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ETHNICITY AND EDUCATIONAL ACHIEVEMENT IN COMPULSORY SCHOOLING*

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This article documents that at the start of school, pupils from most ethnic groups substantially lag behind White British pupils. However, these gaps decline for all groups throughout compulsory schooling. Language is the single most important factor why ethnic minority pupils improve relative to White British pupils. Poverty, in contrast, does not contribute to the catch-up. Our results also suggest the possibility that the greater than average progress of ethnic minority pupils in schools with more poor pupils may partly be related to teacher incentives to concentrate attention on particular pupils, generated by the publication of school league tables.

Achievement gaps between groups that are ethnically and visibly different have, if persistent, the potential to create social disruption, segregation and dissonance. In the US, the persistence of the black–white wage gap in the labour market and the black-white achievement gap in primary and secondary school is a key issue of public policy debate. Starting with the 1966 Coleman report, numerous papers have been written that illustrate the education gap and that try to determine the reasons for its existence.[1] In some European countries, similar debates are ongoing and it is the achievement gap between ethnic minority descendents from former migration movements and native-born Whites that are the principal reason for concern. This is the case in particular for those European countries that have experienced large-scale immigration of ethnically diverse populations since the end of the Second World War.[2] In this group of countries, Britain stands out, as it is perhaps the country in Europe with the longest history of ethnically diverse immigration on a larger scale (starting in the late 1940s) and with the largest and most diverse population of ethnic minority inhabitants.

In this article, we use an extraordinarily rich data source to document and evaluate explanations of achievement gaps between ethnic minority and White British-born individuals in England. The six main ethnic minority groups we consider are: Black Caribbean, Black Non-Caribbean (of which the vast majority are of African descent), Indian, Pakistani, Bangladeshi and Chinese. When comparing the educational achievement of Britain's adult ethnic minority population with that of majority White British born, the remarkably strong educational background of the ethnic minority population stands out: Ethnic minorities (British or foreign born) of any of the large minority groups outperform White British born in terms of educational achievements; see Dustmann and Fabbri (2005) and Dustmann and Theoropolous (2009) for detailed

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[1] See Donohue and Heckman (1991), Chandra (2000), Neal (2004, 2006) for evidence on racial gaps in the labour market. Recent studies that analyse black–white achievement gaps in primary and secondary school include Fryer and Levitt (2004, 2007) and Hanushek and Rivkin (2006).

[2] See for instance the latest unrest in the suburbs of French cities such as Paris and Lyon, or the early 2000s riots in Northern cities of the UK, both involving disadvantaged ethnic minority groups.

analyses. This seems to be in sharp contrast to what we observe very early on, just before the start of school: at the ages of 3 and 5, ethnic minority children significantly under-perform in early cognitive tests compared to the White British-born pupils; see Dustmann and Trentini (2008) who analyse the achievement gap of white and ethnic minority children at ages 3 and 5.

Here we focus on the period of compulsory schooling, between the ages of 5 and 16, that lays the foundation for later non-compulsory education choices and economic performance in the labour market.[3] Our analysis is based on administrative data for all pupils in state schools (primary and secondary) in England. We focus on test scores in national exams at age 6/7 (so-called Key Stage 1) and the school leaving exams at age 15/16 (Key Stage 4). We confirm that at the beginning of primary school (Key Stage 1), ethnic minority pupils (with the exception of Chinese pupils) lag behind White British-born pupils. Remarkably, with the exception of Black Caribbean pupils, ethnic minority pupils gain substantially relative to White British pupils throughout primary and compulsory schooling. Among Black Non-Caribbean, Bangladeshi and Pakistani pupils, this relative progress is more pronounced for girls than for boys. The difference between girls and boys is most striking among Black Caribbean pupils: here, boys lose ground, while girls improve, although at a lower rate than any other minority group, relative to their White British counterparts throughout compulsory schooling.

Our article is not the first to address this issue for the UK. The paper closest to ours is Wilson *et al.* (2005) who nicely document the evolution of achievement gaps between White British born and ethnic minority pupils throughout primary and secondary school, using the same data base (though a different sample and different achievement measures) as us. Some of their findings have been corroborated in a number of later studies and research reports (DfES, 2005; Cassen and Kingdon, 2007*a*, *b*) and are similar to ours. We add to these papers by more extensively exploring different explanations for the divergent evolution of test scores of White British and ethnic minority pupils throughout primary and secondary school. We focus on three possible explanations: family background characteristics, school quality and teacher incentives. In this article, we focus on findings for English. The basic patterns are, however, similar for mathematics and we report them in an Online Appendix available from our web page.

With respect to the first explanation, we show that English is not a mother tongue for a high fraction of ethnic minority pupils, with the exception of the Black Caribbean. For instance, among Indians, the share of native English speakers is only 19.5%. We find that conditioning in English as a mother tongue substantially reduces achievement gaps. We also observe that the impact of language declines as children become older. Consequently, language contributes to explaining why ethnic minority pupils improve relative to White British pupils and helps to explain why the relative improvement is smaller for Black Caribbean pupils than other ethnic minority pupils. Moreover, with the exception of Indian and Chinese pupils, ethnic minority pupils are substantially more likely to be in poverty, which we proxy with a variable measuring eligibility for free school meals. The inclusion of this variable likewise reduces ethnic minority attainment

[3] For instance, Neal and Johnson (1996) find that the inclusion of the AFQT score (a measure of skill that is determined prior to labour market entry) eliminates the black–white wage gap for women and explains much of the gap for men.

gaps substantially. However, poverty cannot explain why ethnic minority pupils make greater *progress* than White British pupils.

With respect to the second explanation (school quality), we find strong evidence that ethnic minority pupils attend different schools from White British pupils. For instance, in primary school, the average share of White British classmates for pupils who are themselves White British is 92.8% but it is only 33.4% for Pakistani pupils. While much of the relative improvement of ethnic minority pupils occurs within schools, for most minority groups at least 35% of the progress between the beginning of primary and the end of secondary school occurs between schools. This between-school component suggests that the transitions that ethnic minorities make when moving up from primary to secondary school (and during these school phases) are of some importance in explaining the changing achievement gaps.

The third explanation that we explore, teacher incentives, has received relatively little attention in the UK. At the end of Key Stage 4, the Department for Education and Skills publishes so-called school league tables, which report the share of pupils who passed at least 5 GCSEs, including Mathematics and English, with a grade of C or better. These reports are extensively discussed in the media, such as *The Times* or BBC news. These league table rankings are widely viewed as measures of school performance, although their existence and function is controversial in some circles; see, among others, Goldstein and Leckie (2008) and Leckie and Goldstein (2009). One aspect of this is that they may provide incentives for teachers to focus their attention on pupils who are most likely to just pass or just fail the target, i.e. teaching to the test – see Lazear (2006) and Neal and Whitmore Schanzenbach (2010). To the extent that ethnic minority pupils are more likely to fall in this attention interval, then incentives induced by the publication of school league tables could contribute to why ethnic minority pupils make greater progress than White British pupils, in particular between Key Stage 3 and 4. Overall, teacher incentives contribute little to explaining the larger progress of ethnic minority pupils relative to White British pupils in secondary school – the differences in the predicted probability of being in the teacher's attention interval between White British and ethnic minority pupils are simply too small to have a big impact on the ethnic achievement gaps. However, teacher incentives do help to explain why the relative progress of ethnic minority pupils is particularly pronounced in poor schools.

The structure of the article is as follows. Section 1 provides some background information on ethnic minority groups in Britain and on the English school system. In Section 2, we describe the data and the samples we use for our analysis. Section 3 documents the basic facts about achievement gaps between British-born white and ethnic minority pupils through primary and secondary school. In Section 4, we investigate three explanations for our findings: different family background characteristics, different school quality, and teacher incentives. Section 5 concludes.

1. Background

This Section first provides an overview of how ethnic minorities in the UK fare in the labour market. We focus on England, since our school data only covers pupils in England but not in Wales, Northern Ireland and Scotland. We then briefly describe the English education system.

1.1. *Ethnic Minorities in the Labour Market*

According to the 2001 Census, ethnic minority groups account for 9.1% of the total English population, up from 6.2% in 1991. The six main ethnic minority groups are: Black Caribbean, Black African, Indian, Pakistani, Bangladeshi and Chinese. These are also the six groups that we will distinguish in our analysis of pupil achievement below. Individuals who belong to these groups arrived nearly exclusively in the period after the Second World War but their arrivals have been at different stages and were triggered by different events. While the majority of immigrants from the Caribbean arrived in the period between 1955 and 1964, the main time of arrival of Black African, Indian and Pakistani first generation groups was between 1965 and 1974 (Peach, 1968, 1996). Bangladeshi arrivals peaked in the period 1980–4. The smallest, and fastest growing, group is the Chinese who started to arrive in the UK in the 1980s, after mainland China was opened to the western world.

Table 1 gives an overview of the main ethnic minority groups based on Labour Force Survey data, pooled for the years 2003 and 2004, separately for men and women. Results refer to ethnic minorities in England. Here, we summarise Black Africans and Blacks with a background other than Caribbean or African into one category.[4] The first column reports the population share of each ethnic minority group. The biggest groups are Indians and Pakistanis, followed by Blacks of Caribbean or other heritage.

Table 1

Ethnic Minorities in the Labour Market

	Share	% of group born in UK	Age left FT Education	Employment Rate	Hourly Wage
(*a*) *Men*					
White British	90.45	94.43	17.38	80.16	11.60
Black, Caribbean	1.08	62.31	17.22	68.76	10.32
Black, Other	1.06	17.25	20.39	64.47	9.26
Bangladeshi	0.56	20.68	17.61	59.55	6.73
Pakistani	1.38	37.03	18.43	62.31	8.54
Indian	2.26	37.74	19.52	75.29	11.72
Chinese	0.47	23.59	20.10	61.99	11.87
Other	2.74	30.61	19.38	64.85	10.46
(*b*) *Women*					
White British	90.16	93.82	17.37	67.57	8.93
Black, Caribbean	1.25	59.53	17.50	64.70	9.37
Black, Other	1.28	15.85	19.16	50.92	8.74
Bangladeshi	0.53	24.62	16.94	21.83	8.93
Pakistani	1.34	40.94	17.43	24.37	8.59
Indian	2.14	34.57	18.74	58.72	9.08
Chinese	0.47	17.29	19.78	51.52	9.96
Other	2.81	30.97	18.88	52.75	9.43

Note. The Table reports the share of ethnic minorities in the working age (16–65) population in England, the share of individuals born in the UK, the average age at which individuals left full time education, excluding those currently in education, the share of employed workers and the gross hourly wage.
Source. Labour Force Survey, 2003 and 2004, working age population (16–65).

[4] In this category, about 84% are Black African.

The next column shows the share born in the UK. This share is highest for Black Caribbeans, the group that arrived first in the UK, and lowest for the Bangladeshi and Chinese, the two groups that arrived latest. The Table also shows that with the exception of Black Caribbean men and Bangladeshi women, the average years of education among ethnic minorities exceeds that of the White British working-age population (Column 3). The difference is particularly striking for Indian and Chinese men and women, as well as men and women from any other background. In contrast, employment rates are substantially higher among White British men and women than among ethnic minorities (Column 4). Despite the (slightly) higher levels of education, Black, Bangladeshi and Pakistani men as well as men from other ethnic backgrounds earn considerably lower wages than White British men; for Bangladeshi men the difference is as large as 40%. Chinese and Indian men earn slightly higher wages than White British men (Column 5). A more detailed description of the labour market experiences of ethnic minority groups throughout the 1980s and 1990s can be found in Dustmann and Fabri (2005) and Dustmann and Theodoropoulos (2010).

1.2. *The Education System in England*

We now turn to explaining the key features of the education system in England, which in many aspects is different from education systems in the US or Continental Europe and indeed to the education systems of the other parts of the UK. One very important feature of the system is the centralised assessment of pupils' understanding of the curriculum; see Machin and Vignoles (2005) for more details. Testing takes place in 4 key stages, Key Stage 1 from grade 1 to 2 (ages 4/5 to 6/7), Key Stage 2 from grade 3 to 6 (age 7/8 to 10/11), Key Stage 3 from grade 7 to 9 (age 11/12 to 13/14) and Key Stage 4 from grade 10 to 11 (age 14/15 to 15/16). Primary schools cover Key Stage 1 and Key Stage 2, while secondary schools comprise Key Stage 3 and Key Stage 4. The end of Key Stage 4 marks the end of compulsory schooling. At the end of each key stage, pupils take nation-wide exams that are anonymously marked by external graders. Throughout Key Stage 1 to Key Stage 3, pupils are assessed in the core disciplines English, Mathematics and Science (not in Key Stage 1). Key Stage 4 exams are the school leaving age exams also known as GCSE exams (General Certificate of Secondary Education). Here, pupils can take a variety of subjects, ranging from foreign languages to arts and design to information technology. However, the core subjects English and Mathematics are mandatory for all pupils. In this article, we focus on English and Mathematics scores that are tested at the beginning and end of compulsory schooling, at Key Stage 1 and Key Stage 4.

There is little or no grade repetition in England (and no formal policy for it to occur). This means that pupils who entered school in the same year take their key stage examinations in the same year. Hence, our estimates for the evolution of achievement gaps between White British pupils and ethnic minorities will not be affected by selection caused by different grade retention rates across ethnic groups. This may be a problem in commonly used US data sets, such as the Early Childhood Longitudinal Study (Hanushek and Rivkin, 2006).

At each key stage, the Department for Education and Skills sets specific achievement targets that pupils are supposed to meet. For instance, the target at Key Stage 2 is

Level 4 in English, Mathematics and Science, which in 2003 was met by about 80% of pupils. The target at Key Stage 4 is passing at least 5 GCSEs with C or better, including English and Mathematics, which in 2003 was met by 55% of pupils. Each year, the Department of Education and Skills publishes school league tables that report the share of pupils above the target in each school in Key Stage 2 (primary schools) and Key Stage 4 (secondary schools). These reports are extensively discussed in the media, such as *The Times* or BBC news. A small, but growing literature demonstrates that parents significantly value these dimensions of school quality.[5] It is evident that the league tables convey important information to parents that can influence the demand for particular schools. In the English education system, head teachers (school principals) also have incentives to maximise student numbers since money follows pupils. We return to this below since it does mean that schools that want to attract more pupils have incentives to improve their league table performance. We investigate whether this induces aspects of 'teaching to the test' for pupils close to government Key Stage 2 and Key Stage 4 performance targets and whether these differ across ethnic groups.

2. Data Description

Our empirical analysis is primarily based on the National Pupil Data Base (NPD). We also report some findings based on the Millennium Cohort Survey (MCS). We briefly describe each data set in turn.

2.1. *The National Pupil Data Base (NPD)*

The National Pupil Data Base (NPD) covers all pupils in all state primary and secondary schools in England and is currently available from 1996 onwards. The data are collected by the Department for Education and Skills, which uses the data to (amongst other things) construct the annual school league tables. Pupils can be followed from year to year and across schools through a pupil identifier. For each key stage, the NPD contains various achievement outcomes, including English and Mathematics test scores. To make test scores comparable across years, we standardise them to have a mean of 50 and a standard deviation of 10.

We merge this database with information from the Pupil Level Annual Schools Census (PLASC) to obtain pupil-level background characteristics; most importantly, ethnicity (which we define in the same way as in Table 1), whether or not English is the mother tongue, as well as an indicator for family poverty. From this database, we select all pupils who took Key Stage 1 examinations in 1998 and can be followed throughout the end of compulsory schooling, i.e. Key Stage 4 examinations in 2007.

Table 2 provides an overview of the estimation sample. The share of White British pupils in the two samples is about 85%, and thus about 5% lower than in England as a whole (see Table 1). This probably reflects the higher fertility rate of ethnic minority

[5] Hedonic house price equations research uncovers a significant link between house prices and primary school performance; see Black (1999) for US evidence, Gibbons and Machin (2003, 2006) for evidence from England and the literature reviews of Gibbons and Machin (2008) and Black and Machin (forthcoming).

Table 2

Ethnic Minorities in Primary and Secondary Schools

	N	Share (%)	Free Meal Status (%)	Mother Tongue: English (%)	Age in KS1	Age in KS4
White British	411,315	87.54	12.45	100.00	6.46	15.46
Black, Caribbean	5,683	1.21	30.83	95.09	6.47	15.46
Black, Other	6,036	1.28	37.87	59.84	6.46	15.45
Bangladeshi	3,701	0.79	51.96	3.76	6.47	15.47
Pakistani	9,953	2.12	35.35	11.41	6.47	15.46
Indian	9,980	2.12	11.79	19.54	6.46	15.46
Chinese	1,287	0.27	14.06	26.73	6.48	15.48
Other	21,893	4.66	23.94	75.07	6.46	15.46

Note. The Table reports the number of observations (*N*), the share of ethnic minorities, the share of pupils eligible for free school meals (at Key Stage 2), the share of pupils for whom English is their mother tongue, and the average age of pupils at Key Stage 1 and Key Stage 4 examinations in each ethnic category.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007.

groups. As for the whole English population, the two largest minorities are the Indians and Pakistanis, followed by Blacks with Caribbean or other heritage.

Our proxy indicator for family poverty is eligibility for free school meals. Pupils who receive free meals are the 15–20% poorest pupils. With the exception of the Indians and Chinese, the share of pupils who are eligible for free school meals is substantially higher among ethnic minorities than among White British pupils. In the case of the Bangladeshi, the difference is as large as (about) 40 percentage points. From Table 1, this is also the group amongst adults with the lowest employment rate and the lowest wage, while wages of Indian and Chinese men are similar to those of White British men.

For the vast majority of pupils with Bangladeshi, Pakistani, Indian or Chinese background, English is not their mother tongue.[6] In contrast, this is the case for only 5% of Black Caribbean pupils. As expected, since there is virtually no grade repetition, the average age at Key Stage 1 and 4 is virtually identical across ethnic groups.

2.2. *The Millennium Cohort Study (MCS)*

The Millennium Cohort Study (MCS) is a longitudinal survey that follows a random sample of about 20,000 children who were born in the UK between September 2000 and August 2001. Blacks and Asians (with the exceptions of Chinese) are over-sampled. Since the start of the survey, children have been followed twice, once at age 3 and again at age 5, just before the start of school. We use this database to compute achievement gaps between White British pupils and ethnic minorities at the start of school, at age 5; see Dustmann and Trentini (2008) for an extensive analysis of the evolution of achievement gaps and the effects of pre-school attainment from age 3 to 5. At age 5, the MCS includes three achievement outcomes: the Picture Similarity Assessment, the Naming Vocabulary Assessment, and the Pattern Construction Assessment. We describe

[6] This variable measures whether the first language to which the child was exposed was English. If the child was exposed to more than one language and these include English, English is taken as the mother tongue. In contrast, if a child acquires English subsequent to early development, then English is not recorded as their mother tongue no matter how proficient the pupil becomes.

each test in more detail in Appendix B. Test scores are again standardised to mean 50 and standard deviation 10.

3. Achievement of Ethnic Minorities Through Primary and Secondary School – The Basic Facts

We now document how test score gaps in English (and Mathematics) between White British pupils and pupils from ethnic minorities evolve throughout primary and secondary school.

3.1. *The Basic Facts*

The figures in Table 1 indicate that, with the exception of Black Caribbean men and Bangladeshi women, average years of education among ethnic minorities in Britain exceeds that of the White British working-age population. This advantage is particularly large for Indian and Chinese men and women, as well as men and women from any other background.

3.1.1. *Entry gaps*

How does the achievement of White British children differ from that of children from ethnic minorities at around school starting age, at the age of 5? Table 3(*a*), reports achievement gaps based on a Vocabulary Naming Assessment, a Picture Similarity Assessment and a Pattern Construction Assessment, from the MCS. In almost all tests, White British pupils outperform ethnic minority pupils, which is in contrast with the overall educational advantage of ethnic minorities at working age. According to the Vocabulary Naming Assessment, scores of all ethnic minority children are at least 42% of a standard deviation lower than those of White British children; for non-Caribbean Blacks, Bangladeshi and Pakistani children, the gap is larger than 1 standard deviation. Achievement gaps are substantially smaller for the Picture Similarity and Pattern Construction Assessment. There is again substantial heterogeneity across ethnic groups: while the achievement gap is at least 30% of a standard deviation for Black Caribbean, other Black (Pattern Construction Assessment), Pakistani and Bangladeshi children (Pattern Construction and Picture Similarity Assessment), it is insignificant or even positive for Indians, Chinese and other ethnic minority children – although these groups considerably lag behind in the Vocabulary Naming Assessment.

These findings provide a first indication that achievement gaps between White British and ethnic minority children may be partly due to English language ability, as one would expect it to matter more in the Vocabulary Naming Assessment than in the other two Assessments. Moreover, the two ethnic groups with the lowest share of children for whom English is the mother tongue, Bangladeshi and Pakistani, experience the lowest scores.

In Table 3(*b*), we report our findings separately for boys and girls. At age 5, White British girls are ahead of White British boys in each test, by up to 15% of a standard deviation. The patterns described above hold for both boys and girls.

Table 3

Ethnic Achievement Gaps at School Entry

	Vocabulary		Pictures		Patterns	
(*a*) *Overall Achievement Gaps*						
Black, Caribbean	−6.61	(0.93)**	1.84	(1.37)	−2.68	(0.844)**
Black, Other	−10.58	(0.79)**	−0.89	(0.59)	−4.95	(0.91)**
Bangladeshi	−15.14	(0.71)**	−3.66	(0.64)**	−5.39	(0.50)**
Pakistani	−15.51	(0.86)**	−2.84	(1.17)*	−4.87	(0.82)**
Indian	−6.18	(0.94)**	0.31	(0.74)	−0.99	(0.63)
Chinese	−6.44	(4.31)	5.21	(2.86)	4.33	(1.75)**
Other	−4.21	(0.73)**	0.62	(0.53)	−0.97	(0.53)
N	9,039		9,031		9,012	

	Vocabulary		Pictures		Patterns	
	Boys	Girls	Boys	Girls	Boys	Girls
(*b*) *Boys versus Girls*						
Constant (White British)	55.91	56.52	55.13	56.17	50.59	52.14
	(0.29)**	(0.29)**	(0.29)**	(0.26)**	(0.28)**	(0.28)**
Black, Caribbean	−7.53	−5.53	3.27	0.25	−2.58	−2.71
	(1.43)**	(1.38)**	(1.51)*	(1.50)	(1.26)*	(0.94)**
Black, Other	−11.69	−9.33	−1.61	−0.06	−5.78	−3.97
	(1.15)**	(0.94)**	(0.79)*	(0.98)	(1.23)**	(0.89)**
Bangladeshi	−15.45	−14.83	−3.88	−3.46	−6.25	−4.57
	(0.86)**	(0.87)**	(0.72)**	(0.89)**	(0.59)**	(0.69)**
Pakistani	−15.25	−15.79	−4.50	−1.28	−5.97	−3.82
	(0.99)**	(1.17)**	(1.13)**	(1.65)	(0.95)**	(1.06)**
Indian	−6.12	−6.25	0.79	−0.19	−0.45	−1.56
	(1.36)**	(1.06)**	(1.01)	(1.02)	(0.87)	(0.79)*
Chinese	−14.73	−1.27	4.85	5.23	0.04	6.77
	(6.77)*	(3.71)	(4.93)	(3.57)	(1.69)	(2.18)**
Other	−3.80	−4.63	0.84	0.35	−0.70	−1.30
	(1.00)**	(0.93)**	(0.79)	(0.83)	(0.78)	(0.74)
N	4,587	4,452	4,590	4,441	4,570	4,442

Note. Panel (*a*) shows achievement gaps at age 5 (before the start of school) between ethnic minorities and the White British in three tests: naming vocabulary test, picture similarity test, and pattern construction test. Panel (*b*) reports results separately for boys and girls. Results are weighted to make them representative for the child population as a whole. Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.

Source. Millennium Cohort Survey (MCS), age 5.

3.1.2. *The achievement gap through primary and secondary school*

How do achievement gaps evolve through primary and secondary school? In Figure 1, we plot test score gaps in English and Mathematics at beginning of compulsory schooling at Key Stage 1 (age 6/7) against those at the end of compulsory schooling at Key Stage 4 (age 15/16). We also plot the 45-degree line. Points along this line indicate that ethnic achievement gaps remain roughly constant throughout compulsory schooling, while points above the 45-degree line imply that ethnic minorities experience larger test score gains than the White British. In Table 4 we display the raw ethnic achievement gap in English at Key Stage 1 (column (1)) and the change in the gap between Key Stage 1 and Key Stage 4 (column (2)).

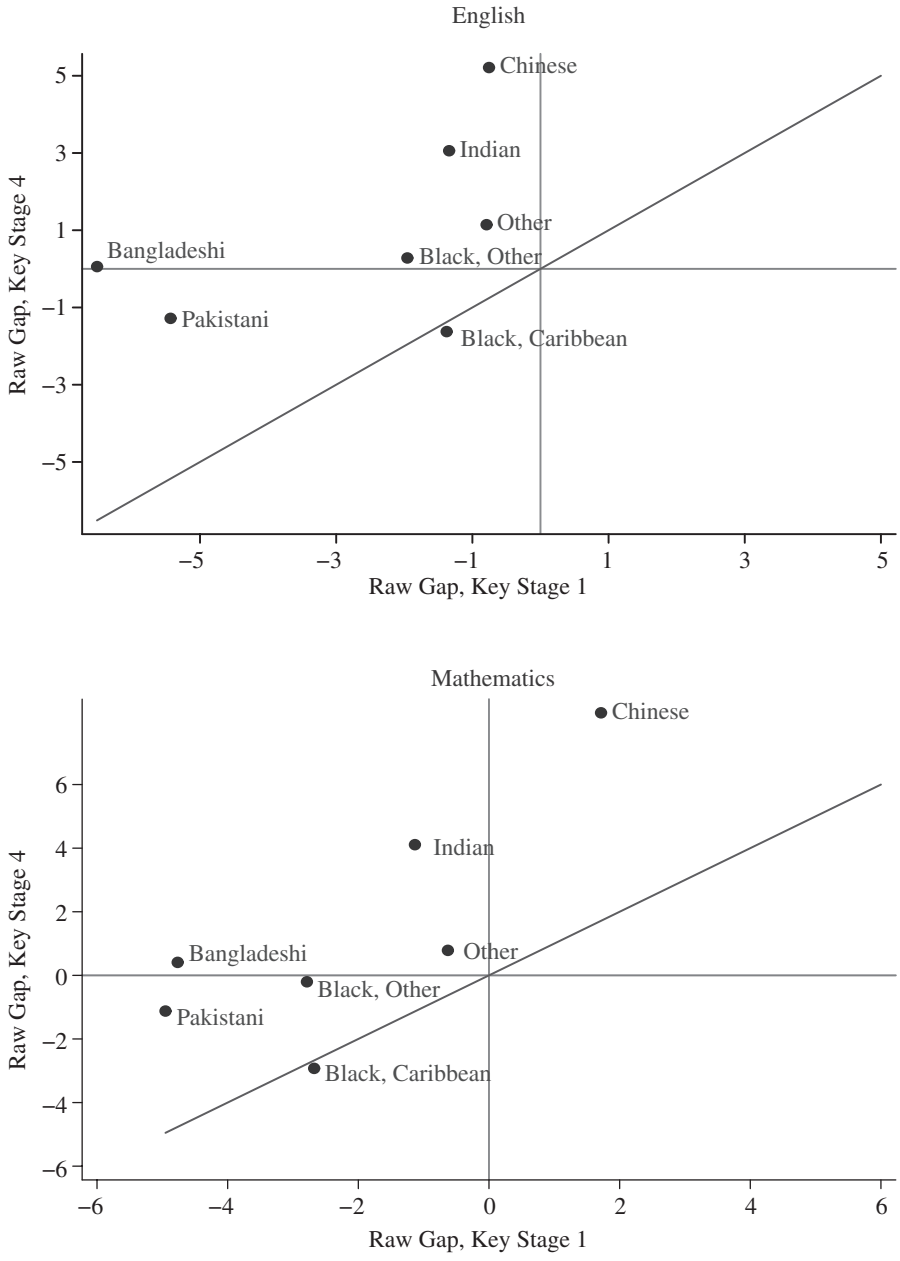

Fig. 1. *Ethnic Achievement Gaps at the Beginning* (*Key Stage* 1) *and End* (*Key Stage* 4) *of Compulsory Schooling*

Note. The Figure plots ethnic achievement gaps in English and Mathematics at age 6/7 (Key Stage 1) against the respective achievment gaps at age 15/16 (Key Stage 4). Test scores are standardised with mean 50 and standard deviation 10.

Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007. $N = 469{,}847$.

Table 4

Raw and Adjusted Changes in Ethnic Achievement Gap Throughout Compulsory Schooling

	(1)	(2)	(3)	(4)	(5)	(6)
	Key Stage 1	Change from Key Stage 1 to Key Stage 4			Share Explained	
	Raw gap	Raw	EMT adjusted	FMS adjusted	EMT (%)	FMS (%)
Black, Caribbean	−1.38	−0.25	−0.40	−0.29	−60.00	−18.42
	(0.16)**	(0.16)	(0.16)**	(0.16)		
Black, Other	−1.95	2.24	1.02	2.19	54.42	2.30
	(0.17)**	(0.16)**	(0.16)**	(0.17)**		
Bangladeshi	−6.51	6.57	3.65	7.28	44.44	−10.74
	(0.28)**	(0.28)**	(0.28)**	(0.29)**		
Pakistani	−5.43	4.15	1.47	4.53	64.72	−9.12
	(0.18)**	(0.18)**	(0.18)**	(0.18)**		
Indian	−1.34	4.40	1.96	4.51	55.52	−2.54
	(0.15)**	(0.14)**	(0.14)**	(0.14)**		
Chinese	−0.76	5.97	3.74	6.09	37.25	−2.01
	(0.29)*	(0.25)**	(0.25)**	(0.25)**		
Other	−0.79	1.94	1.18	1.96	39.05	−1.31
	(0.09)**	(0.08)**	(0.08)**	(0.09)**		
N	469,847	469,847	469,847	469,847		

Note. The first column displays the raw ethnic achievement gap in English at Key Stage 1. The second to fourth columns show the raw and adjusted changes in ethnic achievement gaps between Key stage 1 and 4. Column (3) adjusts for whether English is the pupil's mother tongue, while column (4) adjusts for whether the pupil is eligible for a free school lunch. Columns (5) and (6) display the share of the widening or narrowing of the achievement gap between Key Stage 1 and 4 that can be attributed to English as a mother tongue and free meal status. Test scores are standardised with mean 50 and standard deviation 10. Standard errors in parentheses allow for clustering at the school level. Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007.

First notice that the groups that perform the worst at Key Stage 1 English and mathematics examinations (i.e. Black Caribbean, Black other, Bangladeshi, and Pakistani) are the same groups that performed particularly poorly in the Pattern Construction Test at age 5. The two groups that lag behind most are Bangladeshi and Pakistani pupils, where the raw test score gaps in both English and Mathematics exceed 50% of a standard deviation (see also Table 4, column (1)).

Most importantly, most ethnic minority groups experience larger gains in English and Mathematics test scores through compulsory schooling than White British pupils. By the end of compulsory schooling at Key Stage 4, Bangladeshi and Black non-Caribbean pupils completely catch up with their White British peers in both English and mathematics, despite their considerable disadvantage at Key Stage 1. For Pakistani pupils, the achievement gaps in English and Mathematics closed by more than 80%. At Key Stage 4, Indian and Chinese pupils outperform White British pupils by more than 30% of a standard deviation in both English and Mathematics. Recall from Table 1 that these are also the two ethnic groups with the highest educational attainment. The only group for which we do not observe a narrowing of the achievement gap throughout compulsory schooling is Black Caribbean pupils (see also Table 4, column (2)).

In Table 5, we report raw English test score gaps at Key Stage 1 and the change in this gap between Key Stage 1 and Key Stage 4 separately for boys and girls. At Key Stage 1, White British girls outperform White British boys in English by almost 30% of a

Table 5

Ethnic Achievement Gaps at the Beginning and End of Compulsory Schooling: Boys Versus Girls

	(1)		(2)		(3)	
	Key Stage 1, raw gap		Change from KS 1 to KS 4, raw		Share explained by EMT	
	Boys	Girls	Boys	Girls	Boys (%)	Girls (%)
Baseline	48.81	51.73	−0.56	−0.17		
(White British)	(0.04)**	(0.04)**	(0.03)**	(0.03)**		
Black, Caribbean	−1.40	−1.54	−1.01	0.38	−13.29	42.33
	(0.21)**	(0.21)**	(0.21)**	(0.19)*		
Black, Other	−1.72	−2.20	1.62	2.84	61.43	50.80
	(0.22)**	(0.21)**	(0.22)**	(0.19)**		
Bangladeshi	−6.33	−6.85	5.86	7.16	44.06	44.99
	(0.36)**	(0.32)**	(0.35)**	(0.32)**		
Pakistani	−5.33	−5.52	3.76	4.55	62.20	62.00
	(0.21)**	(0.20)**	(0.21)**	(0.20)**		
Indian	−1.30	−1.39	4.23	4.57	51.50	58.53
	(0.18)**	(0.17)**	(0.17)**	(0.15)**		
Chinese	−0.94	−0.60	6.32	5.63	30.45	44.52
	(0.43)*	0.38	(0.37)**	(0.34)**		
Other	−0.84	−0.77	1.95	1.92	35.24	42.30
	(0.12)**	(0.12)**	(0.11)**	(0.10)**		
N	233,244	236,603	233,244	236,603	233,244	236,603

Note. The first column displays the raw ethnic achievement gap in English at Key Stage 1, separately for boys and girls. The second column shows the raw change in ethnic achievement gaps between Key Stage 1 and 4, again separately for boys and girls. Column (3) displays the share of this change that can be attributed to language. Test scores are standardised with mean 50 and standard deviation 10. Standard errors in parentheses allow for clustering at the school level. Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007.

standard deviation – a larger advantage than in any of the tests at age 5 (Table 3). This advantage slightly increases throughout compulsory schooling (column (2)). Interestingly, while Black Caribbean girls experience a slightly larger gain in English test scores throughout compulsory schooling than White British girls, Black Caribbean boys lose relative to their White British counterparts by about 10% of a standard deviation. We observe a larger, statistically significant gain in English test scores between Key Stage 1 and Key Stage 4 for girls than for boys also among Black non-Caribbean, Pakistani, and Bangladeshi pupils. Notice that these are the groups where girls started out at somewhat lower levels than boys.

4. The Evolution of Achievement Gaps through Primary and Secondary School – Explanations

We now explore three possible explanations for these significant changes in ethnic achievement gaps: different family background characteristics, different school quality and teacher incentives. Before we discuss each explanation, we would like to rule out a fourth explanation: teacher bias. Since all key stage examinations are centralised and anonymously marked by external graders, it is unlikely that achievement gaps as well as

the progress of ethnic minority pupils relative to White British pupils are due to teachers being biased against ethnic minorities.

We focus on ethnic achievement gaps in English. The basic patterns are the same for Mathematics and can be found in an Online Appendix available from our web page.

4.1. *The Role of Family Characteristics*

We first analyse how the evolution of ethnic attainment gaps through the school years are affected by family characteristics. We concentrate on two characteristics: poverty, measured by the proxy variable measuring whether the child is eligible for free meals,[7] and English language ability, measured as whether English is the mother tongue. We acknowledge that both variables may be correlated with other (to us) unobserved family characteristics, such as parental education or parental aspiration, that may affect pupil achievement. We are not able to isolate these factors from poverty and language. It is also important to stress that the empirical connections between test scores and poverty or language ability should be interpreted as associations, and not in a causal manner.

4.1.1. *Language*

In Table 6, we report the coefficient on English as a mother tongue on English test scores at Key Stage 1 and at Key Stage 4 (columns (1) and (4)). Results indicate that at Key Stage 1, English test scores of pupils whose mother tongue is English are 35.9% of a standard deviation higher than those of pupils whose mother tongue is not English, compared to only 5.6% of a standard deviation at Key Stage 4. Hence, language not

Table 6

The Impact of English as a Mother Tongue (EMT) and Free Meal Status (FMS) on English Test Scores at the Beginning and End of Compulsary Schooling

	Key Stage 1			Key Stage 4		
	(1)	(2)	(3)	(4)	(5)	(6)
	EMT	FMS	Both	EMT	FMS	Both
English as a Mother Tongue	3.59 (0.13)**		3.04 (0.13)**	0.56 (0.17)**		−0.13 (0.16)
Free Meal Status		−5.26 (0.05)**	−5.21 (0.05)**		−6.52 (0.08)**	−6.53 (0.08)**
N	469,847	469,847	469,847	469,847	469,847	469,847

Note. The Table reports the coefficient on two indicator variables, English as a Mother Tongue (EMT) and Free Meal Status (FMT), on English test scores at Key Stage 1 and Key Stage 4. Test scores are standardised with mean 50 and standard deviation 10. Standard errors in parentheses allow for clustering at the school level. Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.
Source: NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007.

[7] Hobbs and Vignoles (2007) provide an extensive discussion whether free meal status provides a valid proxy for socio-economic status.

only helps to explain differences in the level but also in the evolution of attainment gaps between White British and ethnic minority pupils.

We explore this further in Figure 2. In the left Figure of Panel (*a*), we plot the raw test score gap in English at Key Stage 1 against the gap adjusted for whether or not English is the pupil's mother tongue at Key Stage 1. With the exception of Black Caribbean pupils (for most of whom English is the mother tongue), all points lie above the 45-degree line, indicating that language helps to contribute towards why ethnic minorities lag behind White British pupils at the beginning of compulsory schooling. For instance, for Bangladeshi and Pakistani pupils, achievement gaps decline by about 60%. This mirrors our finding in Table 3 that ethnic achievement gaps at age 5 are considerably larger for the vocabulary test than for the picture and pattern tests.

In the left Figure of Panel (*b*), we plot the test score gap adjusted for English as a mother tongue at Key Stage 1 against the adjusted gap at Key Stage 4. Compared to the corresponding Figure on raw gaps (Figure 1), points are now much closer to the 45-degree line. Hence, language plays a powerful role in explaining greater progress in English of ethnic minority pupils relative to White British pupils.

We provide more details in Table 4, where we report in column (3) the change in ethnic achievement gaps between Key Stage 1 and Key Stage 4, adjusted for whether or not English is the pupil's mother tongue. In column (5), we display the share of the change that can be attributed to language.[8] With the exception of Black Caribbean pupils, language alone can explain between 37% (Chinese) and 64% (Pakistani) of the greater progress of ethnic minority pupils relative to White British pupils. Language also helps to explain why Black Caribbean pupils, for most of whom English is the mother tongue, improve less than any other ethnic group. For instance, the numbers in Table 4 imply that about 50% of the greater progress of Indian relative to Black Caribbean pupils in English between Key Stage 1 and 4 is due to language.[9]

4.1.2. *Poverty*

Next, we explore how poverty status, proxied by free school meal eligibility, affects attainment gaps between White British pupils and ethnic minority groups. Table 6 shows that at Key Stage 1, English test scores of pupils who are eligible for free meals are 52.6% of a standard deviation lower than those of non-eligible pupils. At Key Stage 4, the impact of free school meal eligibility increases to 65.2%. Consequently, while being poor may contribute to explaining the disadvantage of pupils at the beginning of compulsory schooling at Key Stage 1, it cannot explain why most ethnic minority children catch up with or even overtake White British pupils throughout compulsory schooling. This makes the progress of poor ethnic minority groups, such as Bangladeshi and Pakistani, relative to White British pupils all the more remarkable.

[8] The shares are computed as $(1 - \Delta gap^{ajdusted}/\Delta gap^{raw})100$, where $\Delta gap^{adjusted}$ and Δgap^{raw} are the adjusted (column (2)) and raw (column (3)) changes in achievement gaps between Key Stage 1 and Key Stage 4.

[9] This share is computed as follows. The raw progress of Indian relative to Black Caribbean pupils between Key Stage 1 and Key Stage 4 is 4.65 (4.40 + 0.25), while the progress adjusted for language is 2.36 (1.96 + 0.4). Hence, $(1-2.36/4.65)\times100$, i.e. around 50%, of the greater progress of Indian relative to Black Caribbean pupils between Key Stage 1 and 4 is due to language.

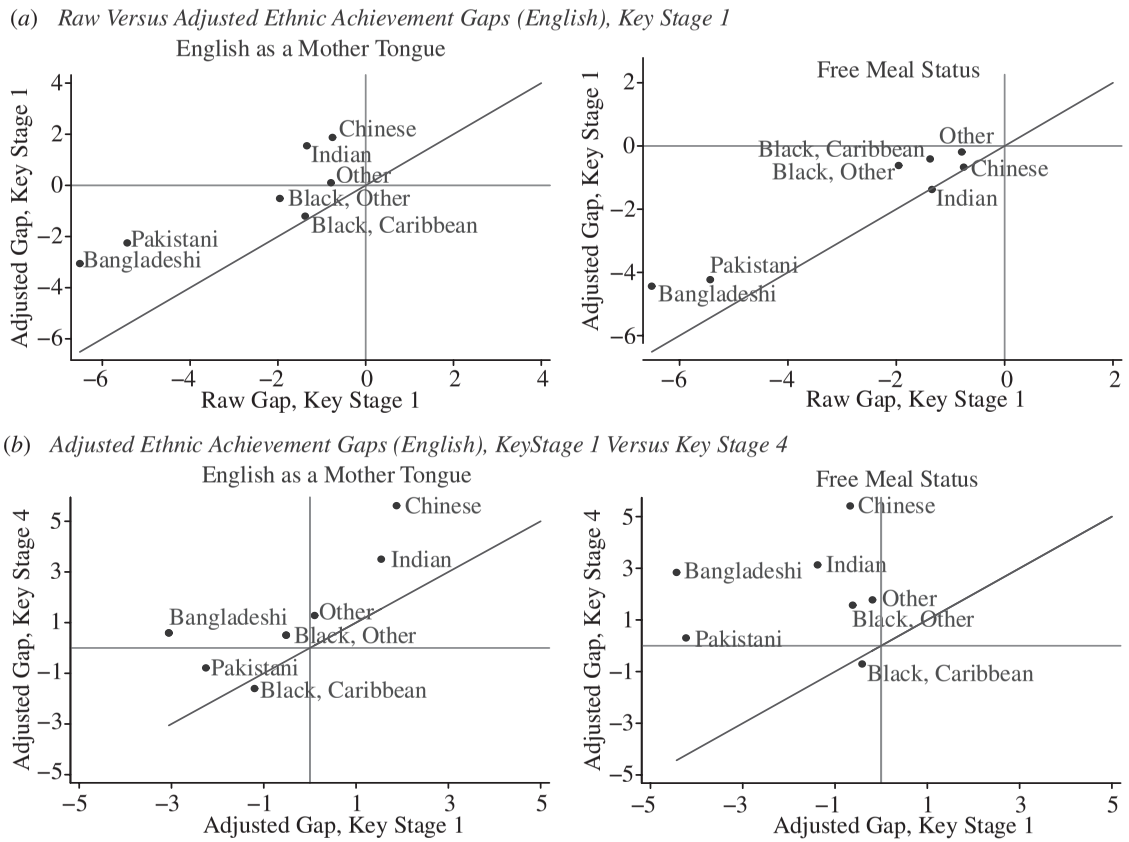

Fig. 2. *Ethnic Achievement Gaps at the Beginning (Key Stage 1) and End (Key Stage 4) of Compulsory Schooling: The Role of Family Background Characteristics*

Note. In Panel (*a*), we plot the raw ethnic test score gaps in English at Key Stage 1 against the adjusted ethnic test score gap at Key Stage 1. In Panel (*b*), we plot the adjusted ethnic test score gaps in English at Key Stage 1 against those in Key Stage 4. The left Figures adjust for whether English is the pupil's mother tongue, while the right Figures adjust for whether the pupil is eligible for free school lunches. Test scores are standardised with mean 50 and standard deviation 10.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007. $N = 469{,}847$.

We investigate this further in Figure 2 (right Figures), where in Panel (*a*) we plot the raw test score gap in English at Key Stage 1 against the gap adjusted for free school meal eligibility at Key Stage 1. For the four poorest groups, Black Caribbean and Other, Pakistani and Bangladeshi, points lie above the 45-degree line, indicating the inclusion of free school meal eligibility reduces the attainment gaps for these groups. For instance, at Key Stage 1 the raw gap in English between Bangladeshi (Black Caribbean) and White British pupils is −6.51 (−1.40), compared to −4.44 (−0.41) conditional on free meal eligibility. Also, notice that both background characteristics reduce the heterogeneity across ethnic groups. For instance, the difference in the raw achievement gap between the lowest (Bangladeshi) and best (Chinese) performing minority group in English is 5.8, compared to 3.76 for the conditional attainment gaps.

In the right Figure of Panel (*b*), we plot the test score gap adjusted for poverty at Key Stage 1 against the adjusted gap at Key Stage 4. Compared to the corresponding Figure on raw gaps (Figure 1), points are now even further away from the 45-degree line, confirming that poverty does not contribute to explaining the greater progress of ethnic minority pupils relative to White British pupils throughout compulsory schooling.

For completeness, we report in columns (4) and (6) of Table 4 the change in ethnic achievement gaps between Key Stage 1 and Key Stage 4, adjusted for free school meal eligibility and the share of this change that can be attributed to poverty. For most ethnic groups, the adjusted change exceeds the raw change. Hence, the share of the greater progress of ethnic minorities relative to White British pupils that can be attributed to poverty is in fact negative.[10]

We have repeated the analysis separately for boys and girls, and observe much the same pattern for both groups. The relation between English as a mother tongue or free school meal eligibility and English test scores at Key Stage 1 and Key Stage 4 are not statistically different for boys and girls. Hence, the share of the change in ethnic achievement gaps between the beginning and end of compulsory schooling that can be attributed to language (Table 5, column (3)) and poverty (not reported) turns out to be similar for boys and girls.

4.2. *The Role of Schools*

How does school quality affect the progress of ethnic minorities relative to White British pupils? We now investigate this question by analysing whether the progress of ethnic minority pupils (with the exception of Black Caribbean pupils) throughout compulsory schooling predominantly occurs within or between schools.

[10] The analysis so far assumed that the impact of free meal status is the same across all ethnic groups. However, it turns out that the association between free meal status and achievement is stronger for White British pupils than for ethnic minority groups (Cassen and Kingdon, 2007*a*, *b*). The association is smallest for Bangladeshi pupils who have the highest poverty rates (see Table 2). When we evaluate the importance of poverty on ethnic achievement gaps using the coefficient for ethnic minorities as opposed to the (in absolute terms larger) average coefficient, poverty contributes less to explaining ethnic achievement gaps but our overall conclusions are unchanged.

Table 7

Ethnic Minorities and 'School Quality'

	Key Stage 1			Key Stage 4		
	(1)	(2)	(3)	(4)	(5)	(6)
	Share	Share	Mean	Share	Share	Mean
	White British	Free Meal	Test Score	White British	Free Meal	Test Score
White British	92.79	12.78	50.23	92.23	9.15	49.99
Black, Caribbean	45.69	28.34	48.68	47.32	22.36	49.37
Black, Other	43.28	31.16	48.32	46.50	22.11	49.99
Bangladeshi	31.68	41.70	46.11	37.92	37.49	48.88
Pakistani	33.40	31.86	46.58	44.79	25.55	48.76
Indian	44.50	19.69	48.48	49.56	15.14	50.92
Chinese	73.86	19.29	49.61	74.54	13.00	51.71
Other	66.60	19.70	49.47	67.23	14.38	50.76

Note. The Table shows the share of White British peers (columns (1) and (4)), the share of peers who are eligible for free school meals (columns (2) and (5)), as well as the average English test score of peers (columns (3) and (6)) of White British and minority pupils, at the beginning (Key Stage 1) and end (Key Stage 4) of compulsory schooling.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007. $N = 469{,}847$.

In order to get a first impression on whether White British and ethnic minority pupils attend different schools, we report in Table 7 the share of White British pupils White British and ethnic minority pupils go to school with. Segregation is considerable:[11] whereas at Key Stage 1 93% of the schoolmates of White British pupils are themselves White British, the corresponding share is less than 46% for Black, Bangladeshi, Indian and Pakistani pupils. Interestingly, by the end of compulsory schooling at Key Stage 4, schools are somewhat less segregated. For instance, for Bangladeshi, Pakistani and Indian pupils, the share of White British schoolmates increased by more than 5 percentage points between Key Stage 1 and Key Stage 4. Moreover, all ethnic minorities have schoolmates that are substantially poorer than those of White British pupils at both Key Stage 1 and Key Stage 4 but this difference declines throughout compulsory schooling. In a similar vein, while the mean English test score of classmates increases from Key Stage 1 to Key Stage 4 for all ethnic minority pupils, it slightly declines for White British pupils. This suggests that part of the greater progress of ethnic minorities relative to White British pupils may be related to the transitions that ethnic minorities make when moving up from primary to secondary school.

In Table 8(*a*), we compare raw attainment gaps in English at Key Stage 1 and Key Stage 4 with those that condition on school fixed effects and thus exploit variation within schools only. At the beginning of compulsory schooling at Key Stage 1, the within-school achievement gap at Key Stage 1 is considerably smaller than the overall achievement gap for all minority groups. For instance, for the two worst performing groups at Key Stage 1, Bangladeshi and Pakistani, achievement gaps at the beginning of compulsory schooling decline by about 40% if school effects are included. The pattern

[11] See Johnston *et al.* (2006) for a detailed analysis on ethnic segregation in English schools.

Table 8

Ethnic Achievement Gaps at the Beginning and End of Compulsory Schooling: The Role of Schools

		Key Stage 1		Key Stage 4		Share Within, KS1→KS4 (%)
		OLS	FE	OLS	FE	
(*a*) *Overall Achievement Gaps*						
Black, Caribbean	Coeff	−1.38	−0.12	−1.63	−0.72	245.00
	SE	(0.16)**	(0.15)	(0.20)**	(0.16)**	
Black, Other	Coeff	−1.95	−0.33	0.28	0.54	39.09
	SE	(0.17)**	(0.16)*	(0.21)	(0.15)**	
Bangladeshi	Coeff	−6.51	−4.51	0.06	1.84	96.58
	SE	(0.28)**	(0.28)**	(0.27)	(0.22)**	
Pakistani	Coeff	−5.43	−3.20	−1.28	0.30	84.44
	SE	(0.18)**	(0.15)**	(0.21)**	(0.17)	
Indian	Coeff	−1.34	0.05	3.05	2.81	62.93
	SE	(0.15)**	(0.12)	(0.19)**	(0.13)**	
Chinese	Coeff	−0.76	−0.28	5.21	3.65	65.96
	SE	(0.29)**	(0.27)	(0.27)**	(0.24)**	
Other	Coeff	−0.79	−0.24	1.14	0.57	41.59
	SE	(0.09)**	(0.08)**	(0.13)**	(0.08)**	
	N	469,847	469,847	469,847	469,847	

		Key Stage 1		Key Stage 4		Share Within, KS1→KS4	
		Boys	Girls	Boys	Girls	Boys (%)	Girls (%)
(*b*) *Boys versus Girls* (*School Fixed Effect Estimates*)							
Constant (White British)	Coeff	48.61	51.61	48.21	51.53		
	SE	(0.02)**	(0.03)**	(0.02)**	(0.04)**		
Black, Caribbean	Coeff	−0.12	−0.28	−1.32	−0.29	118.75	−3.33
	SE	(0.21)	(0.19)	(0.22)**	(0.18)		
Black, Other	Coeff	−0.07	−0.56	0.39	0.77	28.67	46.90
	SE	(0.20)	(0.20)*	(0.20)*	(0.19)**		
Bangladeshi	Coeff	−3.91	−4.44	1.38	2.12	90.34	91.58
	SE	(0.29)**	(0.27)**	(0.27)**	(0.27)**		
Pakistani	Coeff	−2.99	−3.37	0.20	0.69	84.67	89.18
	SE	(0.19)**	(0.18)**	(0.19)	(0.21)**		
Indian	Coeff	0.20	−0.09	2.81	2.83	61.57	64.10
	SE	(0.16)	(0.16)	(0.16)**	(0.16)**		
Chinese	Coeff	−0.51	−0.08	3.71	3.59	66.76	68.12
	SE	(0.42)	(0.35)	(0.34)**	(0.31)**		
Other	Coeff	−0.28	−0.21	0.63	0.54	46.47	38.74
	SE	(0.11)*	(0.11)	(0.10)**	(0.10)**		
	N	233,244	236,603	233,244	236,603		

Note. In Panel (*a*), we compare OLS with fixed school (within) estimates of ethnic achievment gaps in English at Key Stage 1 and Key Stage 4. In the last column, we display the share of the widening or narrowing test score gap between Key Stage 1 and 4 that occurs within schools. In Panel (*b*), we report fixed school (within estimates) of ethnic achievement gaps in English at Key Stage 1 and Key Stage 4 separately for boys and girls. Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.
Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007.

is the same at the end of compulsory schooling at Key Stage 4. The lower within-school estimates may reflect that minority and White British pupils attending the same school are closer to each other than minority and White British pupils attending different schools.

Does the relative improvement of ethnic minority pupils throughout primary and secondary school predominantly occur within or between schools? In the last column of Table 8, we report the share of the change in the relative attainment gaps between Key Stage 1 and Key Stage 4 that happens within schools.[12] The results show that a substantial part, typically more than 50%, of the catch-up of ethnic minority groups (or the worsening of Black Caribbean pupils in primary school) happens within schools. Yet, with the exception of Black Caribbean, Bangladeshi and Pakistani pupils, over 30% of the relative improvement can be attributed to between-school factors. In line with the evidence in Table 7, this suggests that ethnic minority pupils move up to schools with different composition *relative* to White British pupils. Alternatively, in the absence of pupil mobility through school switching, schools with a higher share of ethnic minority pupils make more progress than schools with predominantly White British pupils.[13]

We have repeated the analysis conditional on indicator variables for English as a mother tongue and poverty that we found to be important in explaining relative attainment gaps in the previous Section. Our overall conclusions are similar. The main difference is that the between-school component becomes smaller for most ethnic groups, suggesting that pupils sort into schools based on poverty and language.

In Table 8(*b*), we report school fixed effect estimates, as well as the share of the change in the achievement gaps between Key Stage 1 and Key Stage 4 that occurs within schools, separately for boys and girls. Among Black Caribbean pupils, only boys, but not girls, lose ground relative to their White British counterparts. The Table shows that all of the relative worsening of Black Caribbean boys happens within schools. For all other minority groups, the share that can be attributed to between-school factors is similar for boys and girls.

4.3. *Teacher Incentives: Teaching to the Test*

We now explore an explanation for the progress of ethnic minority pupils (with the exception of Black Caribbean pupils) relative to White British pupils that has received relatively little attention in education research in England: teacher incentives. The idea is as follows. Each year, the Department of Education and Skills publishes school league tables that report the share of pupils above the target in each school at the end of primary school (Key Stage 2) and secondary school (Key Stage 4). The target is passing at least 5 GCSEs with C or better, including English and Mathematics at Key Stage 4, and Level 4 in English, Mathematics and Science at Key Stage 2. School league tables may provide (probably implicit) incentives for teachers to focus their attention on pupils who are most likely to end up close to the target. Pupils who are

[12] The shares are computed as $[(gap_4^{FE} - gap_1^{FE})/(gap_4^{OLS} - gap_1^{OLS})100]$,where gap_j^{FE} and gap_j^{OLS}, $j = 1, 4$ are the school fixed effect and OLS achievement gaps at Key Stage 1 and Key Stage 4, respectively.

[13] Hanushek and Rivkin (2006) point out that school fixed effects may be misleading if there is substantial ethnic segregation at schools. We have repeated the decomposition of the overall relative achievement gaps between Key Stage 1 and Key Stage 4 into a within and between school component. This method attributes a larger share of the relative improvement of ethnic minority pupils throughout compulsory schooling to between school factors, reinforcing our claim that a substantial part of the catch-up is between schools.

likely to fail anyway may receive less attention and the same may be true for pupils who are likely to pass anyway. If ethnic minority pupils are more likely to be in danger of just failing the target, or show more promise at just passing the target than White British pupils, then ethnic minority pupils may receive more attention from teachers on average than White British pupils – which may contribute to why ethnic minority pupils experience larger gains in test scores than White British pupils. Neal and Whitmore-Schanzenbach (2010) analyse similar teacher incentives within the US context of the No Child Left Behind Act and, based on Chicago Public School data, find strong empirical support.[14]

We focus here on teacher incentives in secondary school, measured at Key Stage 4, where school league tables are more high-profile than in primary school, at Key Stage 2. Which pupils should teachers focus on? Figure 3 shows that they should concentrate on pupils in the middle range of the test score distribution. In the Figure, we group pupils into 100 equally sized groups based on their combined Mathematics and Science test score at Key Stage 3. The Figure plots the probability that pupils in each group end up just failing or just passing the Key Stage 4 target, which we define as passing 4, 5, or 6 GCSEs with a grade of C or better. The probability of ending up close to the target is

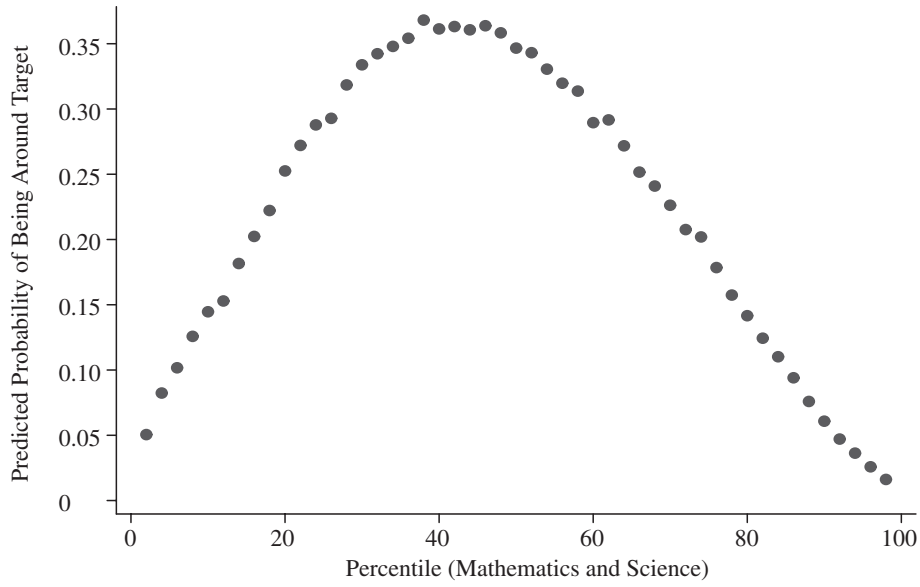

Fig. 3. *Combined Mathematics and Science Test Scores at Key Stage* 3 *and Predicted Probability of Just Passing or Failing the Target*

Note. The Figure plots coefficients from a linear regression that regresses an indicator variable for whether a pupil just passed or just failed the target in Key Stage 4 on the percentile of their combined mathematics and science test score in Key Stage 3. Just failing or just passing the target is defined as passing between 4 and 6 GCSEs, including English and Mathematics, with grade C or better.

Source: NPD and PLASC, Key Stage 3 examinations in 2005 and Key Stage 4 examinations in 2007.

[14] See also Lazear (2006) for a theoretical analysis.

about 35% for pupils in the middle of Mathematics and Science test score distribution but only about 5% for the 10% best and worst pupils.

In the first column of Table 9(*a*), we report the change in English test scores between Key Stage 3 and Key Stage 4 of ethnic minority pupils relative to White British pupils. All ethnic minority pupils, including Black Caribbean pupils, gain relative to White British pupils. If ethnic minority pupils gain more relative to White British pupils from Key Stage 3 to Key Stage 4 because they receive more attention from their teachers, we would expect to see more ethnic minority pupils in the middle range of the mathematics and science test score distribution at Key Stage 3 – where pupils have the highest probability of ending up close to the target at Key Stage 4. In the second column of Table 9(*a*), we report the predicted probability of just meeting or just failing the target of ethnic minority pupils, relative to White British pupils. Based on the combined Mathematics and Science test score at Key Stage 3, Black (Caribbean and Non-Caribbean), Pakistani and Bangladeshi pupils are indeed slightly more likely to end up close to the target than White British pupils. However, Chinese pupils also experience stronger gains from Key Stage 3 to Key Stage 4 than White British pupils, but they are 5% less likely to end up close to the target.

If teacher incentives matter, we would also expect pupils who received more attention from their teachers to experience larger gains in test scores between Key Stage 3 and Key Stage 4. We confirm this in the third column of Table 9(*a*), where we include the predicted probability of ending up around the target as an additional regressor. The coefficient on this variable is 2.66, indicating that an increase in the predicted probability (based on Mathematics and Science test scores) by 10 percentage points increases the gain in English test scores between Key Stage 3 and 4 by 26.6% of a standard deviation.

How far can teaching to the test act as a plausible explanation of the relative progress of ethnic minority pupils between Key Stage 3 and 4? From column (4) of Table 9(*a*), the answer is: not far. The share of the change in English test scores of ethnic minority pupils relative to White British pupils that can be attributed to teacher incentives is less than 3% for most ethnic minority groups, and even negative for others, such as Indian and Chinese pupils.[15] The differences in the predicted probability of ending up close to the target between White British and ethnic minority pupils are simply too small to have a big impact on the ethnic achievement gaps.

One might expect, given that a majority of pupils do achieve the Key Stage 4 target of 5 or more *A**–*C* passes, teacher incentives do matter more in poorer than in richer schools as more children beneath the target attend such schools. In column (1) of Table 9(*b*), we therefore report the change in English test scores between Key Stage 3 and Key Stage 4 for White British and ethnic minority pupils separately for the 20% of schools with the lowest and highest share of pupils eligible for free school meals. Note that unlike in Panel (*a*), we now report the absolute, not relative, test score gains for all groups. Interestingly, ethnic minority pupils from all groups experience larger gains in poor schools than in rich schools, while the opposite is true for White British pupils. Hence, the progress of minority pupils relative to White British pupils between Key

[15] The shares are computed as $(1 - \Delta gap^{adjusted}/\Delta gap^{raw})100$, where $\Delta gap^{adjusted}$ and Δgap^{raw} are the adjusted and raw changes in achievement gaps (column (3) and (1)) between Key Stage 3 and Key Stage 4.

Table 9

Gains in English Test Scores between Key Stage 3 and 4 and the Probability of Ending Up Close to the Key Stage 4 Target (Teaching to the Test)

	(1)		(2)		(3)		(4)
	Gains KS3 to KS4 (English)		Predicted Probability of Being Around Target		Gains KS3 to KS4, predicted target		Share explained (%)
(*a*) *Changes in English Test Scores between Key Stage 3 and Key Stage 4, Ethnic Minorities vs White British (Gaps)*							
Baseline (White British)	−0.11	(0.05)*	0.22	(0.00)**	−0.69	(0.06)**	
Black, Caribbean	0.51	(0.16)**	0.02	(0.00)**	0.47	(0.16)**	9.18
Black, Other	1.27	(0.16)**	0.01	(0.00)**	1.24	(0.16)**	2.68
Bangladeshi	1.89	(0.29)**	0.01	(0.00)*	1.87	(0.29)**	1.43
Pakistani	1.82	(0.16)**	0.01	(0.00)**	1.81	(0.16)**	0.82
Indian	1.35	(0.18)**	−0.01	(0.00)**	1.36	(0.18)**	−1.11
Chinese	0.90	(0.19)**	−0.05	(0.00)**	1.04	(0.19)**	−14.60
Other	0.26	(0.08)**	−0.01	(0.00)**	0.28	(0.08)**	−6.59
Close to target (predicted)					2.66	(0.16)**	

	(1)		(2)		(3)		(4)
	Gains KS3 to KS4 (English)		Predicted Probability of Being Around Target		Gains KS3 to KS4, predicted target		Share explained, rich vs poor (%)
(*b*) *Changes in English Test Scores between Key Stage 3 and Key Stage 4, Poor versus Rich Schools (Absolute Gains)*							
Poor Schools							
White British	−0.51	(0.24)*	0.23	(0.00)**	−1.12	(0.24)**	
Black, Caribbean	0.69	(0.38)	0.23	(0.01)**	0.06	(0.38)	1.88
Black, Other	1.76	(0.37)**	0.23	(0.01)**	1.14	(0.37)**	4.31
Bangladeshi	1.78	(0.48)**	0.23	(0.01)**	1.15	(0.48)*	28.33
Pakistani	1.95	(0.30)**	0.23	(0.01)**	1.34	(0.31)**	4.68
Indian	1.83	(0.42)**	0.23	(0.01)**	1.21	(0.42)**	10.43
Chinese	2.42	(0.54)**	0.22	(0.01)**	1.83	(0.53)**	10.26
Other	0.73	(0.28)**	0.23	(0.00)**	0.13	(0.28)	11.92
Rich Schools							
White British	−0.06	(0.08)	0.20	(0.00)**	−0.60	(0.09)**	
Black, Caribbean	−0.69	(0.41)**	0.22	(0.00)**	−1.30	(0.41)**	
Black, Other	−0.28	(0.37)	0.20	(0.00)**	−0.81	(0.37)*	
Bangladeshi	1.36	(0.45)**	0.19	(0.00)**	0.85	(0.44)*	
Pakistani	0.35	(0.33)	0.20	(0.00)**	−0.19	(0.33)	
Indian	0.15	(0.30)	0.17	(0.00)**	−0.30	(0.29)	
Chinese	0.15	(0.33)	0.13	(0.01)**	−0.21	(0.33)	
Other	−0.17	(0.14)	0.19	(0.00)**	−0.67	(0.14)**	
Close to target (actual)							
Close to target (predicted)					2.69	(0.16)**	

Note. In Panel *(a)*, we first report the gain in English test scores from Key Stage 3 to Key Stage 4 of ethnic minorities relative to the White British. The second column shows ethnic gaps in the predicted probability of ending up close to the target at Key Stage 4. The predicted probability is obtained from a linear regression of ending up close to the target on Key Stage 3 mathematics and science test scores. Column (3) includes the predicted probability that the pupil ends up close to the target as an additional regressor. Column (4) reports the share of the ethnic achievement gaps that can be explained by the inclusion of the predicted probablity of ending up close to the bar.

In Panel *(b)*, we first report the absolute gain in English test scores from Key Stage 3 to Key Stage 4 for ethnic minorities and the White British, separately by poor and rich schools. Column (2) reports the predicted share of pupils who end up close to the target, while column (3) includes the predicted probability that the pupil ends up close to the target as an additional regressor. Column (4) displays the extent to which the inclusion of this regressor can explain the higher test score gains for ethnic minorities in poor than in rich schools.

Coefficients with * are statistically significant at the 5% level, those with ** at the 1% level.

Source. NPD and PLASC, Key Stage 1 examinations in 1998 and Key Stage 4 examinations in 2007. $N = 469{,}847$.

Stage 3 and Key Stage 4 is heavily concentrated in poor schools. Next, we explore whether teacher incentives contribute to the greater progress of minority students in poor schools than in rich schools. In line with this hypothesis, pupils from all groups (including the White British) are more likely to end up close to the target in Key Stage 4 in poor than in rich schools, based on their Mathematics and Science test scores at Key Stage 3 (column 2, Table 9(*b*)). In column 4, we display the share of the difference in test score gains of ethnic minority pupils between poor and rich schools that can be attributed to teaching to the test. While this share is small for Black Caribbean pupils, it is around 10% for Indian and Chinese pupils and 28% for Bangladeshi pupils. Clearly, teacher incentives cannot explain the larger gains of White British pupils in rich than in poor schools: White British pupils are more likely to end up close to the target in poor schools but experience larger test score gains in rich schools.

Overall, our findings suggest that teacher incentives contribute little to explaining the larger progress of ethnic minority pupils relative to White British pupils in secondary school. They do, however, help to explain why the relative progress of ethnic minority pupils is particularly pronounced in poor schools.[16]

We have also broken down the analysis by gender. Ethnic minority pupils experience larger gains in poor than in rich schools among both boys and girls. Interestingly, whereas White British boys perform significantly better in rich than in poor schools White British girls experience about the same gain in English test scores in both types of schools. Moreover, across all groups (including the White British), girls are somewhat more likely to end up close to the Key Stage 4 target in poor schools and somewhat less likely in rich schools. The share of the difference in test score gains of ethnic minority pupils between poor and rich schools that can be attributed to teaching to the test is similar for boys and girls.

5. Conclusion

This article documents the evolution of the achievement gap in English between ethnic minority and White British-born pupils throughout the years of compulsory schooling. Our main analysis is based on administrative data covering all pupils in England within the state schooling system. Our main findings can be summarised as follows.

- Most ethnic minority groups (the exception being Black Caribbean pupils) gain considerably compared to the White British born throughout primary and secondary school, despite their large disadvantage at the beginning of primary school. Among Black Non-Caribbean, Bangladeshi and Pakistani pupils, the relative progress throughout compulsory schooling is more pronounced for girls than for boys. The difference between girls and boys is most striking among Black Caribbean pupils: here, boys lose ground, while girls improve (though at a

[16] We have repeated the analysis for Key Stage 2. We again find that pupils who, based on their Key Stage 1 test scores, are predicted to end up close to the Key Stage 2 target experience larger gains in English test scores between Key Stage 1 and Key Stage 2. However, the differences in the predicted probabilities of just failing or just meeting the target between ethnic minority and White British pupils are again too small to account for much of the greater relative progress of ethnic minority pupils.

lower rate than any other minority group), relative to their White British counterparts throughout compulsory schooling.
- Language spoken at home is the single most important factor why most ethnic minority pupils improve relative to White British pupils and why Black Caribbean pupils make smaller progress than any other ethnic group.
- Poverty, proxied by eligibility for free school lunches, cannot explain why ethnic minority pupils make greater progress than White British pupils.
- Ethnic minority pupils attend different schools from White British pupils in terms of the average share of White British classmates, the average share of poor classmates that are eligible for free school lunches and the average achievement of classmates. These differences between ethnic minority and White British pupils decline throughout compulsory schooling.
- The majority of the relative improvement of ethnic minority pupils occurs within schools. However, for most minority groups, a substantial part of the relative improvement between the beginning of primary and the end of secondary school occurs between schools. For instance, for Black African, Indian and Chinese children, at least 34% of the improvement between KS1 and KS4 occurs between schools. This suggests that the transitions that ethnic minorities make when moving up from primary to secondary school (and during these school phases) are of some importance in explaining the changing achievement gaps.
- Teacher incentives to teach to the test generated by the annual publication of school league tables do not contribute overall to closing the achievement gaps between ethnic minority children and White British. However, around 10% of the larger gains between Key Stage 3 to Key Stage 4 of ethnic minority pupils in poor than in rich schools can be attributed to teacher incentives.

One conclusion one may reach from our analysis is that schools and teacher behaviour does matter when explaining ethnic differences in pupil achievement and (probably more importantly) their evolution through the school careers of children. Future research is needed to investigate the precise mechanisms by which this occurs. For instance, is it due to peer effects or due to teacher practices and policies? We intend to dig deeper in our future research to try and shed some light on these important, highly policy relevant questions.

Appendix

A: *National Pupil Data Base*

We define variables as follows.

Test scores. The Mathematics test score in Key Stage 1 is based on the National Curriculum level awarded for the Mathematics test. Following the Department of Education and Skills, we assign a value of 3 if the pupil is working towards level 1, and 9, 13, 15, 17, 21 and 27 if the level awarded is 1, 2C, 2B, 2A, 3, 4 or 4+. The English test score in Key Stage 1 is an average of the National Curriculum level awarded for the reading and writing test. We use the same rule as above to convert the level into a point score. The Mathematics and English test score in Key Stage 2 and 3 is the total number of points in the National Curriculum English and Mathematics tests. The

Mathematics and English test score in Key Stage 4 is based on the highest grade achieved in Mathematics and English, where we assign values 7, 12, 20, 30, 40, 50, 60, 70 and 75 to levels U, G to A and A*. Our findings are robust to alternative assignment rules.

Ethnicity. In PLASC, ethnicity codes differ for the year 2002, 2003 and 2004 to 2007. The ethnicity variable refers to year 2004. If the ethnicity variable is missing for this year, we use the value for the year 2005, 2006 or 2007. 'Black, Other' comprises the categories 'African' and 'Any other black background'. We also summarise categories 'Any Other Asian Background', 'Any Other Ethnic Group', 'Any Other White Background' and pupils with mixed background by the category 'Other'.

Free Meal Status. Eligibility for free school lunches depends on receipt (by parent or pupil) of Income Support, Income Based Jobseeker's Allowance or support under Part 6 of Immigration and Asylum Act 1999. Since this information comes from the PLASC data for the years 2002 to 2007, it is impossible to link this measure to Key Stage 1. Hence, for Key Stage 1, free school meal eligibility refers to Key Stage 2; for all other key stages, it refers to the corresponding key stage.

We restrict the sample to pupils who have valid test scores in Mathematics and English in each key stage, and pupils with non-missing information on ethnicity, free meal eligibility and English as a mother tongue. The final sample accounts for about 75% of all pupils who sat Key Stage 1 examinations in 1998.[17]

B: *Millennium Cohort Survey*

In the *Vocabulary Test*, the interviewer shows the child a picture and asks the child what the thing on the picture is called. For example, the picture shows an igloo. Only 'igloo' is coded as the correct answer. If the child answers 'snow house', 'Eskimo house' or 'ice house', the answer is marked as incorrect.

In the *Picture Similarity Assessment,* the interviewer points to a row of pictures, shows the child another picture and asks which picture this one goes with. For instance, a picture of a book goes with a picture of a girl who is reading a book.

In the *Pattern Construction Assessment*, each child is given an easel, six black and yellow foam squares, and 9 black and yellow plastic cubes. The interviewer builds a pattern seen on a picture. The child is asked to construct the same pattern. The interviewer notes whether or not the child was able to construct the pattern and whether the child was able to do so within the time limit.

UCL
UCL, LSE and CEPR
UCL and IAB

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[17] One may worry that, due to the fairly large reduction in sample size, our findings may not be representative for the cohorts as a whole. However, several robustness checks indicate that test score gaps between the White British and ethnic minorities evolve similarly throughout primary and secondary school no matter which sample restrictions are used. For instance, attainment gaps are similar if the sample includes all pupils who take key stage examinations in the relevant years.

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