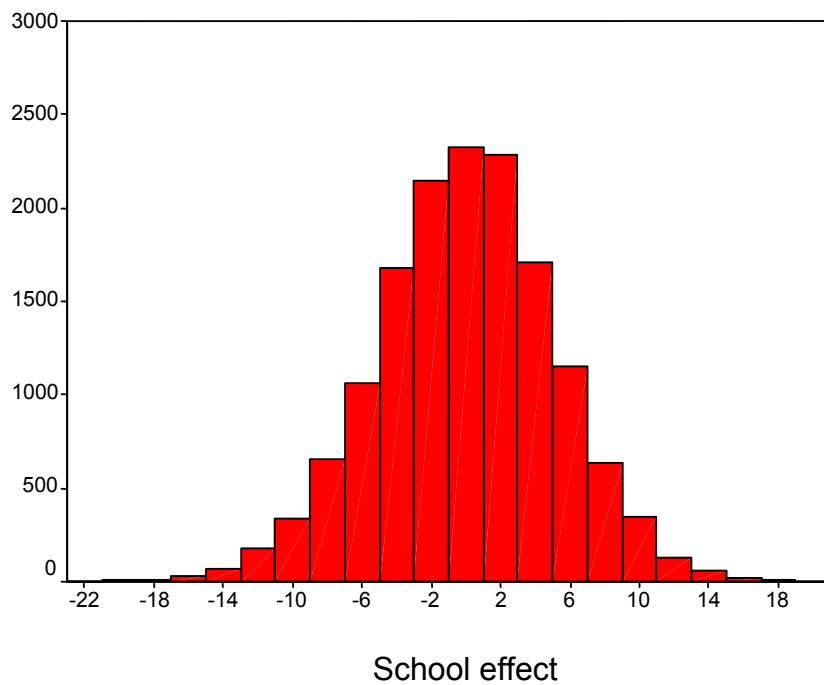
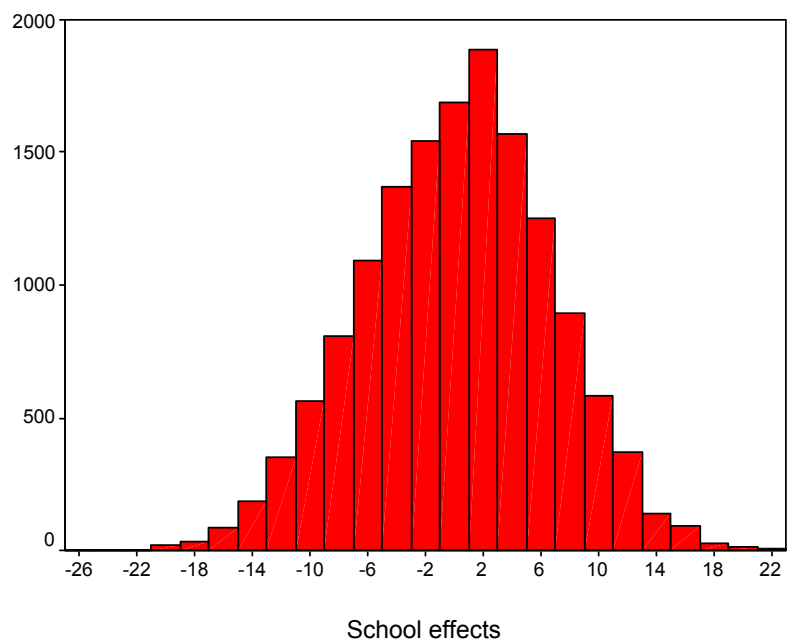


Figure 8: Histogram of School Effects from Science Complex Value Added Model with Categorical KS1 Variables



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