Core Maths qualifications: how they fit in post-16 programmes of study and their impact on other subjects with a quantitative element

Research Report

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Table of contents

Executive summary

Core maths (CM) qualifications were introduced into the post-16 curriculum in England in 2014, with first assessments in 2016. They are a suite of qualifications aimed at students who achieve a grade 4 (originally a grade C) or higher at GCSE Maths but do not go on to take AS or A level Maths. This group comprised around 40% of all students in 2013, when the qualification was proposed (DfE, 2013). Its stated main purpose was to increase participation in post-16 maths and to help develop students' mathematical knowledge and its application to a range of different areas. This means CM qualifications may help students in subjects which have some mathematical content, such as geography, business, engineering, and the sciences.

The main purpose of the research presented here was to investigate whether there is any evidence that taking a CM qualification is beneficial to students in terms of their performance on other qualifications (with a quantitative element) taken concurrently. We also investigated uptake of CM amongst students with different background characteristics, and which other qualifications and subjects CM was most likely to be combined with.

The research questions were:

- What are the background characteristics of Core Maths students?
- Which other level 3 qualifications and subjects are most likely to be taken alongside Core Maths?
- Is there any evidence that Core Maths students perform better in other subjects which have a quantitative element (e.g., A level Biology, Psychology, Business, BTEC Engineering) than similar students not taking Core Maths?

Data and methods

The source of data for this research was the National Pupil Database (NPD), Key Stage 5 (KS5) extract for 2021/22.

For research question 1, we investigated the uptake of CM for groups of students with different background characteristics and compared this with uptake of the most popular A level subjects. We included the top nine most popular A level subjects in terms of entries, and the Extended Project Qualification (EPQ). The characteristics we looked at were gender, prior attainment, deprivation, ethnicity, first language, special educational needs (SEN), school type and school sex composition.

For research question 2, we presented descriptive statistics on the qualifications and subjects most commonly combined with CM. For this analysis we considered both the most common A level subjects and the most common non-A level subjects.

For research question 3, we investigated performance in the eight A level subjects most commonly combined with CM that had a quantitative element. We also chose five BTEC subjects (equivalent in size to one A level) and five BTEC subjects (equivalent in size to three A levels) with a quantitative element. The main analysis was a series of regression models, predicting the probability of CM and non-CM students achieving a particular grade or higher in the subject, after accounting for other contextual variables.

Results

RQ1 – Uptake of Core Maths by background characteristics

- CM had a fairly even gender split (52.1% male). This contrasts with A level Maths which had a much higher proportion of male students (62.5%).
- Over 99% of CM students achieved a grade 4 or higher in GCSE maths and most (78%) achieved grades 5 to 7. These are the types of students the qualification is targeted at. i.e., achieved at least a grade 4 at GCSE. Students going on to take AS or A level maths were much higher attaining.
- CM students tended to have lower levels of prior attainment (as measured by average KS4 point score) than students taking the most popular A levels. However, they were slightly better attaining than students taking A level sociology and were similar to business studies students.
- CM students experienced similar levels of deprivation (as measured by the Income Deprivation Affecting Children Index) to students taking the most popular A level subjects.
- Compared with students taking the most popular A levels, CM students were more likely to be white, and less likely to be Asian, or black.
- CM students were more likely to be English speakers than students taking the most popular A levels.
- Compared with those taking the most popular A levels, CM students were more likely to attend comprehensive schools, FE colleges, or sixth form colleges and less likely to attend independent or selective schools.

RQ2 – Qualifications and subjects taken by core maths students

- CM students were most likely to take 3 A levels (44% of CM students). Next most common qualification taken with CM was 1 BTEC (8%).
- Seven out of the top 10 A level subjects most commonly combined with CM had some quantitative element, with Psychology being the most common subject (30% of Core Maths students).
- EPQ was the most common non-A level subject combined with CM (11.5% of CM students). This was followed by BTEC in applied sciences, and BTEC in business. Most of the top 10 non-A level subjects combined with CM had a quantitative element.
- The qualifications / subjects with the highest percentage of students also taking CM were the Cambridge Technical extended diploma (30.6%) and diploma (25.2%) in engineering.
- In the list of subjects with the highest percentage of students also taking CM, 6 out of the top 10 were engineering-related, suggesting that this a subject area where students might have been particularly encouraged to take CM.
- High proportions of students taking A levels or BTECs with a quantitative element took no maths at KS5. This means there is a lot of potential for increasing uptake of CM if students can be convinced of the benefits of taking the subject.

RQ3 – Do core maths students perform better in subjects which have a quantitative element than similar students not taking core maths?

- The results of the regression analyses for A level subjects showed a statistically significant positive effect of taking CM on the probability of achieving a grade or higher for biology (grades A and C), chemistry (grade C), and business studies (grade A).
- There was a statistically significant negative effect of taking CM on the probability of achieving at least a grade A in A level sociology.
- However, each significant effect for A levels was very small in practical terms. E.g., for chemistry the probability of achieving at least a C increased from 0.68 for non-CM students to 0.72 for CM students.
- For BTECs (size 1) there were only two CM effects which were statistically significant. This was for applied sciences grade D*, and grade D or above.
- For BTECs (size 3) there were, again, just two CM effects which were statistically significant: applied sciences grade MMM or above, and IT grade D*D*D or above. The effect in IT was large, increasing the probability of achieving the grade from 0.07 to 0.21.

Discussion

Uptake of CM remains relatively low, with only 11,522 entries in 2021/22. This is well below the Government's target when they set out the CM policy, which was aimed at the 200,000 students who achieved a grade C in Maths GCSE but did not go on to AS or A level Maths (DfE, 2013). It is worth noting that the Education & Skills Funding Agency has recently announced the 'core maths premium', which is additional funding for CM students as part of the proposed Advanced British Standard (ESFA, 2024). It would be worth repeating some of the analysis presented here in a few years to see whether the increased funding had any impact on uptake levels.

The results of this work show that most students taking the qualification were those it was aimed at, i.e., achieving a grade 4 or higher in GCSE Maths, but not progressing to AS or A level maths. Furthermore, the relatively even gender split for CM suggests that if uptake were to increase CM could help with closing the gender gap in post-16 maths. Further research could investigate the reasons why particular groups of students were less likely to take CM (e.g., not-white, non-English speakers, those attending independent schools) and if anything can be done to encourage uptake amongst these groups of students.

The most common subjects combined with CM were mostly A levels or BTECs with some quantitative element. These results suggest that CM was being taken by many students to support them in these other subjects.

Our analyses found several subjects where taking CM had a statistically significant and positive effect on outcomes. These effects, however, were mostly very small. It is worth noting that several of the effects were in science subjects (e.g., biology, chemistry), which may have more mathematical content than the social science subjects we also investigated (e.g., sociology, geography). It is important to note that as some of the subjects did not have a substantial amount of mathematical content, it is probably unrealistic to expect to find large positive effects on their outcomes.

We need to be somewhat cautious with the interpretation of the results. Although we found significant associations between taking CM and achievement in some other subjects taken concurrently, this does not mean that there was a causal link. There may be other reasons why CM students performed better. For example, it may be that students taking CM were more motivated to do well academically than non-CM students and it was this that meant they did better in their other subjects, rather than taking CM per se.

Introduction

Core maths (CM) qualifications were introduced into the post-16 curriculum in England in 2014, with first assessments in 2016. They are a suite of qualifications aimed at students who achieve a grade 4 (originally a grade C) or higher at GCSE Maths but do not go on to take AS or A level Maths. This group comprised around 40% of all students in 2013, when the qualification was proposed (DfE, 2013). Its stated main purpose was to increase participation in post-16 maths and to help develop students' mathematical knowledge and its application to a range of different areas. This means CM qualifications may help students in subjects which have some mathematical content, such as geography, business, engineering, and sciences. CM qualifications also focus on the application of mathematical techniques to a real-world context.

There are several different qualifications currently within the CM suite. OCR has two different specifications, AQA has three and Pearson just one. These are outlined in Table 1.

Table 1: Summary of Core Maths qualifications

Exam board	Qualification name	Summary of content
OCR	Core Maths A (MEI[1]) Level 3 Certificate	Introduction to quantitative reasoning; Critical maths. "Students use problem-solving cycles in modelling, statistics and financial mathematics in a variety of contexts, and check the outcomes of their calculations. They also use appropriate technology to work with quantitative information."
	Core Maths B (MEI) Level 3 Certificate	Introduction to quantitative reasoning; Statistical problem solving. "Starting from a problem to solve, a quantitative statement to evaluate or a question that has mathematics underlying it, students use a number of skills and processes in engaging in their reasoning. They are expected to think flexibly and use their mathematical and statistical knowledge to make logical and reasoned decisions."
AQA	Certificate in Level 3 Mathematical Studies with Statistical techniques	Analysis of data; Maths for personal finance; Estimation; Critical analysis of given data and models; The normal distribution; Probabilities and estimation; Correlation and regression
	Certificate in Level 3 Mathematical Studies with Critical path and risk analysis	Analysis of data; Maths for personal finance; Estimation; Critical analysis of given data and models; Critical path and risk analysis; Expectation; Cost benefit analysis
	Certificate in Level 3 Mathematical Studies with Graphical techniques	Analysis of data; Maths for personal finance; Estimation; Critical analysis of given data and models; Graphical methods; Rates of change; Exponential functions
Pearson	Level 3 Certificate in Mathematics in Context	Applications of Statistics; Linear Programming; Probability; Sequences and Growth

[1] Mathematics Education Innovation, a charity which advocates for improving lives through advances in mathematics education.

OCR currently provides some guidance on its website[2] as to which specification to choose, based on the content and what other subjects are supported:

> "Core Maths A content supports all Level 3 qualifications which have a quantitative skills requirement. This includes, but is not limited to: business and economics, Physical Education and sport, health and social care, design and technology, engineering and all the science subjects.
>
> Core Maths B content supports subjects that require statistical skills, such as biology and environmental science, psychology, geography and sociology."

The qualifications are designed to be taken over two years and are equivalent to half an A level. However, there is evidence that some schools offer it as a one year course (Homer *et al.* 2020).

Previous research into whether the qualification's aims have been achieved is limited. Homer *et al.* (2020) undertook a review of the qualification in its 'early years' (2016 to 2019), including analysis of the characteristics of students taking CM qualifications, what other qualifications and subjects were taken alongside, and whether there was evidence that CM students performed any better than non-CM students in A levels with some numeric content. In terms of the student characteristics, they found that the percentage of female students increased from 34% in 2016 to 45% in 2019, and that in 2019 CM students were, on average, more deprived than students taking A level maths, but less deprived than students not taking any Key Stage 5 (KS5) maths qualification. In 2018, the most common subjects taken alongside CM were mostly popular AS or A levels with a quantitative element (e.g. maths, psychology, business studies, chemistry) and the Extended Project Qualification (EPQ). They found no evidence that taking CM was associated with better performance in selected A levels taken at the same time (even after accounting for other factors including prior attainment, gender, deprivation, and school type).

They also surveyed teachers and students to elicit views of the qualification. Both teachers and students tended to be positive about it, particularly its applications to real-world situations. They also believed that CM supported students in their other subjects with a mathematical content, although this belief was not backed up with any empirical evidence of improved performance.

Uptake of CM qualifications has increased since its introduction, from 2,930 in 2016 to 12,367 in 2023 (AMSP, no date). However, this is some way below expectations. According to the Royal Society (2023), entries in 2021-22 amounted to just 7% of the potential candidates (i.e., those taking A levels, but not A level Maths). This demonstrates that one aim of the qualification (to significantly increase uptake of Maths post-16) has not been achieved. Their research also found that provision of CM throughout England was 'patchy', with the proportion of schools offering the subject varying greatly between different local authorities. They called for more recognition from universities, such as inclusion of the qualification in entry requirements for students. It is worth noting that some universities already recognise the benefits of CM and make alternative offers to students taking it (see https://amsp.org.uk/universities/university-admissions/alternatives-admissions/).

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[2] https://www.ocr.org.uk/qualifications/core-maths/

Although uptake of CM has been low, it may still be beneficial for those that do take it. The main purpose of the research presented here was to investigate whether there is any evidence that taking a CM qualification is beneficial to students in terms of their performance on other qualifications taken concurrently (e.g., A levels, BTECs). For this analysis, we restricted to qualifications and subjects with some quantitative element, as this was thought to be the most likely area of benefit.

We also investigated uptake of CM amongst students with different background characteristics, and which other qualifications and subjects CM was most likely to be combined with. The purpose of this was to bring up to date the previous analysis of Homer *et al*. (2020). In particular, to see if there have been changes in uptake over time; to expand on their analysis and include more student and school characteristics; and to carry out a more in depth look at qualifications and subjects combined with CM.

The research questions were:

- What are the background characteristics of Core Maths students?
- Which other level 3 qualifications and subjects are most likely to be taken alongside Core Maths?
- Is there any evidence that Core Maths students perform better in other subjects which have a quantitative element (e.g., A level Biology, Psychology, Business, BTEC Engineering) than similar students not taking Core Maths?

This work is of particular interest currently, as the UK government is planning to require students in England to continue to study maths until age 18 (Lewis and Maisuria, 2023). Therefore, the outcomes of this research can inform discussions about possible changes to post-16 maths. Core Maths is a central part of the Key Stage 5 maths offer, and it is important to know whether it is fulfilling its aims of developing quantitative and problem-solving skills, which support the mathematical and quantitative elements in other courses.

Data and methods

The main source of data for this research was the National Pupil Database (NPD). This is administered by the Department for Education (DfE) and includes examination results for all students in all qualifications and subjects in schools and colleges in England. It also includes student and school background characteristics such as gender, ethnicity, prior attainment, and school type. We requested the KS5 extract of the NPD for 2021/22, as this was the most recent available data. We restricted the analysis to students who took at least one qualification equivalent in size to an A level and who were aged 17 or 18 at the start of the academic year.

For research question 1, we investigated the uptake of CM for groups of students with different background characteristics and compared this with uptake of the most popular A level subjects. We included the top nine most popular A level subjects in terms of entries, and the Extended Project Qualification (EPQ). The EPQ was included because entries to this are now high enough to place it above the fifth most popular A level. The characteristics we looked at were gender, prior attainment, deprivation, ethnicity, first language, special educational needs (SEN), school type and school gender composition.

For prior attainment, we split the students completing their KS5 studies in 2021/22 into three equally sized groups (‘High’, ‘Medium’, ‘Low’) based on their average points score (APS) at

Key Stage 4 (KS4). This variable was already in the NPD data and was calculated by assigning a points score to each achieved grade[3] and averaging this across all KS4 qualifications taken by the student.

Student deprivation was measured by the Income Deprivation Affecting Children Index (IDACI), which indicates the proportion of children in the area a student lives in[4] living in low-income families[5]. As such, it cannot tell us how income deprived the student actually is. This variable was also already recorded in the NPD and varies between 0 (0% of children living in low income families) and 1 (100% living in low income families). Students were split into three equally sized groups based on their IDACI score ('High', 'Medium', 'Low').

We used the ethnicity categories already recorded in the NPD to group students by their ethnic background. These are Asian, Black, Chinese, Mixed, White, Other, and Unclassified. Chinese students were in a category of their own due to their tendency to achieve high grades compared to other Asian students. Students were also grouped by their first language (English or other).

For the students with SEN, we used the categories in the NPD. These were 'SEN, no statement', and 'SEN, with statement', with the second of these requiring the most support[6].

For these four student characteristics (IDACI score, ethnicity, language, and SEN), there was a large amount of missing data (around 50%). This was because these variables were collected as part of the school census, using information provided by schools. However, independent schools and colleges were not required to provide this information, leading to large amounts of missing data from these school types.

For the analysis by school type, schools were grouped into six categories: comprehensive (including academies and secondary moderns), sixth form colleges, further education / tertiary colleges, independent schools, selective schools, and other schools.

Schools were also categorised by their sex composition (i.e., boys', girls', or mixed). This was derived from the percentage of girls in each school. If this was greater than 95% then the school was categorised as a girls' school, if it was less than 5% it was categorised as a boys' school. Otherwise, it was categorised as a mixed sex school.

For research question 2, we present descriptive statistics on the qualifications and subjects most commonly combined with CM. For this analysis we considered both the most common A level subjects and the most common non-A level subjects. The main aim of this section was to investigate whether students were mainly combining CM with subjects (A levels or other) with a substantial quantitative element (as recommended).

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[3] For reformed GCSEs the points score was the same as the grade (e.g., 9, 8 etc.). For pre-reform GCSEs, the following points score were assigned to each grade: A*=8.5, A=7, B=5.5, C=4, D=3, E=2, F=1.5, G=1, U=0. See DfE (2017) for details.

[4] A small geographical area known as a Lower Layer Super Output Area (LSOA).

[5] For further information on IDACI calculation, including definitions of children, families, and income deprivation, see Smith *et al.* (2015).

[6] A 'statement' of special educational needs is a legal document which outlines the educational needs of the child and how they will be met by the local education authority.

For research question 3, we were interested in whether CM helped students' performance in other subjects (with a quantitative element) taken at the same time. For this analysis we removed students who took either AS or A level maths, as they would not be able to take CM. This meant we were directly comparing students taking CM with those not taking any maths in KS5.

We investigated performance in the eight A level subjects most commonly combined with CM that had a quantitative element. We also chose five BTEC subjects (equivalent in size to one A level) and five BTEC subjects (equivalent in size to three A levels) with a quantitative element. We begin with a descriptive analysis, showing the grade distributions of the A level and BTEC subjects, broken down by whether CM was taken or not. We then present the results of a series of regression models, detailed below.

Regression analysis

For each A level or BTEC subject we investigated, we fitted logistic regression models predicting the probability of students achieving a particular grade or higher. We chose two different grades for each subject. For A levels, the dependent variables were achieving at least a grade A and achieving at least a grade C. For BTECs equivalent in size to 1 A level, the dependent variables were achieving grade D* and achieving at least a grade D. For BTECs equivalent in size to 3 A levels, the dependent variables were achieving at least a grade D*D*D and achieving at least a grade MMM. These grades were chosen to represent two different points across the grade distribution. Firstly, a high achieving grade, only attained by a minority of students. Second, a grade somewhere in the middle of the distribution, which was achieved by a substantial majority of the students.

In each model, we included a variable which indicated whether the student had taken CM or not. This was our main variable of interest. A statistically significant parameter estimate for this variable would indicate that there was a significant association between taking CM and the probability of achieving a particular grade or higher.

We used multilevel regression models, as these accounted for the clustering of students within schools (leading to students within schools having, on average, more similar outcomes than students in different schools). For a more detailed description of multilevel logistic regressions see Goldstein (2011). The general form of the models were as follows:

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_0 + \beta_1 x_{1ij} + \beta_2 x_{2ij} + \cdots + \beta_l x_{lij} + u_j$$

where p_{ij} is the probability of student i from school j achieving the relevant grade or higher, x_{1ij} to x_{lij} are the independent variables (including the indicator of taking CM), β_0 to β_l are the regression coefficients, and u_j is a random variable at school level.

For each regression model, other contextual variables which were likely to have had an impact on the outcome variable were included. These were student gender, prior attainment, deprivation, ethnic group, first language, special educational needs (SEN) status, student total qualification size, school type, school sex composition, and school mean KS5 attainment.

Most of these variables were described in more detail in the previous section. In addition, the student total qualification size variable indicated the total size of the KS5 qualifications taken by each student, measured in A level equivalents. For example, a student taking 3 A levels would have a value of 3. Other qualifications were already assigned a size in the NPD (e.g., BTECs were equivalent in size to either 1, 2 or 3 A levels).

For the school KS5 attainment measure (centre KS5 point score), we calculated the average KS5 points score amongst all students in each school. The KS5 points score for each student was available in the NPD data and (as with the KS4 points score) was calculated by assigning a points score to each achieved grade[7] and averaging this across all KS5 qualifications taken by the student.

To ensure confidentiality of the data, statistical disclosure controls have been applied to the results (tables and graphs). In particular, counts below 10 and percentages based on counts below 10 have either been suppressed or merged with other counts/percentages.

Results

RQ1 – Uptake of Core Maths by background characteristics

Table 2 shows the number of entries to CM and the percentage split by student gender, compared to the same data for the 10 most popular A level subjects.

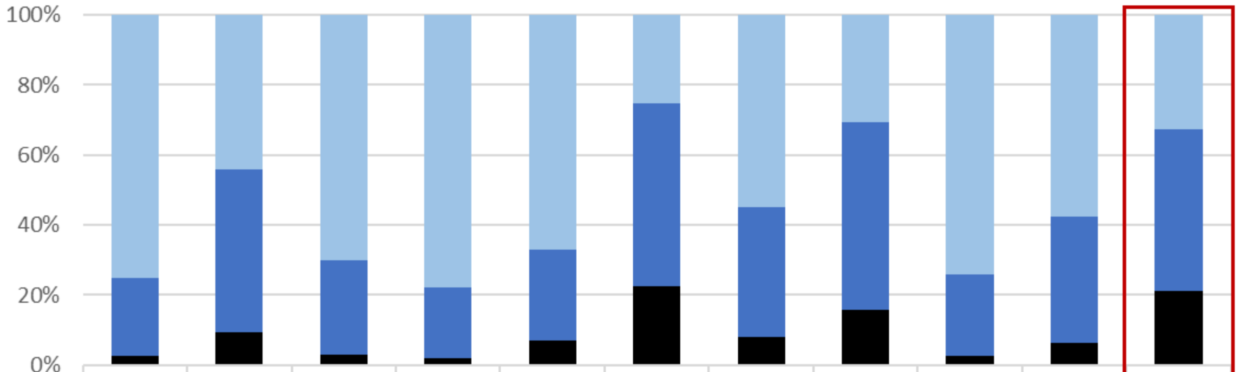
Table 2: Number of entries to core maths and 10 most popular A levels, by gender

Subject	Number of students	Female (%)	Male (%)
Core Maths	11,522	47.9	52.1
Maths	85,341	37.5	62.5
Psychology	74,919	73.5	26.5
Biology	63,636	63.7	36.3
Chemistry	52,188	55.3	44.7
EPQ	48,810	61.5	38.5
Sociology	42,869	76.1	23.9
History	42,550	53.7	46.3
Business Studies	38,463	40.2	59.8
Physics	35,603	22.9	77.1
Economics	35,087	30.8	69.2

This shows that CM had a fairly even gender split, with slightly more male than female students. This contrasts with the A level subjects, almost all of which had a substantial gender gap, in one direction or the other. In particular, it is interesting that CM had a much more even split compared with Maths, which had a much higher proportion of male students (62.5%).

[7] For example, a grade A* at A level is worth 60 points, A grade is worth 50 points, down to a grade E (10 points) and a grade U (0 points).

Figure 1 presents the number of entries, split by prior attainment group, for CM and the most popular A levels.



	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths
High %	75.3	44.3	70.0	77.7	67.0	25.2	54.9	30.7	74.0	57.7	32.7
Medium %	22.2	46.3	27.2	20.3	25.9	52.4	37.1	53.5	23.5	36.0	46.3
Low %	2.6	9.5	2.8	2.0	7.1	22.4	7.9	15.8	2.5	6.3	21.0

Figure 1: Entries to core maths and 10 most popular A levels, by prior attainment category

This shows that CM students were most likely to be in the middle attainment group (46.3%), followed by the high attainment group (32.7%). Compared with most other subjects displayed in the figure, CM students tended to be lower attaining. However, they were slightly better attaining than students taking sociology and were similar to business studies students.

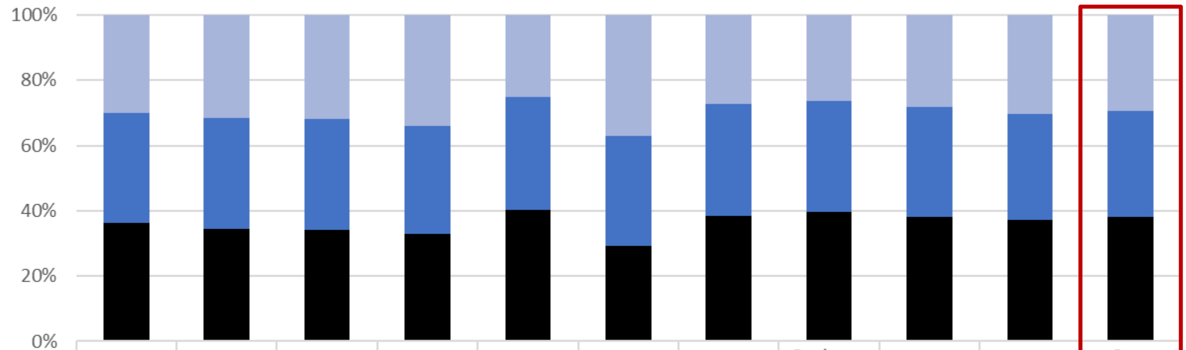
We also compared the GCSE mathematics grade distribution of CM students with those taking AS or A level mathematics and with those not taking any level 3 mathematics qualification. This is shown in Table 3.

Table 3: GCSE maths grade distribution by post-16 maths option

		GCSE grade							
Level 3 maths	**N**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**<3**
Core Maths	11,034	2.6	10.2	21.5	29.6	27.0	8.6	0.7	0.1
AS / A level	76,508	33.8	33.5	23.5	7.7	1.3	0.2	<0.1	<0.1
No maths	318,321	1.3	5.1	11.6	17.2	26.4	22.9	9.6	5.9

This shows that over 99% of CM students achieved a grade 4 or higher and most (78%) achieved grades 5 to 7. These are the types of students the qualification is targeted at. i.e., achieved at least a grade 4 at GCSE, but not amongst the highest attainers. Students going on to take AS or A level maths were much higher attaining, with over 90% achieving grade 7 or higher.

Figure 2 presents the data on entries, split by deprivation group. As noted in the data and methods section, there was a lot of missing data for the deprivation measure (IDACI score). Figure 2 is based on 193,225 students, compared with 422,705 for the analysis by prior attainment category.

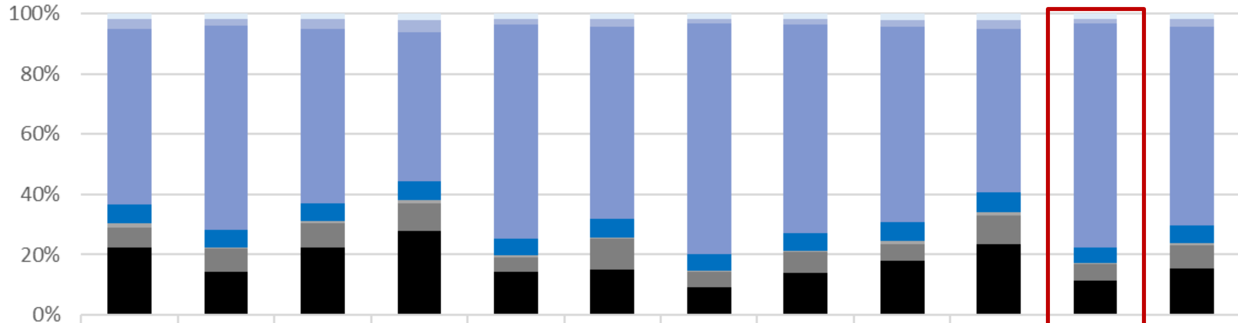


	Maths	Psychology	Biology	Chemistry	EPQ	Sociology	History	Business Studies	Physics	Economics	Core Maths
High %	30	31.6	32	34.1	25.2	37.2	27.2	26.5	28.1	30.3	29.5
Medium %	33.8	34.1	33.9	33.1	34.6	33.7	34.5	33.9	33.9	32.5	32.3
Low %	36.2	34.3	34.1	32.8	40.2	29.1	38.3	39.6	38.1	37.2	38.2

Figure 2: Entries to core maths and 10 most popular A levels, by deprivation category

CM students were slightly more likely to be in the low deprivation group than in the medium or high deprivation groups. This was also the case for most of the A level subjects.

Figure 3 shows entries by ethnic group. In this and all subsequent uptake figures, we include an extra column showing uptake amongst all students not taking CM ('Non-Core Maths'), split by the relevant background characteristic.

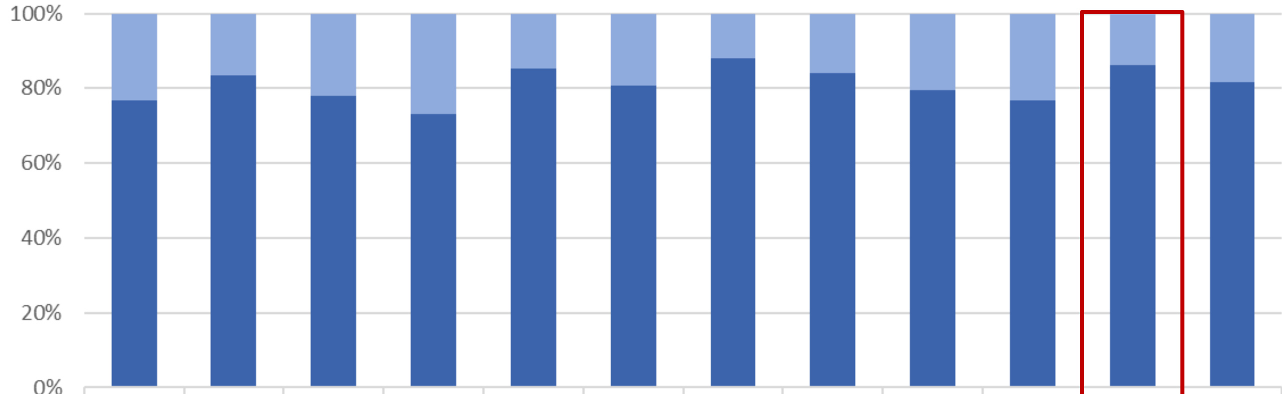


	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths	Non-Core Maths
Unclassified %	2.0	1.8	2.0	2.1	1.8	2.0	1.7	1.8	2.1	2.2	1.8	1.9
Other %	3.0	2.2	3.2	4.0	1.9	2.5	1.6	2.0	2.4	2.9	1.4	2.5
White %	58.4	67.8	57.7	49.7	71.0	63.6	76.7	69.3	64.7	54.3	74.4	65.8
Mixed %	6.1	5.9	6.0	6.1	5.5	6.3	5.5	5.5	6.2	6.5	5.2	6.0
Chinese %	1.5	0.5	0.9	1.2	0.8	0.3	0.4	0.5	1.3	1.0	0.4	0.6
Black %	6.8	7.4	7.9	9.0	5.0	10.4	5.0	6.9	5.5	9.7	5.3	7.7
Asian %	22.2	14.4	22.3	27.9	14.1	15.0	9.1	14.0	17.9	23.4	11.5	15.3

Figure 3: Entries to core maths and 10 most popular A levels, by ethnicity

Compared with all other students, CM students were more likely to be white, and less likely to be Asian, black, or of mixed race. Only one subject (history) had a higher percentage of white students and a lower percentage of Asian students. Only two subjects (history and EPQ) had a lower percentage of black students.

Figure 4 presents entries broken down by first language.

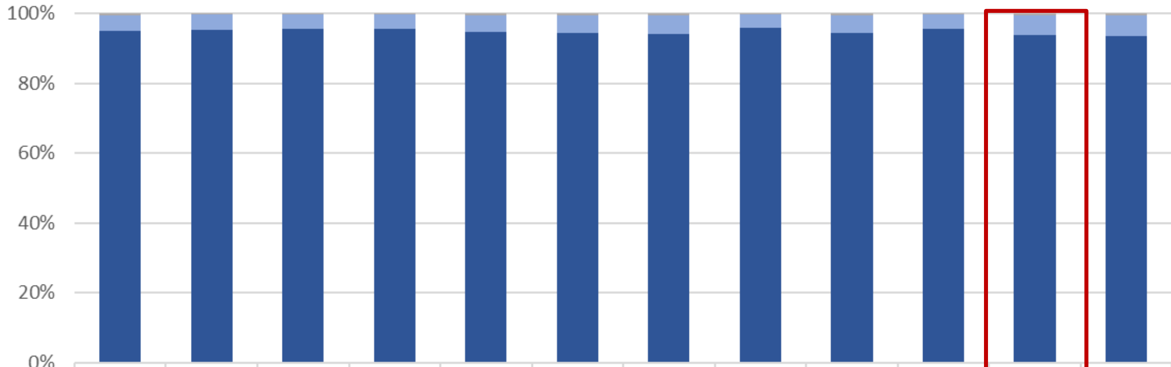


	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths	Non-Core Maths
Other %	23.0	16.5	21.9	26.7	14.6	19.2	11.8	15.8	20.3	23.2	13.9	18.4
English %	76.3	83.0	77.5	72.6	84.9	80.2	87.7	83.6	79.1	76.0	85.6	81.0

Figure 4: Entries to core maths and 10 most popular A levels, by first language

Overall, 81 % of students not taking CM (where data was available) were English speakers, with 18.4% speaking another language. CM students were more likely to be English speakers (85.6%). Again, only history had a higher percentage of English speakers than CM.

Entry numbers split by SEN status are shown in Figure 5.

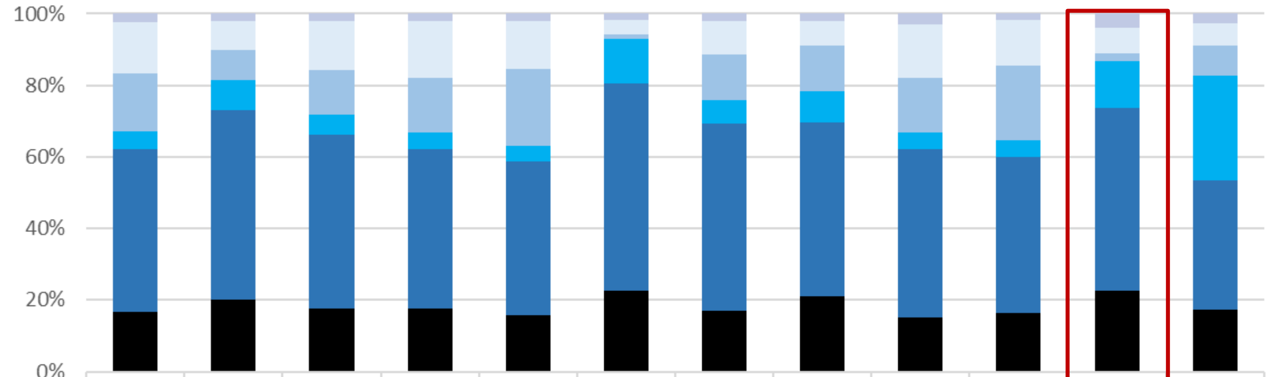


	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths	Non-Core Maths
SEN, with statement %	0.5	0.3	0.3	0.4	0.5	0.5	0.7	0.3	0.6	0.4	0.6	0.7
SEN, no statement %	4.4	4.4	4.0	3.9	4.8	5.1	5.2	3.9	5.1	3.9	5.7	5.7
None %	95.1	95.3	95.6	95.7	94.7	94.3	94.1	95.8	94.2	95.7	93.7	93.6

Figure 5: Entries to core maths and 10 most popular A levels, by SEN status

Students with SEN made up 6.3% of CM students. This was slightly more than in each of the A level subjects shown here. However, it was almost identical to the KS5 cohort as a whole.

Figure 6 shows the breakdown of entries by school type



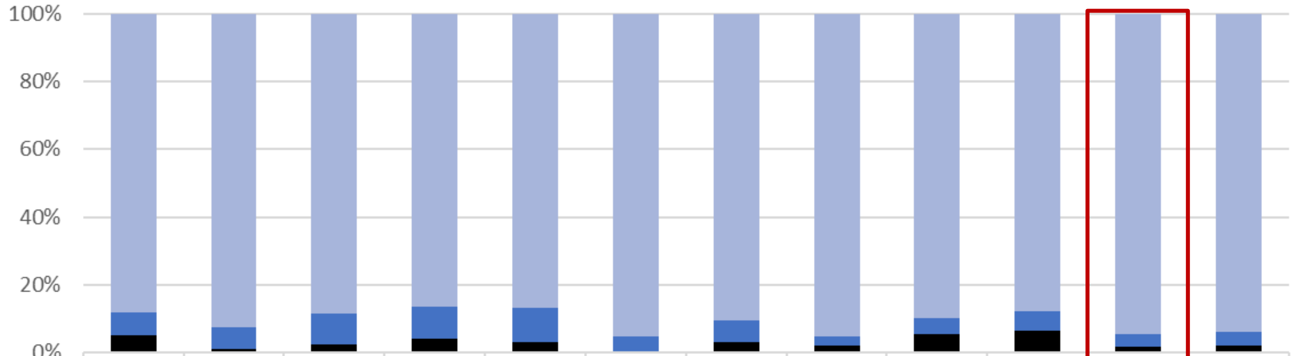
	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths	Non-Core Maths
Other %	2.5	2.1	2.2	2.1	2.2	1.9	2.0	2.2	3.0	1.6	4.0	2.8
Selective %	14.1	8.1	13.6	15.9	13.1	3.9	9.3	6.8	14.9	13.0	7.0	6.0
Ind %	16.3	8.4	12.3	15.3	21.6	1.3	12.8	12.6	15.3	20.9	2.4	8.5
FE %	5.0	8.5	5.7	4.8	4.4	12.3	6.6	8.8	4.6	4.5	12.9	29.1
Comp %	45.3	52.8	48.6	44.6	43.1	57.9	52.4	48.5	47.0	43.7	51.0	36.3
6th form %	16.8	20.2	17.6	17.5	15.6	22.6	17.0	21.1	15.2	16.3	22.6	17.2

Figure 6: Entries to core maths and 10 most popular A levels, by school type

CM students were more likely to attend comprehensives / academy schools, or sixth form colleges and less likely to attend FE colleges or independent schools when compared to all other students.

Compared with those taking the most popular A levels, they were more likely to attend FE colleges or sixth form colleges and less likely to attend independent or selective schools.

Finally, Figure 7 presents entry numbers split by school sex composition.



	Maths	Psych	Biology	Chem	EPQ	Sociology	History	Business Studies	Physics	Econ	Core Maths	Non-Core Maths
Mixed %	88.2	92.3	88.6	86.3	86.9	95.2	90.6	95.1	89.7	87.7	94.5	94.0
Girls' %	6.5	6.6	8.8	9.5	10.0	4.4	6.2	2.9	4.7	5.9	3.9	4.0
Boys' %	5.2	1.0	2.6	4.1	3.1	0.4	3.2	2.0	5.6	6.4	1.6	2.0

Figure 7: Entries to core maths and 10 most popular A levels, by school sex composition

Compared with all other students, those taking CM were slightly more likely to attend mixed schools and slightly less likely to attend boys' schools. When compared with the popular A levels, only sociology and business studies students were more likely than CM students to attend mixed schools. Only business studies students were less likely to attend girls' schools.

RQ2 – Qualifications and subjects taken by core maths students

Table 4 presents the qualifications (and combinations of qualifications) most likely to be taken alongside CM.

Table 4: Qualifications most commonly combined with core maths

Combination	No. of students	% of CM students
A levels only	5,487	47.6
BTECs only	1,221	10.6
A levels / BTECs	1,194	10.4
A levels / EPQ	693	6.0
A levels / VRQ[8]	605	5.3
A levels / Cambridge. Technicals	379	3.3
A levels / BTECs / VRQ	191	1.7
EPQ / VRQ	167	1.5
BTECs / VRQ	135	1.2
A levels / BTECs / EPQ	134	1.2

Almost half of CM students (47.6%) combined it with A levels only. The next most common qualification was BTECs (10.6% BTECs only, 10.4% BTECs and A levels). A substantial number of students (693, or 6.0% of CM students) combined CM with A levels and the Extended Project Qualification (EPQ).

Table 5 breaks this data down further by including the number of each qualification. This shows that the highest proportion of CM students (44.4%) combined it with three A levels. Next most common was one BTEC only, followed by two A level and one BTEC, and three A levels and EPQ.

Table 5: Qualifications (including numbers of) most commonly combined with core maths

Combination	No. of students	% of CM students
3 A levels only	5,115	44.4
1 BTEC only	883	7.7
2 A levels / 1 BTEC	713	6.2
3 A levels / 1 EPQ	572	5.0
2 A levels / 1 VRQ	439	3.8
2 A levels only	333	2.9
2 BTECs only	282	2.5
1 A level / 1 BTEC	267	2.3
2 A levels / 1 Cam. Tech	253	2.2
1 EPQ / 1 VRQ	168	1.5

[8] VRQ = Vocationally Related Qualification. These are mainly introductions to an area of work, but do not develop a recognised competence or lead directly to employment. Examples include Applied Diploma / Certificate in Criminology (WJEC), and Diploma / Certificate in Financial Studies (London Institute of Banking & Finance).

Table 6 presents the most common A level subjects combined with CM.

Table 6: A level subjects most commonly combined with core maths (students can take more than one subject)

Subject	No. of CM cands	% of CM cands	% of cands taking subject
Psychology	3,464	30.1	4.6
Biology	3,151	27.3	5.0
Chemistry	1,891	16.4	3.6
Business Studies	1,845	16.0	4.8
Geography	1,756	15.2	5.1
Economics	1,241	10.8	3.5
Sociology	1,211	10.5	2.8
History	1,135	9.9	2.7
Physics	635	5.5	1.8
English Literature	610	5.3	1.9

The top seven most common A level subjects all had some quantitative elements, for which CM may be useful. The third column shows the percentage of CM candidates who took the subject. For example, just over 30% of CM candidates also took psychology A level. The final column in the table shows the percentage of students taking the A level subject who also took CM. The highest percentages were for geography (5.1%) and biology (5.0%). This suggests that only very low percentages of students were apparently persuaded that CM would help with these A level subjects. However, this table doesn't show the percentages who took A level maths instead of CM. It is likely that a relatively high percentage of students took A level maths alongside the main science subjects, particularly physics and chemistry.

Table 7 shows the most common non-A level subjects taken alongside CM. The EPQ was the most popular, with 11.6% of CM students. This was followed by two BTECs (Applied Sciences, and Business). Six out of the top 10 non-A level subjects were BTECs.

Table 7: Non-A level subjects most commonly combined with Core Maths (students can take more than one subject)

Qualification	Subject	No. of CM cands	% of CM cands	% of cands taking subject
EPQ	n/a	1,342	11.6	2.7
BTEC	Applied Sciences	861	7.5	5.5
BTEC	Business	669	5.8	2.4
VRQ	Criminology	595	5.2	3.0
BTEC	Engineering	535	4.6	8.3
BTEC	IT	371	3.2	4.5
BTEC	Health Studies	323	2.8	1.5
BTEC	Sports Studies	297	2.6	2.0
Cambridge Technical	IT	260	2.3	5.0
VRQ	Financial Studies	229	2.0	3.3

The most common combinations of A level subjects taken alongside CM are presented in Table 8.

Table 8: Combinations of A level subjects most commonly taken with core maths

A level subjects	No. of students	% of CM students	% of students taking A level combination
Biology, Chemistry, Psychology	453	3.9	9.0
Biology, Chemistry, Geography	170	1.5	12.4
Biology, Geography, Psychology	90	0.8	10.0
Biology, Chemistry, Physics	82	0.7	9.8
Biology, Psychology, Sociology	77	0.7	7.8
Biology, Psychology, Physical Education	73	0.6	7.9
Biology, Chemistry, History	67	0.6	8.3
Business Studies, Geography, Economics	64	0.6	9.9
Business Studies, Economics, Psychology	64	0.6	9.3
Biology, Chemistry, Business Studies	55	0.5	11.5

The most common combination was biology, chemistry, and psychology. This is not surprising as all three of these have a substantial quantitative element. Almost all these combinations (8 out of 10) included biology, with five including chemistry as well. The final column indicates the percentage of students taking this combination of A levels who also took CM. The highest percentage was for biology, chemistry, and geography (12.4% - i.e., one in eight taking this combination also took CM).

Table 9 presents the most common combinations of all subjects (i.e., not just A levels).

Table 9: Combinations of subjects most commonly taken with core maths

Subjects	No. of students	% of CM students	% of students taking subject combination
Biology, Chemistry, Psychology	453	3.9	9.0
BTEC Engineering	271	2.4	8.0
BTEC Applied Sciences	256	2.2	4.3
Biology, Chemistry, Geography	170	1.5	12.4
BTEC Business	118	1.0	1.1
Biology, Geography, Psychology	90	0.8	10.0
Biology, Chemistry, Psychology, EPQ	83	0.7	6.7
Biology, Chemistry, Physics	82	0.7	9.8
Biology, Psychology, Sociology	77	0.7	7.8
BTEC IT	74	0.6	4.0

This shows that after the most common A level combination, the next most popular were two BTEC subjects, engineering, and applied sciences. These were both the BTEC versions equivalent in size to three A levels.

We also looked at the most popular combinations in a different way, by calculating the subjects with the highest percentage of students also taking CM (Table 10). This was restricted to subjects with at least 100 entries. This may give an indication of which subjects and qualifications teachers and students believed would most benefit from being taken alongside CM.

Table 10: Subjects with highest percentage of students taking Core Maths (at least 100 entries)

Qualification	Subject	No. of CM students	% of students taking subject
OCR Cambridge Tech Extended Diploma	Engineering	45	30.6
OCR Cambridge Tech Diploma	Engineering	79	25.2
VRQ	Religious Education	25	17.2
BTEC National Extended Diploma	Manufacturing Engineering	22	15.6
OCR Cambridge Tech Extended Cert	Engineering	74	13.8
BTEC Level 3 National Certificate	Applied Sciences	32	13.0
BTEC Certificate	Manufacturing Engineering	16	11.1
A level	Environmental Science	125	10.7
BTEC National Foundation Diploma	Engineering	118	10.3

The highest percentage was for the OCR Cambridge Technical Extended Diploma in engineering, with 30.6% of the students taking the subject also taking CM. It is worth noting that six out of these nine qualifications were in an engineering-related subject.

Finally, in this section we also investigated the number of students who took one of the subjects defined earlier as having a quantitative element but did not take any KS5 maths qualification. This gives an indication of the potential for increases in uptake of CM.

Firstly, Table 11 shows the number of students taking the A level subjects with a quantitative element and the number and percentage of these who did not take any maths at KS5.

Table 11: Proportion of students taking A levels with a quantitative element not taking any maths at KS5

Subject	Students	Not taking KS5 maths (n)	Not taking KS5 maths (%)
Biology	63,638	36,901	58.0
Chemistry	52,190	20,281	38.9
Physics	35,603	4,109	11.5
Business studies	38,464	30,235	78.6
Geography	34,256	25,907	75.6
Economics	35,088	17,638	50.3
Psychology	74,920	63,614	84.9
Sociology	42,870	39,970	93.2
Any	**229,597**	**143,847**	**62.7**

There were over 140,000 students (62.7%) taking at least one of these A level subjects and not taking any maths. This means there are a lot of students taking these A levels who could potentially take CM. The subjects with the largest proportions taking no maths were sociology (93.2%), business studies (78.6%), and geography (75.6%). At the other end of the scale was physics, with only 11.5% taking no maths at all. It is not surprising that physics had the lowest percentage as it has a lot of mathematical content, meaning that students taking it are required or very much encouraged to take maths alongside.

Table 12 and 13 present the same analysis for students taking the BTECs identified previously as including quantitative elements.

Table 12: Proportion of students taking BTECs (size 1) with a quantitative element not taking any maths at KS5

Subject	Students	Not taking KS5 maths (n)	Not taking KS5 maths (%)
Business studies	11,838	10,731	90.6
IT	5,732	5,004	87.3
Sport	5,901	5,336	90.4
Health & SC	8,657	8,340	96.3
Applied sciences	6,470	5,631	87.0
Any	**33,472**	**30,252**	**90.4**

Table 13: Proportion of students taking BTECs (size 3) with a quantitative element not taking any maths at KS5

Subject	Students	Not taking KS5 maths (n)	Not taking KS5 maths (%)
Business studies	8,059	7,931	98.4
IT	2,377	2,273	95.6
Health & SC	7,273	7,216	99.2
Applied sciences	5,443	5,118	94.0
Engineering	2,606	2,288	87.8
Any	**25,758**	**24,826**	**96.4**

For these qualifications, when compared to A levels, there were even higher percentages of students not taking maths (90.4% for BTECs size 1, 96.4% for BTECs size 3). Again, this suggests there is a lot of potential for increasing uptake of CM amongst the students taking these qualifications.

RQ3 – Do core maths students perform better in subjects which have a quantitative element than similar students not taking core maths?

For this analysis we chose eight A level subjects, five BTEC subjects equivalent in size to one A level, and five BTEC subjects equivalent in size to three A levels. These were the most common subjects taken alongside CM which were deemed to have a substantial quantitative element.

Table 14 to 16 present the cumulative grade distributions in each subject, comparing CM and non-CM students. For A levels, most subjects showed very little difference between the two sets of students. However, in psychology and business studies CM students performed slightly better than non-CM students at all grades, and in chemistry, geography, physics and economics, non-CM students performed slightly better.

For BTECs, the tendency was for CM students to perform substantially better than non-CM students. The exception to this was for the BTEC in information technology (size of 3 A levels), where non-CM students had higher cumulative percentages at lower grades.

Table 14: Cumulative grade distributions of A level subjects (CM v non-CM students)

Subject	Core maths	N	A*	A	B	C	D	E
Psychology	No	63,524	10.0	27.8	55.5	78.4	92.3	98.1
	Yes	3,433	10.6	30.5	60.0	81.0	94.1	98.7
Biology	No	36,847	7.8	25.7	47.2	69.4	86.9	97.3
	Yes	3,112	6.3	24.2	46.3	68.5	87.5	97.9
Chemistry	No	20,260	6.2	25.0	45.2	65.0	82.9	96.0
	Yes	1,840	4.4	21.9	43.0	63.4	81.1	95.7
Business Studies	No	30,204	6.8	23.3	57.7	82.3	94.2	98.6
	Yes	1,819	7.1	23.9	58.4	85.3	96.6	99.4
Geography	No	25,858	10.0	31.1	61.4	84.2	95.1	98.9
	Yes	1,741	7.9	28.7	60.3	83.4	95.5	99.4
Economics	No	17,622	9.8	30.8	59.7	82.0	93.9	98.5
	Yes	1,210	6.2	26.6	54.8	80.3	94.3	98.7
Sociology	No	39,864	8.7	26.2	56.8	82.0	94.4	98.6
	Yes	1,202	7.2	25.7	58.8	83.7	95.0	98.8
Physics	No	4,102	2.7	12.0	27.7	49.5	72.3	92.0
	Yes	575	SUPP	8.4	22.6	43.7	68.9	90.8

Table 15: Cumulative grade distributions of BTEC subjects (equivalent in size to 1 A level, CM v non-CM students)

Subject	Core maths	N	D*	D	M	P / U
Applied Sciences	No	5,631	15.1	45.6	83.3	98.7
	Yes	426	17.6	49.1	86.4	100.0
Business	No	10,731	17.9	52.9	84.7	98.6
	Yes	387	17.8	54.5	89.4	100.0
Information Technology	No	5,004	19.1	51.2	83.9	97.8
	Yes	265	27.9	63.8	91.3	100.0
Sport	No	5,336	23.0	55.5	84.2	99.0
	Yes	202	26.7	64.9	92.1	100.0
Health & Social Care	No	8,340	22.2	57.4	85.9	98.5
	Yes	190	28.4	64.7	88.4	100.0

Table 16: Cumulative grade distributions of BTEC subjects (equivalent in size to 3 A levels, CM v non-CM students)

Subject	Core maths	N	***	**D	*DD	DDD	DDM	DMM	MMM	MMP	Below MMP
Applied Sciences	No	5,118	8.1	18.2	28.7	39.5	52.2	64.9	76.6	85.9	100.0
	Yes	265	13.6	26.8	41.5	54.0	67.2	78.1	89.1	SUPP	100.0
Engineering	No	2,288	7.4	15.8	26.5	37.2	49.7	61.1	73.5	83.1	100.0
	Yes	217	11.1	20.3	30.0	41.9	53.5	65.0	76.5	87.1	100.0
Information Technology	No	2,273	6.0	14.4	24.1	34.1	46.4	58.0	71.0	81.6	100.0
	Yes	89	SUPP	20.2	SUPP	SUPP	38.2	51.7	65.2	SUPP	100.0
Business	No	7,931	4.4	17.2	31.2	42.9	54.7	65.8	76.1	85.1	100.0
	Yes	77	SUPP	28.6	41.6	57.1	SUPP	84.4	SUPP	SUPP	100.0
Health & Social Care	No	7,216	8.1	20.4	34.3	47.5	59.9	70.7	79.8	86.7	100.0
	Yes	51	SUPP	SUPP	SUPP	SUPP	SUPP	SUPP	SUPP	SUPP	SUPP

Regression analysis

We ran several regression models for each subject, predicting the probability of achieving a particular grade or higher in each of the subjects. The independent variables in these models included gender, prior attainment, deprivation, ethnicity, first language, special educational needs (SEN), school type and school sex composition.

Due to the large amount of output, the full results of the regression models are not shown here but are presented in the Appendix (one table per subject: Tables A1 to A16 for A levels, Tables A17 to A26 for BTECs size 1, Tables A27 to A26 for BTECs size 3). The key results are presented within the report in Tables 17 to 19. These show, for each subject in each qualification, the parameter estimates for the variable indicating whether CM was taken or not.

For each subject we ran two sets of models, predicting the probability of achieving:

- At least grade A and at least grade C for A level subjects
- Grade D* and at least grade D for BTECs equivalent in size to one A level
- At least grade D*D*D and at least grade MMM for BTECs equivalent in size to three A levels

Within each grade we also ran multiple models. Firstly, a model including all variables (both at student and school level) which were statistically significant (‘All variables model’). Second, a model which excludes the census variables (IDACI, ethnicity, language, and SEN), called the ‘No census variables model’. As noted in the methods section, the census variables have large amounts of missing data. Therefore, by running a model excluding these we were able to include many more students and get a sense of whether this affected the results.

We also ran models to test for any significant interaction effects between the CM variable and each of the other predictor variables. The purpose of these models was to investigate whether any significant effect of CM was different for different groups of students. The results of these models, discussed briefly in the next section, are not presented in the main report but are shown in the tables in the appendix.

The results for A levels (Table 17) show a positive effect of taking CM for all subjects and grades apart from sociology. However, there were only a few occasions when the effect was statistically significant. In terms of the models with all variables in, there were significant positive effects for biology (grades A and C), chemistry (grade C), and business studies (grade A). All these instances were also significant in the models without the census variables (and mostly only changed in value by a small amount). There were also two occasions (business studies grade C, and economics grade A) where there was no significant effect of CM in the models with census variables but with a significant positive effect in the models without census variables.

There was one instance of a significant negative effect of taking CM, for sociology grade A (although in the model without the census variables this was no longer significant).

Table 17: Parameter estimates for core maths variable (A level subjects, standard errors in parentheses).

		Number of students		Core maths parameter estimate	
Subject	**Grade predicted**	**All variables model**	**No census variables model**	**All variables model**	**No census variables model)**
Psychology	At least grade A	42,174	66,209	0.034 (0.065)	0.103 (0.053)
	At least grade C			0.130 (0.072)	0.105 (0.059)
Biology	At least grade A	26,091	39,409	0.232 (0.073)*	0.235 (0.059)*
	At least grade C			0.180 (0.067)*	0.132 (0.055)*
Chemistry	At least grade A	14,122	21,735	0.096 (0.092)	0.124 (0.075)
	At least grade C			0.188 (0.083)*	0.145 (0.068)*
Business Studies	At least grade A	18,208	31,529	0.250 (0.088)*	0.199 (0.072)*
	At least grade C			0.184 (0.105)	0.247 (0.084)*
Geography	At least grade A	18,186	27,391	0.166 (0.087)	0.051 (0.075)
	At least grade C			0.057 (0.099)	0.068 (0.086)
Economics	At least grade A	11,060	18,487	0.105 (0.107)	0.175 (0.088)
	At least grade C			0.204 (0.120)	0.175 (0.097)
Sociology	At least grade A	26,205	40,812	-0.249 (0.105)*	-0.150 (0.085)
	At least grade C			0.116 (0.120)	0.052 (0.100)
Physics	At least grade A	26,091	39,409	0.345 (0.222)	0.188 (0.201)
	At least grade C			0.253 (0.138)	0.118 (0.119)

In these logistic regressions, the parameter estimates are hard to interpret as they are the log of the odds of achieving the grade or higher. However, we can convert these into probabilities for 'typical' students to illustrate the size of these effects. The typical students we chose were those in the base category for each of the categorical variables and with a value of each continuous variable equal to the mean. Figure 8 compares the probabilities (for CM and non-CM students) of achieving the relevant grade (or higher) for each subject and grade with a significant CM effect.

This shows that the differences in probabilities were all very small, despite being statistically significant.

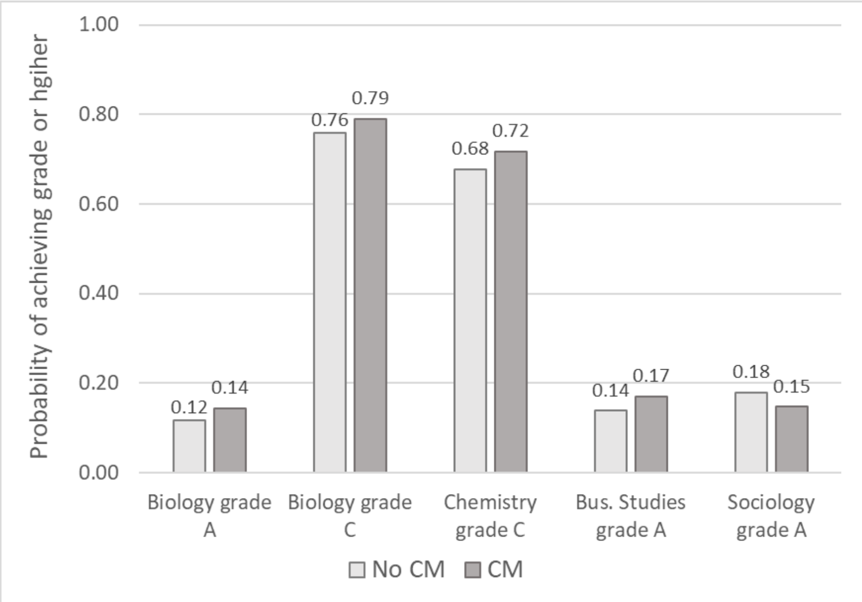


Figure 8: Probabilities of achieving a grade (or higher), for CM and non-CM students (A levels; models with significant CM effect)

The results for BTECs (equivalent in size to one A level) are shown in Table 18. The 'n/a' in the table are for subjects and grades where none of the census variables had a significant effect, meaning there was no model 1.

Table 18: Parameter estimates for core maths variable (BTEC subjects equivalent in size to one A level, standard errors in parentheses).

		Number of students		Core maths parameter estimate	
Subject	**Grade predicted**	**All variables model**	**No census variables model**	**All variables model**	**No census variables model**
Applied Sciences	Grade D*	3,373	4,577	0.492 (0.219)*	0.359 (0.176)*
	At least grade D			n/a	0.288 (0.144)*
Business	Grade D*	7,000	11,014	0.085 (0.214)	-0.080 (0.179)
	At least grade D			n/a	-0.005 (0.139)
Information Technology	Grade D*	3,314	5,211	n/a	-0.011 (0.203)
	At least grade D			0.165 (0.242)	0.233 (0.176)
Sport	Grade D*	3,883	5,453	n/a	-0.178 (0.230)
	At least grade D			0.060 (0.250)	-0.025 (0.216)
Health & Social Care	Grade D*	6,163	8,473	-0.058 (0.270)	-0.050 (0.211)
	At least grade D			0.183 (0.253)	-0.091 (0.209)

Only for one subject was there a significant effect of taking CM. This was applied sciences, which had significant positive effects for both grades. The effect in terms of probabilities is shown in Figure 9.

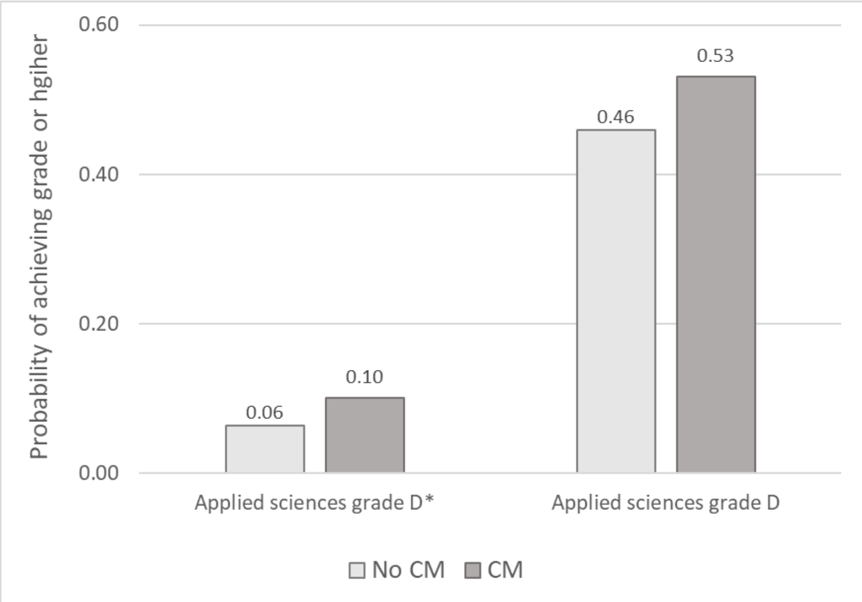


Figure 9: Probabilities of achieving each grade or higher for CM and non-CM students (BTECs equivalent in size to one A level; models with significant CM effect)

Table 19 presents the results for the BTECs equivalent in size to three A levels. In all subjects there were no significant effects of the census variables. Therefore, only one model is presented for each subject grade combination.

Table 19: Parameter estimates for core maths variable (BTEC subjects equivalent in size to three A levels, standard errors in parentheses).

Subject	**Grade predicted**	**Number of students**	**Core maths parameter estimate**
Applied Sciences	At least grade D*D*D	5,299	0.343 (0.198)
	At least grade MMM		0.614 (0.259)*
Engineering	At least grade D*D*D	2,478	0.108 (0.276)
	At least grade MMM		0.314 (0.269)
Information Technology	At least grade D*D*D	2,323	1.216 (0.407)*
	At least grade MMM		0.084 (0.349)
Business	At least grade D*D*D	7,886	-0.046 (0.316)
	At least grade MMM		0.720 (0.475)
Health & Social Care	At least grade D*D*D	7,206	-0.120 (0.508)
	At least grade MMM		-0.488 (0.493)

There were only two subjects for which CM had a significant (positive) effect on performance. In applied sciences, this was for grade MMM or higher; in information technology, this was for grade D*D*D or higher. Figure 10 compares the probabilities for CM and non-CM students in these subjects.

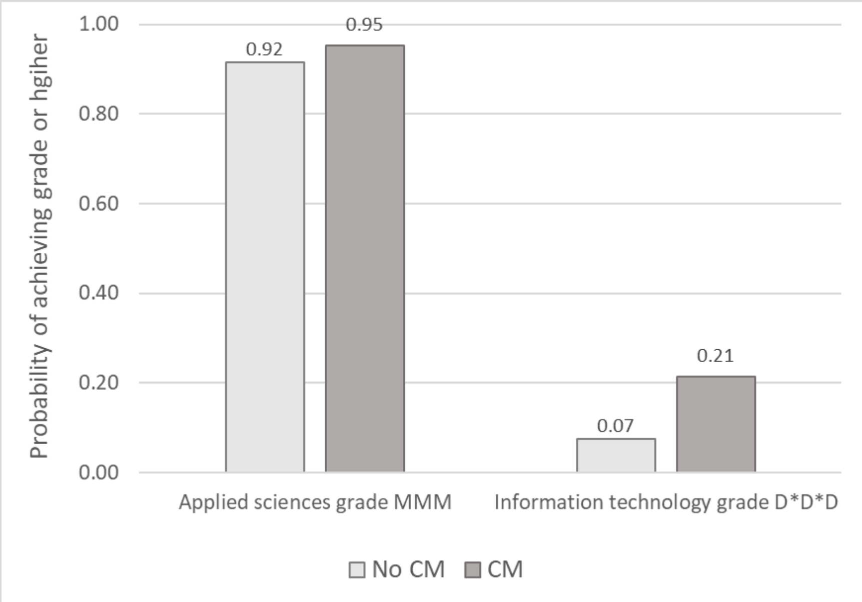


Figure 10: Probabilities of achieving each grade or higher for CM and non-CM students (BTECs equivalent in size to three A levels; models with significant CM effect).

This shows a very small effect for applied sciences grade MMM or higher. However, there was a much larger effect for IT grade D*D*D or higher, with a probability of just 0.07 for non-CM students and a probability of 0.21 for CM students.

Interaction effects

There were a few significant interaction effects between the CM variable and the other variables in the models. These were for A levels in psychology, business studies and geography, and the BTEC in applied sciences (size = 3 A levels).

A level psychology

For A level psychology grade C there were two effects, a positive effect between CM and KS4 mean points score and a negative effect between CM and centre mean KS5 points score. To illustrate what the first interaction effect means, Figure 11 presents some predicted probabilities for CM and non-CM students at different levels of the KS4 mean points score (ranging from 4.5 to 8).

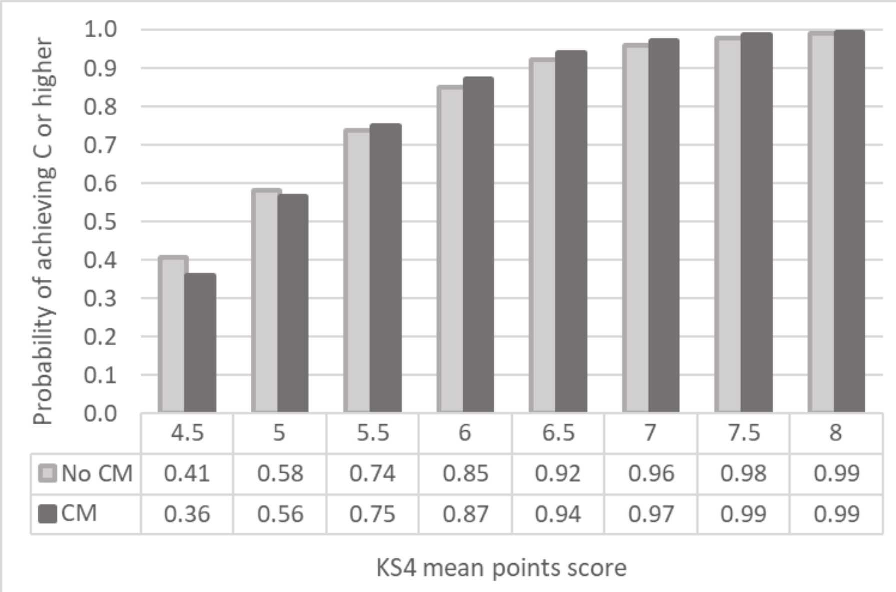


Figure 11: Predicted probabilities of achieving at least a grade C in psychology A level at selected levels of KS4 mean points score (CM v non-CM students)

This shows that at the low levels of KS4 points score (5 or below), non-CM students had a higher probability of achieving at least grade C in psychology. However, there were very few students with such a low points score in the data. At higher levels of KS4 point score (5.5 and above) CM students had higher probabilities. However, the differences in probabilities were very small either way.

The second interaction effect for psychology grade C is illustrated in Figure 12. The predictions shown here are for different levels of the centre mean KS5 points score (between 25 and 45).

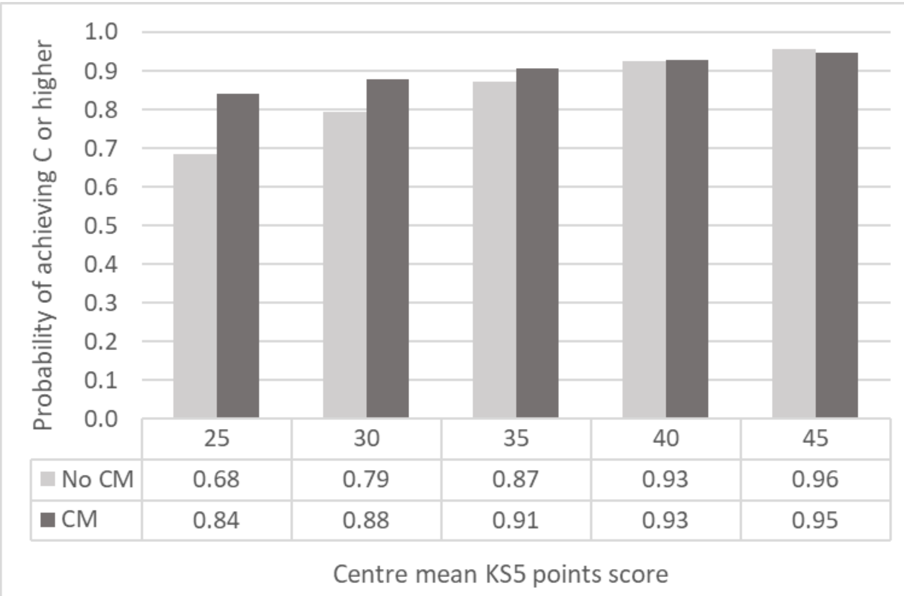


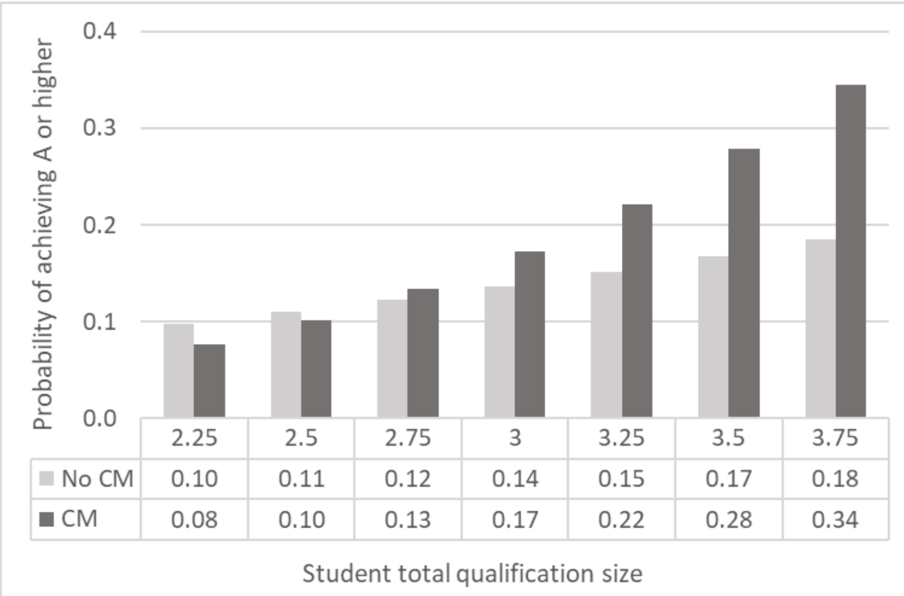
Figure 12: Predicted probabilities of achieving at least a grade C in psychology A level at selected levels of centre KS5 mean points score (CM v non-CM students)

This shows CM students had a higher probability of achieving a grade C or better at lower levels of the centre KS5 points score. At a centre mean points score of 25 (equivalent to grade C/D at A level) the difference was quite large (0.84 for CM students, compared with 0.68 for non-CM). However, at higher levels (above 40, which is equivalent to an A level grade B), non-CM students had a very slightly higher probability.

A level business studies

For business studies at grade A there were two interaction effects. The first of these was between taking CM and student total qualification size. This was a positive effect, indicating that the effect of CM on the probability of achieving at least grade A was larger for those taking more qualifications. Secondly, there was a negative interaction between taking CM and centre level mean KS5 points score. A negative estimate indicates that the impact of taking CM was larger for students in schools with lower KS5 mean points scores.

The first of these effects is illustrated in Figure 13, which shows predicted probabilities (of at least a grade A) for different levels of the student total qualification size variable.

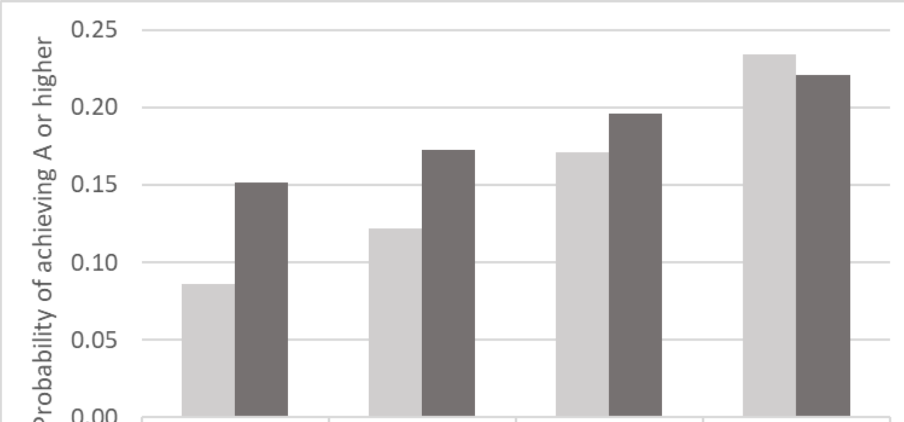


	2.25	2.5	2.75	3	3.25	3.5	3.75
No CM	0.10	0.11	0.12	0.14	0.15	0.17	0.18
CM	0.08	0.10	0.13	0.17	0.22	0.28	0.34

Figure 13: Predicted probabilities of achieving at least a grade A in business studies A level at selected levels of student total qualification size (CM v non-CM students)

This shows that at lower levels of total qualification size, non-CM students had a very slightly higher probability of achieving at least a grade A. However, at higher levels, CM students had a much higher probability (e.g., for students taking the equivalent of 3.75 A levels the probability was 0.34 for CM students and 0.18 for non-CM students).

The data in Figure 14 illustrates the effect of the second interaction. At a centre KS5 mean points score of 30 (equivalent to grade C at A level) there was a substantial advantage for CM students (probability of 0.15, compared with 0.09). However, this had disappeared at a centre KS5 mean points score of 45 (equivalent to grade A/B at A level).

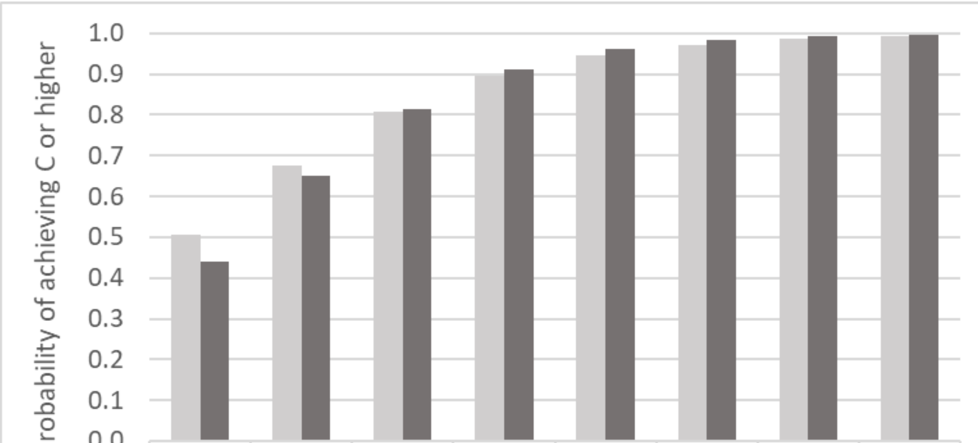


	30	35	40	45
No CM	0.09	0.12	0.17	0.23
CM	0.15	0.17	0.20	0.22

Figure 14: Predicted probabilities of achieving at least a grade A in business studies A level at selected levels of centre KS5 mean points score (CM v non-CM students)

A level geography

The final significant interaction for A levels was for geography at grade C. This was a positive interaction between taking CM and KS4 mean points score. Figure 15 shows the effect of taking CM at different levels of the KS4 mean points score.



	4.5	5	5.5	6	6.5	7	7.5	8
No CM	0.51	0.68	0.81	0.90	0.95	0.97	0.99	0.99
CM	0.44	0.65	0.81	0.91	0.96	0.98	0.99	1.00

Figure 15: Predicted probabilities of achieving at least a grade C in geography A level at selected levels of KS4 mean points score (CM v non-CM students)

At lower levels of KS4 points score, non-CM students had a higher probability of achieving at least a grade C in the subject. However, at KS4 points scores 5.5 and above, CM students had a slightly higher probability.

BTEC applied sciences (size = 3 A levels)

Finally, for BTEC applied sciences grade MMM there was a significant positive interaction between taking CM and KS4 mean points score. Figure 16 shows the effect of taking CM on the probability of achieving at least grade MMM for different KS4 mean points scores. At a low KS4 mean points score (3.5), there was a negative effect of taking CM. However, the effect was positive for higher values of mean points score.

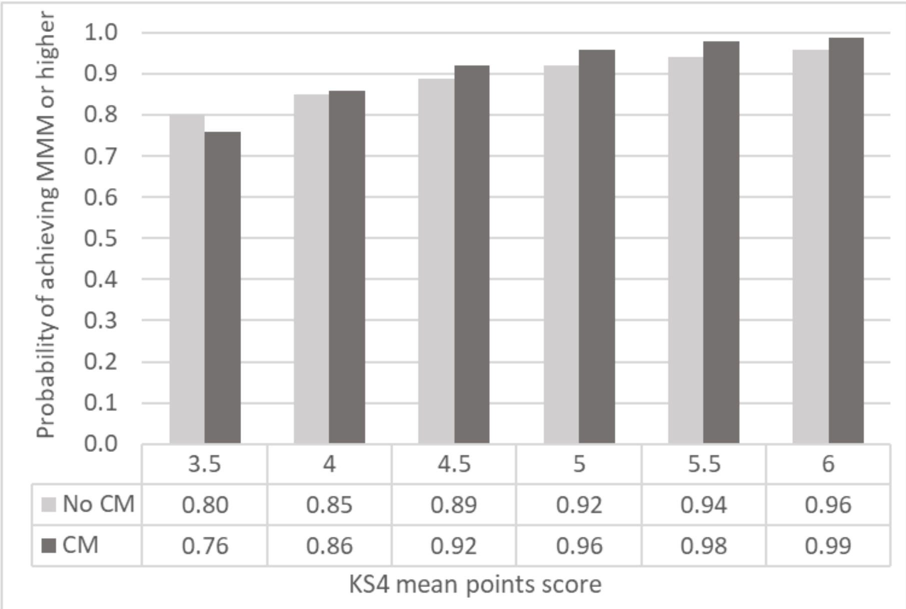


Figure 16: Predicted probabilities of achieving at least a grade MMM in applied sciences BTEC at selected levels of KS4 mean points score (CM v non-CM students)

Discussion

The main aims of this research were to investigate the position of the Core Maths qualifications in the KS5 curriculum, including uptake amongst students with different background characteristics and the qualifications and subjects it was combined with, and to see whether students taking CM performed better in their A level subjects taken at the same time.

We found that uptake of CM remained relatively low, with only 11,522 entries in 2021/22 (amongst those completing KS5 in that year). This is well below the Government’s target when they set out the CM policy, which was aimed at the 200,000 students who achieved a grade C in Maths GCSE but did not go on to AS or A level Maths (DfE, 2013). It is worth noting that the Education & Skills Funding Agency has recently announced the ‘core maths premium’, which is additional funding for CM students as part of the proposed Advanced British Standard (ESFA, 2024). It would be worth repeating some of the analysis presented here in a few years to see whether the increased funding had any impact on uptake levels.

Although uptake was low, there was evidence that most students taking the qualification were those it was aimed at, i.e., achieving a grade 4 or higher in GCSE Maths, but not progressing to AS or A level in the subject. Over 99% of CM students achieved a grade 4 or higher in their GCSE, with most (78%) achieving grades 5 to 7. On average, CM students achieved lower grades than AS / A level students, but higher grades than those not taking any level 3 maths qualifications.

In terms of the background characteristics of CM students, we found the following:

- 52% were female – this is a much more even split than in A level maths, which was 63% male in 2021/22. This suggests that CM could help with closing the gender gap in post-16 maths.
- CM students were less deprived than average, with a level of deprivation (measured by the IDACI) similar to those taking the most popular 10 A levels.
- They were more likely than other KS5 students to be white, English speakers and less likely to be black or Asian or speakers of other languages.
- They were more likely to attend comprehensive schools, or sixth form colleges and less likely to attend FE colleges or independent schools when compared to all other students.

It was not within the scope of the current research to investigate the reasons for the low uptake levels, particularly in specific groups of students. However, further research could investigate the reasons why particular groups of students were less likely to take CM (e.g., not-white, non-English speakers, those attending independent schools) and if anything can be done to encourage uptake amongst these groups of students.

CM students were most likely to combine the qualification with three A levels (44% of CM students). The next most common combination was with one BTEC (usually equivalent in size to 3 A levels). The most common subjects combined with CM were mostly A levels or BTECs with some quantitative element. For example, the most common A levels combined with CM were psychology, biology, and chemistry and the most common BTECs were in applied sciences, business studies, and engineering. These results suggest that CM was being taken by many students to support them in these other subjects. This confirms previous case study findings from Homer et al (2020), who reported that several schools they surveyed required or strongly encouraged students taking particular subjects (e.g., BTEC applied sciences, A level psychology) to also take CM alongside. Many students also reported that they chose (or were required) to take CM because it would support them taking A levels with a quantitative element.

The subjects with the highest proportions of students also taking CM were mostly Cambridge Technicals and BTECs. Six out of the top nine of these were engineering-related subjects. This suggests that this a subject area where students were being particularly encouraged to take CM. This is not surprising, as engineering is a subject with a significant amount of mathematical content. It may be that students taking engineering were generally required to also take a level 3 maths qualification, either AS / A level (for higher attainers) or CM (for lower attainers).

Although this research has shown that Core Maths is often taken alongside A level and BTEC subjects with a quantitative component, there is still plenty of potential for increase in uptake. In particular, we have shown that for some subjects with high entries (e.g. sociology, psychology, business studies), there were still large percentages of students not taking any maths at all at KS5.

The research provided some evidence that students taking CM achieved better grades than those not taking CM in subjects with a quantitative element taken at the same time. The results of our analyses showed four occasions when CM students had a significantly higher probability of achieving a particular grade or higher in specific A level subjects. This was for biology grades A and C, chemistry grade C, and business studies grade A. However, in each case the size of the effect was small (an increased probability of between 0.02 and 0.04).

There was one significant negative effect of taking CM, for A level sociology. This reduced the probability of achieving at least a grade A for CM students from 0.18 to 0.15. It is not clear why taking CM was associated with worse performance in this subject, but it may reflect the relatively low levels of mathematical content. It is also possible that the increased workload from taking CM led to students spending less time on their sociology A level. However, the size of the effect was very small.

These findings were somewhat different to those from previous research into the impact of taking CM on performance in other subjects (Homer *et al.*, 2020). They found no significant positive effects across five A level subjects. Their only significant effect was a small negative one for A level business studies. However, it is worth noting that their outcome variable was different from the one in our research, being the points score achieved in the A level (A*=60, A=50 etc.) and their statistical model included fewer variables.

We also found evidence of an effect of taking CM on BTEC performance. For example, for BTECs equivalent in size to one A level there were two significant positive effects on performance (applied sciences at grade D* and at grade D or above). Similarly, for BTECs equivalent in size to three A levels, there were two significant positive effects (applied sciences at grade MMM or above; IT at grade D*D*D or above). Two of these effects were very small, but two were substantially larger than the significant A level effects. For applied sciences (worth one A level), taking CM increased the probability of achieving grade D or better from 0.46 to 0.53. For IT (worth three A levels), taking CM increased the probability of achieving grade D*D*D or better from 0.07 to 0.21.

Overall, the positive effects of taking CM were mostly very small, but it is worth noting that several of them were in science subjects, which may have more mathematical content than the social science subjects we investigated (e.g., sociology, geography). It is also important to note that most of the subjects we investigated did not have a substantial amount of mathematical content, so it is probably unrealistic to expect to find large effects. One possible area of further research would be to look at question papers for subjects with a quantitative element and identify items requiring mathematical knowledge or skills. Then see if students taking CM performed significantly better on these items than non-CM students.

There were several interaction effects between CM and the contextual variables considered in the analyses, most of which were very small. However, for psychology A level at grade C the interaction effect between CM and centre KS5 mean score was more substantial. This showed the advantage for CM students getting smaller in centres with higher ability students, suggesting that taking CM might be more beneficial for students in centres with lower ability students.

The other significant interaction of note was between CM and student total qualification size for A level business studies at grade A. This showed that the benefit of taking CM was larger for students taking more qualifications.

Finally, we need to be somewhat cautious with the interpretation of the results. Although, in some instances, we found a significant association between taking CM and achievement in other subjects taken concurrently, this does not mean that there was a causal link. There may be other reasons why CM students performed better. For example, it may be that students taking CM were more motivated to do well academically than non-CM students and it was this that meant they did better in their other subjects, rather than taking CM per se.

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Appendix

This appendix presents the full output from all regression models fitted for the analyses of research question 3.

Table A1: regression parameters for a model predicting the probability of at least a grade A (A level Psychology; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=42,174)	Model 2 (n=42,174)	Model 3 (n=66,209)
Intercept		-1.554 (0.030)*	-1.435 (0.029)*	-1.338 (0.025)*
Taken Core Maths	No			
	Yes	0.055 (0.066)	0.034 (0.065)	0.103 (0.053)
Gender	Female			
	Male	-0.477 (0.037)*	-0.492 (0.037)*	-0.503 (0.029)*
KS4 points score		1.545 (0.019)*	1.493 (0.019)*	1.404 (0.014)*
IDACI score		-1.649 (0.163)*	-1.263 (0.162)*	
Ethnic group	White			
	Other	0.317 (0.100)*	0.284 (0.100)*	
	Asian	0.227 (0.049)*	0.212 (0.048)*	
	Black	0.208 (0.063)*	0.187 (0.062)*	
	Chinese	0.476 (0.222)*	0.457 (0.222)*	
	Mixed	0.183 (0.061)*	0.158 (0.061)*	
	Unclassified	-0.046 (0.118)	-0.077 (0.117)	
Student total qualification size		0.318 (0.048)*	0.328 (0.048)*	0.359 (0.034)*
School type	Comp/Academy			
	6th Form College		-0.079 (0.170)	-0.024 (0.072)
	FE College		-3.326 (15.73)	0.148 (0.091)
	Independent		2.441 (1.715)	-0.587 (0.066)*
	Other		-0.023 (0.133)	-0.073 (0.129)
	Selective		-0.515 (0.077)*	-0.492 (0.073)*
Centre KS5 points score			0.106 (0.005)*	0.110 (0.004)*

Table A2: regression parameters for a model predicting the probability of at least a grade C (A level Psychology; Model 1=student level variables; Model 2 = school level variables; Model 3 = interactions; Model 4 = excluding census variables, due to missing data)

Effect		Model 1 (n=42,174)	Model 2 (n=42,174)	Model 3 (n=42,174)	Model 4 (n=66,209)
Intercept		1.977 (0.032)*	2.131 (0.032)*	2.127 (0.033)*	2.159 (0.028)*
Taken Core Maths	No				
	Yes	0.159 (0.074)*	0.130 (0.072)	0.247 (0.095)*	0.105 (0.059)
Gender	Female				
	Male	-0.359 (0.033)*	-0.377 (0.032)*	-0.375 (0.032)*	-0.389 (0.026)*
KS4 points score		1.503 (0.021)*	1.422 (0.021)*	1.412 (0.021)*	1.279 (0.015)*
IDACI score		-1.630 (0.156)*	-1.168 (0.155)*	-1.170 (0.155)*	
Ethnic group	White				
	Other	0.415 (0.108)*	0.418 (0.107)*	0.417 (0.107)*	
	Asian	0.390 (0.052)*	0.399 (0.050)*	0.401 (0.050)*	
	Black	0.581 (0.063)*	0.590 (0.062)*	0.588 (0.062)*	
	Chinese	0.796 (0.291)*	0.742 (0.288)*	0.753 (0.288)*	
	Mixed	0.247 (0.066)*	0.230 (0.065)*	0.232 (0.065)*	
	Unclassified	0.093 (0.112)	0.065 (0.110)	0.069 (0.110)	
SEN status	No SEN				
	SEN, no statement	0.129 (0.071)	0.095 (0.070)	0.097 (0.070)	
	SEN, statement	0.676 (0.266)*	0.681 (0.269)*	0.663 (0.268)*	
Student total qualification size		0.894 (0.056)*	0.901 (0.055)*	0.900 (0.055)*	0.731 (0.038)*
School type	Comp/Academy				
	6th Form College		0.152 (0.191)	0.148 (0.191)	-0.134 (0.071)
	FE College		-1.446 (1.379)	-1.507 (1.359)	0.111 (0.081)
	Independent		-1.482 (1.593)	-1.295 (1.665)	-0.411 (0.074)*
	Other		-0.114 (0.110)	-0.108 (0.110)	-0.094 (0.107)
	Selective		-0.565 (0.089)*	-0.558 (0.089)*	-0.504 (0.085)*
Centre KS5 points score			0.113 (0.005)*	0.116 (0.005)*	
Core Maths * KS4 points score				0.251 (0.098)*	
Core Maths * Centre KS5 points score				-0.055 (0.018)*	

Table A3: regression parameters for a model predicting the probability of at least a grade A (A level Biology; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=26,091)**	**Model 2 (n=26,091)**	**Model 3 (n=39,409)**
Intercept		-2.130 (0.036)*	-2.025 (0.036)*	-1.868 (0.031)*
Taken Core Maths	**No**			
	Yes	0.249 (0.075)*	0.232 (0.073)*	0.235 (0.059)*
Gender	**Female**			
	Male	0.552 (0.045)*	0.543 (0.045)*	0.463 (0.034)*
KS4 points score		1.896 (0.028)*	1.831 (0.029)*	1.632 (0.021)*
IDACI score		-1.846 (0.204)*	-1.420 (0.203)*	
SEN status	**No SEN**			
	SEN, no statement	0.256 (0.097)*	0.218 (0.097)*	
	SEN, statement	0.009 (0.358)	0.004 (0.358)	
Student total qualification size		0.284 (0.062)*	0.285 (0.062)*	0.345 (0.043)*
School type	**Comp/Academy**			
	6th Form College		-0.245 (0.162)	-0.001 (0.067)
	FE College		-1.033 (28.076)	0.155 (0.101)
	Independent		n/a	-0.485 (0.067)*
	Other		-0.481 (0.159)*	-0.475 (0.153)*
	Selective		-0.206 (0.073)*	-0.214 (0.067)*
Centre KS5 points score			0.077 (0.006)*	0.087 (0.005)*

Table A4: regression parameters for a model predicting the probability of at least a grade C (A level Biology; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=26,091)	Model 2 (n=26,091)	Model 3 (n=39,409)
Intercept		0.980 (0.032)*	1.145 (0.034)	1.18 (0.029)*
Taken Core Maths	No			
	Yes	0.225 (0.069)*	0.180 (0.067)*	0.132 (0.055)*
Gender	Female			
	Male	0.427 (0.038)*	0.413 (0.038)*	0.346 (0.030)*
KS4 points score		1.528 (0.023)*	1.440 (0.023)*	1.305 (0.018)*
IDACI score		-2.021 (0.178)*	-1.525 (0.176)*	
Ethnic group	White			
	Other	0.251 (0.108)*	0.213 (0.108)	
	Asian	0.188 (0.051)*	0.151 (0.050)*	
	Black	0.241 (0.068)*	0.211 (0.067)*	
	Chinese	0.791 (0.281)*	0.698 (0.279)*	
	Mixed	0.121 (0.074)	0.083 (0.074)	
	Unclassified	0.263 (0.128)*	0.211 (0.127)	
SEN status	No SEN			
	SEN, no statement	0.116 (0.081)	0.082 (0.081)	
	SEN, statement	0.640 (0.277)*	0.661 (0.278)*	
Student total qualification size		0.361 (0.060)*	0.371 (0.059)*	0.457 (0.043)*
School type	Comp/Academy			
	6th Form College		-0.084 (0.169)	-0.063 (0.070)
	FE College		8.337 (24.068)	0.228 (0.090)*
	Independent		n/a	-0.406 (0.071)*
	Other		-0.135 (0.116)	-0.156 (0.114)
	Selective		-0.275 (0.079)*	-0.225 (0.076)*
Centre KS5 points score			0.094 (0.005)*	0.099 (0.004)*

Table A5: regression parameters for a model predicting the probability of at least a grade A (A level Chemistry; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=14,122)	Model 2 (n=14,122)	Model 3 (n=21,735)
Intercept		-2.128 (0.050)*	-1.978 (0.05)*	-1.818 (0.041)*
Taken Core Maths	No			
	Yes	0.094 (0.094)	0.096 (0.092)	0.124 (0.075)
Gender	Female			
	Male	0.594 (0.057)*	0.597 (0.057)*	0.550 (0.044)*
KS4 points score		1.590 (0.035)*	1.515 (0.035)*	1.389 (0.027)*
IDACI score		-2.272 (0.262)*	-1.840 (0.261)*	
Student total qualification size				0.205 (0.060)*
SEN status	No SEN			
	SEN, no statement	0.302 (0.129)*		
	SEN, statement	-0.252 (0.522)		
Language	English			
	Other	0.241 (0.064)*	0.238 (0.064)*	
	Unclassified	0.158 (0.344)	0.140 (0.339)	
School type	Comp/Academy			
	6th Form College		-0.352 (0.184)	0.007 (0.079)
	FE College		-1.071 (28.190)	0.136 (0.131)
	Independent		n/a	-0.483 (0.081)*
	Other		-0.208 (0.200)	-0.233 (0.198)
	Selective		-0.378 (0.084)*	-0.400 (0.079)*
Centre KS5 points score			0.083 (0.007)*	0.094 (0.006)*

Table A6: regression parameters for a model predicting the probability of at least a grade C (A level Chemistry; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=14,122)	Model 2 (n=14,122)	Model 3 (n=21,735)
Intercept		0.523 (0.042)*	0.741 (0.045)*	0.843 (0.037)*
Taken Core Maths	**No**			
	Yes	0.220 (0.085)*	0.188 (0.083)*	0.145 (0.068)*
Gender	**Female**			
	Male	0.489 (0.050)*	0.489 (0.049)*	0.379 (0.039)*
KS4 points score		1.359 (0.028)*	1.277 (0.029)*	1.127 (0.022)*
IDACI score		-1.466 (0.222)*	-0.972 (0.222)*	0.347 (0.060)*
Ethnic group	**White**			
	Other	0.292 (0.119)*	0.243 (0.119)*	
	Asian	0.143 (0.060)*	0.123 (0.059)*	
	Black	0.333 (0.081)*	0.293 (0.080)*	
	Chinese	0.527 (0.314)	0.483 (0.315)	
	Mixed	0.155 (0.096)	0.101 (0.096)	
	Unclassified	0.335 (0.158)*	0.280 (0.157)	
Student total qualification size		0.329 (0.086)*	0.357 (0.086)*	
School type	**Comp/Academy**			
	6th Form College		-0.007 (0.191)	-0.004 (0.084)
	FE College		8.679 (23.492)	0.174 (0.114)
	Independent		n/a	-0.343 (0.086)*
	Other		-0.213 (0.153)	-0.240 (0.154)
	Selective		-0.548 (0.09)	-0.545 (0.088)*
Centre KS5 points score			0.093 (0.007)*	0.105 (0.006)*

Table A7: regression parameters for a model predicting the probability of at least a grade A (A level Business Studies; Model 1=student level variables; Model 2 = school level variables; Model 3 = Interactions; Model 4 = excluding census variables, due to missing data)

Effect		Model 1 (n=18,208)	Model 2 (n=18,208)	Model 3 (n=18,208)	Model 4 (n=31,529)
Intercept		-1.861 (0.048)*	-1.832 (0.047)*	-1.831 (0.047)*	-1.851 (0.034)
Taken Core Maths	**No**				
	Yes	0.278 (0.089)*	0.250 (0.088)*	0.318 (0.090)*	0.199 (0.072)
Gender	**Female**				
	Male	0.323 (0.045)*	0.328 (0.045)*	0.327 (0.045)*	0.287 (0.033)
KS4 points score		1.368 (0.028)*	1.323 (0.029)*	1.323 (0.029)*	1.217 (0.020)
IDACI score		-1.251 (0.257)*	-0.829 (0.257)*	-0.823 (0.257)*	
Ethnic group	**White**				
	Other	0.033 (0.166)	0.034 (0.166)	0.044 (0.166)	
	Asian	0.027 (0.075)	0.037 (0.075)	0.034 (0.075)	
	Black	-0.429 (0.109)*	-0.434 (0.109)*	-0.436 (0.109)*	
	Chinese	0.011 (0.348)	-0.048 (0.349)	-0.071 (0.352)	
	Mixed	-0.159 (0.097)	-0.172 (0.096)	-0.170 (0.096)	
	Unclassified	-0.379 (0.194)*	-0.397 (0.194)*	-0.395 (0.194)*	
Student total qualification size		0.544 (0.076)*	0.489 (0.078)*	0.489 (0.078)*	0.430 (0.050)
Centre KS5 points score			0.076 (0.007)*	0.079 (0.007)*	0.074 (0.005)
Taken Core Maths*Qualification size				0.742 (0.352)*	
Taken Core Maths*Centre KS5 points score				-0.048 (0.023)*	

Table A8: regression parameters for a model predicting the probability of at least a grade C (A level Business Studies; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=18,208)	Model 2 (n=18,208)	Model 3 (n=31,529)
Intercept		2.073 (0.053)*	2.121 (0.052)*	1.950 (0.037)*
Taken Core Maths	**No**			
	Yes	0.226 (0.107)*	0.184 (0.105)	0.247 (0.084)*
Gender	**Female**			
	Male	0.521 (0.051)*	0.527 (0.050)*	0.469 (0.036)*
KS4 points score		1.443 (0.034)*	1.362 (0.034)*	1.217 (0.024)*
IDACI score		-1.273 (0.262)*	-0.765 (0.262)*	
Ethnic group	**White**			
	Other	0.033 (0.167)	0.049 (0.166)	
	Asian	0.000 (0.077)	0.025 (0.076)	
	Black	-0.333 (0.093)*	-0.323 (0.092)*	
	Chinese	-0.018 (0.434)	-0.054 (0.431)	
	Mixed	-0.144 (0.103)	-0.152 (0.102)	
	Unclassified	-0.077 (0.174)	-0.068 (0.173)	
Student total qualification size		1.205 (0.089)*	1.187 (0.088)*	0.881 (0.056)*
Centre KS5 points score			0.095 (0.008)*	0.101 (0.005)*

Table A9: regression parameters for a model predicting the probability of at least a grade A (A level Geography; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=18,186)**	**Model 2 (n=18,186)**	**Model 3 (n=27,391)**
Intercept		-1.290 (0.038)*	-1.187 (0.039)*	-1.139 (0.035)*
Taken Core Maths	**No**			
	Yes	0.160 (0.087)	0.166 (0.087)	0.051 (0.075)
Gender	**Female**			
	Male	-0.186 (0.045)*	-0.185 (0.045)*	-0.179 (0.036)*
KS4 points score		1.613 (0.029)*	1.566 (0.029)*	1.496 (0.023)*
IDACI score		-2.164 (0.257)*	-1.804 (0.257)*	
SEN status	**No SEN**			
	SEN, no statement	0.362 (0.097)*	0.337 (0.097)*	
	SEN, statement	-0.104 (0.356)	-0.103 (0.358)	
Student total qualification size		0.490 (0.072)*	0.495 (0.072)*	0.424 (0.053*)
School type	**Comp/Academy**			
	6th Form College		-0.153 (0.211)	-0.171 (0.081)
	FE College		-3.849 (18.001)	0.035 (0.120)
	Independent		1.352 (1.516)	-0.174 (0.076)
	Other		-0.356 (0.177)*	-0.358 (0.173)*
	Selective		-0.294 (0.086)*	-0.278 (0.081)*
Centre KS5 points score			0.069 (0.007)*	0.075 (0.005)*

Table A10: regression parameters for a model predicting the probability of at least a grade C (A level Geography; Model 1=student level variables; Model 2 = school level variables; Model 3 = Interactions; Model 4 = excluding census variables, due to missing data)

Effect		**Model 1 (n=18,186)**	**Model 2 (n=18,186)**	**Model 3 (n=18,186)**	**Model 4 (n=27,391)**
Intercept		2.579 (0.045)*	2.732 (0.051)*	2.717 (0.051)*	2.631 (0.045)*
Taken Core Maths	**No**				
	Yes	0.051 (0.100)	0.057 (0.099)	0.308 (0.156)*	0.068 (0.086)
KS4 points score		1.509 (0.029)*	1.431 (0.034)*	1.413 (0.035)*	1.323 (0.026)*
IDACI score		-2.443 (0.262)*	-1.840 (0.266)*	-1.841 (0.266)*	
Student total qualification size		1.018 (0.095)*	1.020 (0.094)*	1.018 (0.094)*	0.898 (0.07)*
School type	**Comp/Academy**				
	6th Form College		0.085 (0.253)	0.086 (0.253)	-0.119 (0.097)
	FE College		5.744 (16.320)	5.810 (16.176)	0.163 (0.124)
	Independent		3.834 (18.999)	3.843 (19.004)	0.094 (0.111)
	Other		-0.181 (0.160)	-0.180 (0.160)	-0.156 (0.157)
	Selective		-0.487 (0.122)*	-0.488 (0.122)*	-0.450 (0.121)*
Centre KS5 points score			0.089 (0.008)*	0.089 (0.008)*	0.103 (0.007)*
Taken Core Maths* KS4 points score				0.305 (0.137)*	

Table A11: regression parameters for a model predicting the probability of at least a grade A (A level Economics; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=11,060)	Model 2 (n=11,060)	Model 3 (n=18,487)
Intercept		-1.542 (0.057)*	-1.406 (0.059)*	-1.354 (0.05)
Taken Core Maths	No			
	Yes	0.116 (0.109)	0.105 (0.107)	0.175 (0.088)
Gender	Female			
	Male	0.333 (0.060)*	0.349 (0.060)*	0.335 (0.045)
KS4 points score		1.385 (0.035)*		1.169 (0.025)
IDACI score		-1.814 (0.304)*	-1.382 (0.302)*	
Student total qualification size		0.364 (0.092)*	0.359 (0.092)*	0.286 (0.061)
School type	Comp/Academy			
	6th Form College		-0.052 (0.229)	-0.173 (0.091)
	FE College		n/a	-0.068 (0.155)
	Independent		-6.526 (25.175)	-0.202 (0.082)
	Other		-0.392 (0.219)	-0.296 (0.206)
	Selective		-0.354 (0.102)*	-0.326 (0.092)
Centre KS5 points score			0.087 (0.009)*	0.096 (0.006)*

Table A12: regression parameters for a model predicting the probability of at least a grade C (A level Economics; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=11,060)	Model 2 (n=11,060)	Model 3 (n=18,487)
Intercept		2.059 (0.069)*	2.156 (0.070)*	2.028 (0.053)*
Taken Core Maths	No			
	Yes	0.234 (0.122)	0.204 (0.120)	0.175 (0.097)
Gender	Female			
	Male	0.347 (0.070)*	0.358 (0.069)*	0.379 (0.053)*
KS4 points score		1.341 (0.041)*	1.238 (0.041)*	1.053 (0.029)*
IDACI score		-1.393 (0.317)*	-0.894 (0.317)*	
Student total qualification size		1.089 (0.123)*	1.073 (0.122)*	0.798 (0.081)*
Centre KS5 points score			0.092 (0.010)*	0.111 (0.007)*

Table A13: regression parameters for a model predicting the probability of at least a grade A (A level Sociology; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=26,205)	Model 2 (n=26,205)	Model 3 (n=40,812)
Intercept		-1.524 (0.034)*	-1.534 (0.034)*	-1.426 (0.028)*
Taken Core Maths	No			
	Yes	-0.235 (0.106)*	-0.249 (0.105)*	-0.150 (0.085)
Gender	Female			
	Male	-0.241 (0.044)*	-0.235 (0.044)*	-0.22 (0.035)*
KS4 points score		1.347 (0.021)*	1.304 (0.022)*	1.239 (0.017)*
IDACI score		-1.363 (0.189)*	-0.950 (0.189)*	
Ethnic group	White			
	Other	0.263 (0.113)*	0.257 (0.113)*	
	Asian	0.144 (0.059)*	0.164 (0.058)*	
	Black	0.283 (0.066)*	0.281 (0.065)*	
	Chinese	0.296 (0.347)	0.255 (0.347)	
	Mixed	0.112 (0.072)	0.100 (0.072)	
	Unclassified	0.066 (0.133)	0.033 (0.132)	
SEN status	No SEN			
	SEN, no statement	0.365 (0.078)*	0.349 (0.078)*	
	SEN, statement	0.259 (0.243)	0.260 (0.243)	
Student total qualification size		0.475 (0.063)*	0.491 (0.062)*	0.456 (0.045)*
School type	Comp/Academy			
	6th Form College		0.190 (0.198)	-0.029 (0.071)
	FE College		-3.683 (26.674)	0.033 (0.088)
	Independent		n/a	-0.445 (0.148)*
	Other		-0.125 (0.150)	-0.149 (0.145)
	Selective		-0.292 (0.103)*	-0.245 (0.099)*
Centre KS5 points score			0.090 (0.006)*	0.088 (0.005)*
School sex	Mixed			
	Boys		-0.893 (0.360)*	-1.020 (0.328)*
	Girls		0.067 (0.100)	0.040 (0.092)

Table A14: regression parameters for a model predicting the probability of at least a grade C (A level Sociology; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=26,205)**	**Model 2 (n=26,205)**	**Model 3 (n=40,812)**
Intercept		2.163 (0.037)	2.136 (0.035)	2.148 (0.026)
Taken Core Maths	**No**			
	Yes	0.13 (0.121)	0.116 (0.120)	0.052 (0.100)
KS4 points score		1.411 (0.027)*	1.328 (0.027)	1.219 (0.020)
IDACI score		-1.277 (0.199)	-0.775 (0.197)	
Ethnic group	**White**			
	Other	0.274 (0.13)	0.275 (0.130)	
	Asian	0.317 (0.064)	0.350 (0.062)	
	Black	0.41 (0.072)	0.422 (0.071)	
	Chinese	0.852 (0.524)	0.859 (0.525)	
	Mixed	0.163 (0.083)	0.156 (0.083)	
	Unclassified	0.299 (0.154)	0.259 (0.152)	
Student total qualification size		1.051 (0.074)	1.053 (0.073)	0.970 (0.051)
Centre KS5 points score			0.098 (0.006)*	0.091 (0.005)*

Table A15: regression parameters for a model predicting the probability of at least a grade A (A level Physics; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=3,373)**	**Model 2 (n=3,373)**	**Model 3 (n=4,577)**
Intercept		-4.026 (0.209)*	-4.03 (0.207)*	-3.936 (0.174)*
Taken Core Maths	**No**			
	Yes	0.313 (0.225)	0.345 (0.222)	0.188 (0.201)
Gender	**Female**			
	Male	0.700 (0.155)*	0.727 (0.154)*	0.733 (0.130)*
KS4 points score		1.932 (0.105)*	1.852 (0.105)*	1.758 (0.087)*
IDACI score		-3.293 (0.821)*	-2.758 (0.820)*	
Centre KS5 points score			0.066 (0.015)*	0.069 (0.012)*

Table A16: regression parameters for a model predicting the probability of at least a grade C (A level Physics; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=3,373)**	**Model 2 (n=3,373)**	**Model 3 (n=4,577)**
Intercept		-0.661 (0.093)*	-0.640 (0.091)*	-0.513 (0.076)*
Taken Core Maths	**No**			
	Yes	0.251 (0.140)	0.253 (0.138)	0.118 (0.119)
Gender	**Female**			
	Male	0.702 (0.107)*	0.736 (0.106)*	0.623 (0.089)*
KS4 points score		1.458 (0.062)*	1.367 (0.062)*	1.247 (0.050)*
IDACI score		-0.873 (0.453)*		
SEN status	**No SEN**			
	SEN, no statement	0.327 (0.195)	0.290 (0.196)	
	SEN, statement	1.317 (0.521)*	1.432 (0.528)*	
Student total qualification size		0.423 (0.147)*	0.415 (0.146)*	0.372 (0.105)*
Centre KS5 points score			0.084 (0.011)*	0.078 (0.008)*

Table A17: regression parameters for a model predicting the probability of a grade D* (BTEC Applied Sciences, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=4,416)	Model 2 (n=4,416)	Model 3 (n=6,018)
Intercept		-2.760 (0.124)*	-2.682 (0.123)*	-2.594 (0.106)*
Taken Core Maths	**No**			
	Yes	0.431 (0.221)	0.492 (0.219)*	0.359 (0.176)*
Gender	**Female**			
	Male	-0.350 (0.117)*	-0.372 (0.117)*	-0.268 (0.094)*
KS4 points score		1.497 (0.080)*	1.430 (0.080)*	1.328 (0.063)*
IDACI score		-1.830 (0.517)*	-1.216 (0.513)*	
Student total qualification size		0.437 (0.171)*	0.459 (0.170)*	0.273 (0.120)*
School type	**Comp/Academy**			
	6th Form College		0.071 (0.578)	0.099 (0.198)
	FE College		-4.408 (14.582)	-0.004 (0.396)
	Independent		n/a	-2.020 (0.956)*
	Other		0.213 (0.366)	0.332 (0.347)
	Selective		1.941 (0.620)*	1.825 (0.590)*
Centre KS5 points score			0.129 (0.020)*	0.140 (0.018)*
School sex	**Mixed**			
	Boys		-1.304 (0.901)	-1.423 (0.880)
	Girls		-0.922 (0.407)*	-0.836 (0.385)*

Table A18: regression parameters for a model predicting the probability of at least a grade D (BTEC Applied Sciences, A level size = 1; Model 1=student level variables; Model 2 = school level variables (no census variables significant, so no need for model 3))

Effect		Model 1 (n=4,416)	Model 2 (n=6,018)
Intercept		-0.279 (0.079)*	-0.163 (0.068)*
Taken Core Maths	**No**		
	Yes	0.355 (0.172)*	0.288 (0.144)*
Gender	**Female**		
	Male	-0.435 (0.084)*	-0.415 (0.071)*
KS4 points score		1.496 (0.063)*	1.330 (0.051)*
IDACI score		-0.794 (0.367)*	
Student total qualification size		0.662 (0.128)*	0.529 (0.089)*
Centre KS5 points score			0.113 (0.014)*
School sex	**Mixed**		
	Boys		-0.850 (0.556)
	Girls		-0.632 (0.290)*

Table A19: regression parameters for a model predicting the probability of a grade D* (BTEC Business, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=7,000)	Model 2 (n=7,000)	Model 3 (n=11,014)
Intercept		-2.494 (0.109)*	-2.504 (0.108)*	-2.375 (0.078)*
Taken Core Maths	**No**			
	Yes	0.077 (0.214)	0.085 (0.214)	-0.080 (0.179)
Gender	**Female**			
	Male	-0.231 (0.086)*	-0.226 (0.086)*	-0.161 (0.064)*
KS4 points score		1.563 (0.057)*	1.543 (0.057)*	1.310 (0.040)*
Ethnic group	**White**			
	Other	0.289 (0.283)	0.312 (0.282)	
	Asian	-0.107 (0.143)	-0.061 (0.143)	
	Black	-1.013 (0.199)*	-0.983 (0.199)*	
	Chinese	-1.392 (0.865)	-1.422 (0.862)	
	Mixed	-0.171 (0.190)	-0.145 (0.189)	
	Unclassified	-1.116 (0.435)*	-1.192 (0.440)*	
Student total qualification size		0.478 (0.130)*	0.481 (0.130)*	0.273 (0.079)*
Centre KS5 points score			0.075 (0.017)*	0.075 (0.013)*

Table A20: regression parameters for a model predicting the probability of at least a grade D (BTEC Business, A level size = 1; Model 1=student level variables; Model 2 = school level variables; no census variables sig, so no need for model 3)

Effect		**Model 1 (n=7,000)**	**Model 2 (n=11,014)**
Intercept		0.224 (0.068)*	0.206 (0.055)*
Taken Core Maths	**No**		
	Yes	-0.013 (0.164)	-0.005 (0.139)
Gender	**Female**		
	Male	-0.288 (0.066)*	-0.236 (0.052)*
KS4 points score		1.397 (0.046)*	1.167 (0.034)*
IDACI score		-0.658 (0.307)*	
Student total qualification size		0.775 (0.098)*	0.585 (0.057)*
Centre KS5 points score			0.083 (0.010)*

Table A21: regression parameters for a model predicting the probability of a grade D* (BTEC Information Technology, A level size = 1; Model 1=student level variables; Model 2 = school level variables; no census variables sig)

Effect		**Model 1 (n=5,211)**	**Model 2 (n=5,211)**
Intercept		-2.179 (0.088)*	-2.213 (0.087)*
Taken Core Maths	**No**		
	Yes	-0.005 (0.204)	-0.011 (0.203)
KS4 points score		1.251 (0.053)*	1.215 (0.053)*
Student total qualification size		0.324 (0.118)*	0.321 (0.119)*
Centre KS5 points score			0.114 (0.018)*

Table A22: regression parameters for a model predicting the probability of at least a grade D (BTEC Information Technology, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=3,314)**	**Model 2 (n=3,314)**	**Model 3 (n=5,211)**
Intercept		0.218 (0.083)*	0.182 (0.081)*	0.303 (0.097)*
Taken Core Maths	**No**			
	Yes	0.159 (0.243)	0.165 (0.242)	0.233 (0.176)
Gender	**Female**			
	Male			-0.287 (0.096)*
KS4 points score		1.332 (0.064)*	1.289 (0.064)*	1.118 (0.046)*
Ethnic group	**White**			
	Other	0.183 (0.254)	0.205 (0.253)	
	Asian	0.056 (0.131)	0.092 (0.130)	
	Black	-0.610 (0.162)*	-0.588 (0.161)*	
	Chinese	-0.118 (1.067)	-0.156 (1.051)	
	Mixed	-0.372 (0.214)	-0.344 (0.214)	
	Unclassified	-0.575 (0.329)	-0.610 (0.328)	
Student total qualification size		0.633 (0.152)*	0.638 (0.152)*	0.451 (0.088)*
Centre KS5 points score			0.091 (0.017)*	0.107 (0.014)*

Table A23: regression parameters for a model predicting the probability of a grade D* (BTEC Sports studies, A level size = 1; Model 1=student level variables; Model 2 = school level variables; no census variables sig)

Effect		**Model 1 (n=5,453)**	**Model 2 (n=5,453)**
Intercept		-1.483 (0.096)*	-1.386 (0.101)*
Taken Core Maths	**No**		
	Yes	-0.182 (0.232)	-0.178 (0.230)
Gender	**Female**		
	Male	-0.824 (0.090)*	-0.835 (0.090)*
KS4 points score		1.367 (0.056)*	1.330 (0.056)*
Student total qualification size		0.354 (0.110)*	0.299 (0.114)*
School type	**Comp/Academy**		
	6th Form College		-0.046 (0.246)
	FE College		-0.666 (0.386)
	Independent		-0.753 (0.288)*
	Other		-0.436 (0.352)
	Selective		1.103 (0.662)
Centre KS5 points score			0.086 (0.016)*

Table A24: regression parameters for a model predicting the probability of at least a grade D (BTEC Sports studies, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		**Model 1 (n=3,883)**	**Model 2 (n=3,883)**	**Model 3 (n=5,453)**
Intercept		1.338 (0.138)*	1.321 (0.137)*	1.043 (0.096)*
Taken Core Maths	**No**			
	Yes	0.057 (0.251)	0.060 (0.250)	-0.025 (0.216)
Gender	**Female**			
	Male	-0.832 (0.109)*	-0.843 (0.109)*	-0.853 (0.089)*
KS4 points score		1.769 (0.075)*	1.734 (0.075)*	1.552 (0.058)*
IDACI score		-1.468 (0.489)*	-1.121 (0.494)*	
Student total qualification size		0.868 (0.153)*	0.856 (0.152)*	0.663 (0.093)*
Ethnic group	**White**			
	Other	-0.249 (0.415)	-0.255 (0.416)	
	Asian	-0.197 (0.211)	-0.173 (0.210)	
	Black	-0.490 (0.205)*	-0.491 (0.205)*	
	Chinese	-0.801 (1.444)	-0.898 (1.426)	
	Mixed	-0.799 (0.236)*	-0.805 (0.237)*	
	Unclassified	-0.716 (0.356)*	-0.690 (0.357)	
School type	**Comp/Academy**			
	6th Form College			-0.033 (0.229)
	FE College			-0.497 (0.297)
	Independent			-0.869 (0.268)*
	Other			-0.130 (0.310)
	Selective			0.227 (0.804)
Centre KS5 points score			0.075 (0.017)*	0.087 (0.014)*

Table A25: regression parameters for a model predicting the probability of a grade D* (BTEC Health & Social Care, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=6,163)	Model 2 (n=6,163)	Model 3 (n=8,473)
Intercept		-1.833 (0.098)*	-1.883 (0.098)*	-1.859 (0.063)*
Taken Core Maths	**No**			
	Yes	-0.071 (0.270)	-0.058 (0.270)	-0.050 (0.211)
Gender	**Female**			
	Male	-0.573 (0.174)*	-0.567 (0.174)*	-0.737 (0.151)*
KS4 points score		1.470 (0.054)*	1.444 (0.054)*	1.274 (0.042)*
IDACI score		-1.460 (0.379)*	-1.216 (0.381)*	
Student total qualification size		0.646 (0.132)*	0.653 (0.132)*	0.276 (0.088)*
School sex	**Mixed**			
	Boys			-4.242 (6.792)
	Girls			-0.637 (0.225)*
Centre KS5 points score			0.074 (0.015)*	0.084 (0.012)*

Table A26: regression parameters for a model predicting the probability of at least a grade D (BTEC Health & Social Care, A level size = 1; Model 1=student level variables; Model 2 = school level variables; Model 3 = excluding census variables, due to missing data)

Effect		Model 1 (n=6,163)	Model 2 (n=6,163)	Model 3 (n=8,473)
Intercept		0.699 (0.085)*	0.671 (0.084)*	0.546 (0.054)*
Taken Core Maths	No			
	Yes	0.181 (0.254)	0.183 (0.253)	-0.091 (0.209)
Gender	Female			
	Male	-0.866 (0.121)*	-0.863 (0.121)*	-0.894 (0.105)*
KS4 points score		1.493 (0.051)*	1.461 (0.052)*	1.332 (0.041)*
IDACI score		-0.917 (0.336)*	-0.715 (0.338)*	
Student total qualification size		0.813 (0.108)*	0.816 (0.108)*	0.601 (0.070)*
Ethnic group	White			
	Other	-0.756 (0.299)*	-0.763 (0.298)*	
	Asian	0.093 (0.121)	0.128 (0.120)	
	Black	-0.115 (0.136)	-0.105 (0.136)	
	Chinese	-0.560 (0.827)	-0.561 (0.830)	
	Mixed	-0.448 (0.169)*	-0.445 (0.169)*	
	Unclassified	0.041 (0.290)	0.014 (0.289)	
School sex	Mixed			
	Boys			0.545 (1.025)
	Girls			-0.570 (0.214)*
Centre KS5 points score			0.075 (0.013)*	0.089 (0.011)*

Table A27: regression parameters for a model predicting the probability of at least a grade D*D*D (BTEC Applied sciences, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=5,299)	Model 2 (n=5,299)
Intercept		-1.833 (0.096)*	-1.251 (0.204)*
Taken Core Maths	**No**		
	Yes	0.407 (0.204)*	0.343 (0.198)
Gender	**Female**		
	Male	-0.205 (0.086)*	-0.215 (0.086)*
KS4 points score		0.931 (0.047)*	0.916 (0.047)*
School type	**Comp/Academy**		
	6th Form College		-0.269 (0.229)
	FE College		-0.863 (0.251)*
	Independent		-5.848 (22.399)
	Other		-0.705 (0.445)
	Selective		-0.968 (1.396)
Centre KS5 points score			0.062 (0.021)*

Table A28: regression parameters for a model predicting the probability of at least a grade MMM (BTEC Applied sciences, A level size = 3; Model 1=student level variables; Model 2 = school level variables; Model 3 = interactions)

Effect		Model 1 (n=5,299)	Model 2 (n=5,299)	Model 3 (n=5,299)
Intercept		1.766 (0.087)*	2.393 (0.221)*	2.379 (0.221)*
Taken Core Maths	**No**			
	Yes	0.718 (0.253)*	0.614 (0.246)*	0.644 (0.259)*
Gender	**Female**			
	Male	-0.453 (0.075)*	-0.466 (0.075)*	-0.463 (0.075)*
KS4 points score		0.746 (0.042)*	0.708 (0.042)*	0.692 (0.042)*
School type	**Comp/Academy**			
	6th Form College		-0.368 (0.247)	-0.362 (0.247)
	FE College		-0.881 (0.253)*	-0.868 (0.253)*
	Independent		4.324 (28.286)	4.351 (28.230)
	Other		-0.262 (0.440)	-0.240 (0.440)
	Selective		-2.413 (1.170)*	-2.407 (1.169)*
Centre KS5 points score			0.067 (0.020)*	0.068 (0.020)
Core Maths*KS4 points score				0.622 (0.279)*

Table A29: regression parameters for a model predicting the probability of at least a grade D*D*D (BTEC Engineering, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=2,478)	Model 2 (n=2,478)
Intercept		-1.471 (0.238)*	-1.395 (0.232)*
Taken Core Maths	**No**		
	Yes	0.147 (0.284)	0.108 (0.276)
Gender	**Female**		
	Male	-1.010 (0.212)*	-1.014 (0.212)*
KS4 points score		1.021 (0.072)*	1.004 (0.072)*
Centre KS5 points score			0.125 (0.032)*

Table A30: regression parameters for a model predicting the probability of at least a grade MMM (BTEC Engineering, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=2,478)	Model 2 (n=2,478)
Intercept		1.153 (0.129)*	4.483 (0.178)*
Taken Core Maths	**No**		
	Yes	0.411 (0.285)	0.314 (0.269)
KS4 points score		0.685 (0.058)*	0.667 (0.058)*
School type	**Comp/Academy**		
	6th Form College		-3.008 (1.256)*
	FE College		-3.376 (1.189)
	Other		-2.969 (1.204)*
Centre KS5 points score			0.139 (0.034)*

Table A31: regression parameters for a model predicting the probability of at least a grade D*D*D (BTEC Information Technology, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=2,323)	Model 2 (n=2,323)
Intercept		-2.516 (0.145)*	-2.519 (0.137)*
Taken Core Maths	**No**		
	Yes	1.230 (0.415)*	1.216 (0.407)*
KS4 points score		0.855 (0.067)*	0.838 (0.067)*
Student total qualification size		-0.487 (0.159)	-0.323 (0.154)
Centre KS5 points score			0.117 (0.029)*

Table A32: regression parameters for a model predicting the probability of at least a grade MMM (BTEC Information Technology, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=2,323)	Model 2 (n=2,323)
Intercept		1.917 (0.245)*	3.201 (0.531)*
Taken Core Maths	**No**		
	Yes	0.122 (0.357)	0.084 (0.349)
Gender	**Female**		
	Male	-0.871 (0.231)*	-0.855 (0.231)*
KS4 points score		0.565 (0.051)*	0.543 (0.051)*
Student total qualification size		-0.324 (0.126)*	
School type	**Comp/Academy**		
	6th Form College		-1.150 (0.512)*
	FE College		-1.448 (0.514)*
	Other		4.759 (19.642)
Centre KS5 points score			0.104 (0.030)*

Table A33: regression parameters for a model predicting the probability of at least a grade D*D*D (BTEC Business, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=7,886)	Model 2 (n=7,886)
Intercept		-1.748 (0.101)*	-1.880 (0.091)*
Taken Core Maths	**No**		
	Yes	0.034 (0.321)	-0.046 (0.316)
Gender	**Female**		
	Male	-0.391 (0.072)*	-0.416 (0.072)*
KS4 points score		0.869 (0.040)*	0.841 (0.040)*
Student total qualification size		0.369 (0.116)*	0.353 (0.116)*
Centre KS5 points score			0.145 (0.014)*

Table A34: regression parameters for a model predicting the probability of at least a grade MMM (BTEC Business, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=7,886)	Model 2 (n=7,886)
Intercept		2.074 (0.106)*	2.274 (0.188)*
Taken Core Maths	No		
	Yes	0.953 (0.475)*	0.720 (0.475)
Gender	Female		
	Male	-0.395 (0.065)*	-0.408 (0.064)*
KS4 points score		0.556 (0.033)*	0.528 (0.033)*
School type	Comp/Academy		
	6th Form College		0.061 (0.235)
	FE College		-0.629 (0.227)*
	Independent		2.629 (4.744)
	Other		0.131 (0.603)
	Selective		3.207 (9.107)
Centre KS5 points score			0.166 (0.020)*

Table A35: regression parameters for a model predicting the probability of at least a grade D*D*D (BTEC Health & Social Care, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=7,206)	Model 2 (n=7,206)
Intercept		-1.770 (0.088)*	-1.781 (0.144)*
Taken Core Maths	No		
	Yes	-0.309 (0.550)	-0.120 (0.508)
KS4 points score		1.148 (0.041)*	1.131 (0.041)*
Student total qualification size		0.560 (0.159)*	0.538 (0.116)*
School type	Comp/Academy		
	6th Form College		0.310 (0.188)
	FE College		-0.330 (0.205)
	Other		-0.478 (0.416)
	Selective		0.748 (1.499)
Centre KS5 points score			0.124 (0.020)*

Table A36: regression parameters for a model predicting the probability of at least a grade MMM (BTEC Health & Social Care, A level size = 3; Model 1=student level variables; Model 2 = school level variables)

Effect		Model 1 (n=7,206)	Model 2 (n=7,206)
Intercept		1.926 (0.076)*	1.830 (0.083)*
Taken Core Maths	**No**		
	Yes	-0.562 (0.505)	-0.488 (0.493)
Gender	**Female**		
	Male	-0.435 (0.145)*	-0.426 (0.145)*
KS4 points score		0.787 (0.038)*	0.766 (0.038)*
Centre KS5 points score			0.150 (0.018)*