# Options for setting the grade 9 boundary

*A research note for Ofqual*
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## Background

In this short research note we examine three possible options for the setting of the grade 9 boundary across all subjects. We name these options as follows:

- **20% A\*-A rule:** the grade 9 boundary in each subject is set so that 20% of students awarded a grade 7 to 9 on the new scale are award the grade 9 (which is equivalent to 20% of those currently achieving grades A\*-A);
- **50% A\* rule:** the grade 9 boundary in each subject is set so that 50% of students currently awarded an A\* grade would achieve a grade 9;
- **Tailored rule:** the grade 9 boundary is set according to a formula that multiplies the proportion awarded a grade 7 to 9 by 7% plus half the percentage awarded grade 7 or above.

At the heart of the difficulty in devising a universal rule that produces reasonable awarding across all subjects is the problem that the underlying academic capabilities of students sitting different subjects is not the same. The tailored rule aims to indirectly deal with this by using the percentage historically awarded an A\*-A grade as a proxy for the extent to which underlying academic capabilities of entrants are skewed towards the upper end of the distribution.

This note summarises the impact of each possible rule on the number in each subject awarded grade 9 by pupil groups and school types.

## Data

For this analysis we use the population of candidates from all state-funded and independent schools that were aged 15/16 in summer 2014 and so were eligible for inclusion in Key Stage 4 school performance tables. (We use the 2014 rather than 2015 cohort because the latter were affected by the SATs strikes and so do not have reliable Key Stage 2 scores.)

Pupil attainment is measured across 72 subject mappings with at least 1000 entrants, which vary in number of entries from Applied Art and Design with just 1020 entries to Mathematics with 584,884 entries. We include all single-award GCSEs, Level 1/ Level 2 certificates and the international GCSEs that were not eligible for inclusion in 2013/14 Performance Tables; double award GCSEs and vocational GCSEs have not been included.[1] Where a pupil has entered a subject more than once, the following rules are applied to select a single record per pupil:

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[1] We include qualifications not approved for pre-16 use. The full list of qualification types we include are as follows: GCSE Full Course, Edexcel IGCSE type A, Edexcel IGCSE type C, Edexcel IGCSE type D, CIE IGCSE, IGCSE, Edexcel Certificates, Level1/2 certificates, Cambridge International Certificate Level 1/Level 2.

- GCSEs and level 1/ level 2 certificates are preferred to international GCSEs
- In the case of remaining ties, the entry with the highest grade is preferred

## Modelling the awarding of 1 to 9 grades

We need a method for partitioning pupils who are all awarded the same grade on the old A*-G scale into more than one grade on the new 9 to 1 scale. If we do this at random it is unlikely to provide a reasonable prediction of how the awarding rules will affect different pupil groups. For example, suppose pupils from independent schools who achieve an A* in Latin have a higher average paper mark than pupils from state-funded schools who achieve an A* in Latin. This means that they are more likely be awarded a grade 9 under the new scaling and we would like our modelling to accurately reflect this.

We do not know marks awarded in GCSE exam papers, so we proxy this using a measure of the pupils overall academic capabilities across all subjects. The measure we choose to use is the total number of points achieved by pupils in their best 6 entries, excluding community languages (**points_6**). We use the scale ranging from 1 point for grade G to 8 points for grade A*.

We generate a measure of the likelihood of achieving a good grade in each subject, given the pupil's overall academic capabilities (proxied by **points_6**). We do this by estimating the probability of each pupil achieving each grade (A*-G) in each subject entered on the basis of **points_6** using multinomial logistic regression. A predicted points score (**est**) is calculated from the resulting probabilities. We then calculate proportional ranks for each subject for each grade (A*-G) by ordering pupils on this predicted score. Normal scores (z-scores) are calculated for these ranks (**zest**).

We do not want these predicted points scores alone to provide a ranking of the likely marks awarded within each GCSE grade because it will overstate the strength of the relationship between academic capabilities and individual subject achievement. We allow the correlation between predicted point scores and **points_6** to vary by subject so that it is, for example, stronger in mathematics than it is for physical education. We introduce this noise into the relationship between subject predicted point score and **points_6** by taking a random draw for each pupil-subject from a normal distribution with mean **zest** and standard deviation 1 (**rand**). Proportional ranks are again created for each subject for each grade by ordering pupils on **rand**. Normal scores are calculated for these ranks (**zrand**).

The new 1-9 grades are then awarded using the following three step process:

1. We take the pupil's actual A*-G grade awarded and map a value as follows:
   - A* = 8
   - A = 7
   - B = 6
   - C = 4
   - D = 3
   - E = 2
   - F = 1
   - G = 1
   - U = 0
2. Then based on **zrand** calculated above:
   - The top 30% of pupils awarded grade A are imputed grade 8
   - The lowest third of pupils awarded grade B are imputed grade 5
   - The top third of pupils awarded grade C are imputed grade 5
   - The top half of pupils awarded grade F are imputed grade 2
3. Three versions of grade 9 are calculated:

- **20% A\*-A rule**: the grade 9 boundary in each subject is set so that 20% of students awarded a grade 7 to 9 on the new scale are awarded the grade 9 (which is equivalent to 20% of those currently achieving grades A\*-A);
- **50% A\* rule**: the grade 9 boundary in each subject is set so that 50% of students currently awarded an A\* grade would achieve a grade 9;
- **Tailored rule**: the grade 9 boundary is set according to a formula that multiplies the proportion awarded a grade 7 to 9 by 7% plus half the percentage awarded grade 7 or above.

## Overall variation in grades awarded by subject

Table 1 (overleaf) shows the percentage of pupils awarded grade 9 on the 3 possible criteria for all the major subject mappings. For many subjects, the three grade 9 rules applied result in similar numbers awarded. However, for a minority of subjects – mostly community languages and those with high ability intakes – the rule decision is material and we show these in Figure 1. The 20% A*-A rule results in more grade 9 than A* in subjects with relatively weak entry profiles (core science, preparation for work, combined English) and occasionally for those with a higher level of 'difficulty' (e.g. psychology).

It is worth noting that many of these subjects with large differences in number of grade 9s awarded have very small numbers of entries. If *number* of grade 9s awarded is considered, the subjects most affected are essentially those with the highest number of entries overall: Chemistry, Biology, Physics, English Language, English Literature, Mathematics, Science (Core), Science: Additional, Religious Studies, History.

*Figure 1: A\* and grade 9 awarded for subjects with largest deviations between rules*
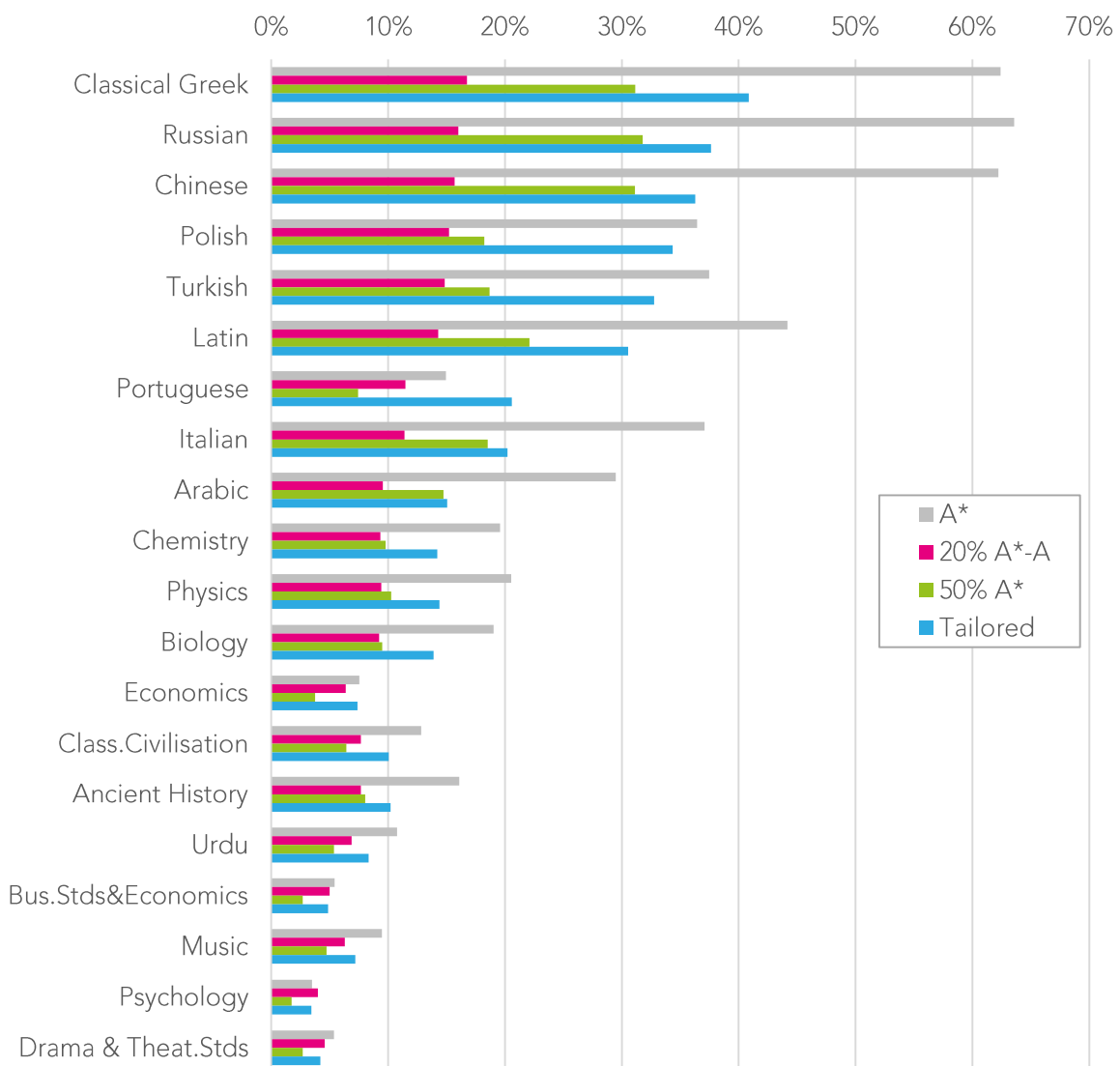
*Table 1: Grades 7 to 9 awarded by proposed rule – all subject groupings*

| | Entries | A*-A | A* | 20% A*-A rule | | | | 50% A* rule | | | Tailored rule | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 7 | 8 | 9 | % A* | 7 | 8 | 9 | 7 | 8 | 9 | % A* |
| Mathematics | 584,906 | 21.5% | 8.8% | 8.9% | 8.5% | 4.2% | 47.2% | 8.9% | 8.2% | 4.4% | 8.9% | 8.9% | 3.7% | 41.9% |
| English Language | 490,951 | 22.8% | 6.5% | 11.4% | 6.9% | 4.5% | 69.9% | 11.4% | 8.1% | 3.3% | 11.4% | 7.2% | 4.2% | 64.3% |
| English Literature | 484,458 | 23.9% | 7.0% | 11.8% | 7.4% | 4.7% | 67.0% | 11.8% | 8.6% | 3.5% | 11.8% | 7.6% | 4.5% | 63.4% |
| Science (Core) | 360,002 | 9.8% | 1.7% | 5.7% | 2.2% | 1.9% | 116.1% | 5.7% | 3.3% | 0.8% | 5.7% | 3.0% | 1.2% | 69.0% |
| Science: Additional | 272,595 | 12.0% | 2.6% | 6.6% | 3.0% | 2.4% | 91.7% | 6.6% | 4.1% | 1.3% | 6.6% | 3.9% | 1.6% | 59.6% |
| Religious Studies | 257,298 | 30.7% | 11.3% | 13.6% | 11.1% | 6.0% | 53.1% | 13.6% | 11.5% | 5.7% | 13.6% | 10.4% | 6.7% | 59.4% |
| History | 245,312 | 30.3% | 11.4% | 13.2% | 11.1% | 6.0% | 52.2% | 13.2% | 11.4% | 5.7% | 13.2% | 10.5% | 6.6% | 57.8% |
| Geography | 213,335 | 28.2% | 10.6% | 12.3% | 10.3% | 5.6% | 52.6% | 12.3% | 10.6% | 5.3% | 12.3% | 10.0% | 5.9% | 55.5% |
| French | 163,944 | 25.9% | 11.8% | 9.9% | 10.8% | 5.2% | 43.9% | 9.9% | 10.1% | 5.9% | 9.9% | 10.9% | 5.2% | 43.8% |
| Biology | 155,348 | 46.2% | 19.0% | 19.0% | 18.0% | 9.2% | 48.5% | 19.0% | 17.7% | 9.5% | 19.0% | 13.3% | 13.9% | 73.0% |
| Chemistry | 151,656 | 46.8% | 19.6% | 19.0% | 18.4% | 9.3% | 47.8% | 19.0% | 17.9% | 9.8% | 19.0% | 13.5% | 14.2% | 72.6% |
| Physics | 151,139 | 47.1% | 20.5% | 18.6% | 19.1% | 9.4% | 45.9% | 18.6% | 18.2% | 10.3% | 18.6% | 14.1% | 14.4% | 70.1% |
| English (combined) | 120,444 | 2.6% | 0.4% | 1.5% | 0.6% | 0.5% | 122.2% | 1.5% | 0.9% | 0.2% | 1.5% | 0.9% | 0.2% | 50.8% |
| Sport/P.E. Studies | 102,599 | 19.9% | 4.1% | 11.0% | 4.8% | 4.0% | 97.2% | 11.0% | 6.8% | 2.0% | 11.0% | 5.5% | 3.4% | 82.3% |
| Spanish | 90,711 | 30.6% | 14.1% | 11.5% | 13.0% | 6.1% | 43.1% | 11.5% | 12.0% | 7.1% | 11.5% | 12.3% | 6.8% | 48.0% |
| Inform Comm Tech | 85,064 | 22.4% | 5.9% | 11.5% | 6.5% | 4.4% | 73.6% | 11.5% | 7.9% | 3.0% | 11.5% | 6.9% | 4.0% | 67.0% |
| Art & Design | 84,189 | 21.4% | 8.4% | 9.1% | 8.0% | 4.3% | 50.9% | 9.1% | 8.1% | 4.2% | 9.1% | 8.5% | 3.8% | 45.1% |
| Bus. Studs:Single | 70,967 | 18.8% | 3.6% | 10.6% | 4.5% | 3.7% | 101.3% | 10.6% | 6.4% | 1.8% | 10.6% | 5.2% | 3.0% | 83.0% |
| Drama & Theat.Stds | 70,768 | 22.9% | 5.4% | 12.3% | 6.1% | 4.6% | 84.8% | 12.3% | 8.0% | 2.7% | 12.3% | 6.4% | 4.2% | 78.3% |
| German | 60,227 | 25.1% | 9.8% | 10.7% | 9.4% | 5.0% | 51.1% | 10.7% | 9.5% | 4.9% | 10.7% | 9.5% | 4.9% | 49.9% |
| D&T Resist. Matrls | 52,019 | 14.2% | 3.8% | 7.3% | 4.1% | 2.8% | 73.7% | 7.3% | 5.0% | 1.9% | 7.3% | 4.9% | 2.0% | 51.8% |
| Art&Des : Fine Art | 51,350 | 27.1% | 11.4% | 11.0% | 10.7% | 5.4% | 47.6% | 11.0% | 10.4% | 5.7% | 11.0% | 10.5% | 5.6% | 49.0% |
| Media/Film/TV Stds | 49,898 | 16.2% | 3.2% | 9.1% | 3.9% | 3.2% | 98.5% | 9.1% | 5.5% | 1.6% | 9.1% | 4.7% | 2.4% | 74.4% |
| Statistics | 45,696 | 22.4% | 5.2% | 12.1% | 5.9% | 4.4% | 85.3% | 12.1% | 7.8% | 2.6% | 12.1% | 6.3% | 4.0% | 77.6% |
| Music | 42,360 | 31.7% | 9.5% | 15.6% | 9.9% | 6.3% | 66.3% | 15.6% | 11.4% | 4.7% | 15.6% | 9.0% | 7.2% | 75.8% |
| D&T Food Tech | 39,895 | 18.1% | 5.2% | 9.1% | 5.5% | 3.6% | 69.4% | 9.1% | 6.5% | 2.6% | 9.1% | 6.2% | 2.9% | 55.7% |
| D&T Product Design | 35,587 | 15.9% | 4.8% | 7.8% | 5.0% | 3.1% | 65.6% | 7.8% | 5.7% | 2.4% | 7.8% | 5.8% | 2.3% | 49.0% |
| D&T Graphic Prods | 33,297 | 17.3% | 4.8% | 8.8% | 5.2% | 3.4% | 70.7% | 8.8% | 6.1% | 2.4% | 8.8% | 5.9% | 2.6% | 55.3% |
| D&T Textiles Tech. | 25,074 | 26.9% | 9.9% | 11.8% | 9.7% | 5.3% | 53.6% | 11.8% | 10.0% | 5.0% | 11.8% | 9.6% | 5.4% | 54.7% |
| Sociology | 20,361 | 17.3% | 3.3% | 9.8% | 4.1% | 3.4% | 103.0% | 9.8% | 5.9% | 1.7% | 9.8% | 4.8% | 2.7% | 80.5% |

| | Entries | A*-A | A* | 20% A*-A rule | | | | 50% A* rule | | | Tailored rule | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 7 | 8 | 9 | % A* | 7 | 8 | 9 | 7 | 8 | 9 | % A* |
| Soc Sci:Citizenshp | 19,566 | 14.9% | 2.5% | 8.7% | 3.3% | 2.9% | 119.2% | 8.7% | 5.0% | 1.2% | 8.7% | 4.1% | 2.1% | 86.3% |
| Art & Des(Photo.) | 19,144 | 20.6% | 7.4% | 9.2% | 7.3% | 4.1% | 55.0% | 9.2% | 7.7% | 3.7% | 9.2% | 7.8% | 3.5% | 47.5% |
| HE: Child Devt | 18,315 | 10.8% | 2.3% | 6.0% | 2.7% | 2.1% | 93.5% | 6.0% | 3.7% | 1.1% | 6.0% | 3.5% | 1.3% | 58.0% |
| Com/Computing | 15,610 | 23.7% | 6.5% | 12.1% | 7.0% | 4.6% | 71.4% | 12.1% | 8.4% | 3.2% | 12.1% | 7.3% | 4.3% | 67.2% |
| Method in Math | 15,434 | 24.6% | 9.9% | 10.3% | 9.4% | 4.9% | 49.3% | 10.3% | 9.4% | 4.9% | 10.3% | 9.6% | 4.7% | 47.6% |
| Application of Math | 14,741 | 24.3% | 9.0% | 10.7% | 8.8% | 4.8% | 53.4% | 10.7% | 9.1% | 4.5% | 10.7% | 9.0% | 4.6% | 51.1% |
| Psychology | 14,194 | 20.4% | 3.5% | 11.8% | 4.6% | 4.0% | 114.4% | 11.8% | 6.8% | 1.7% | 11.8% | 5.1% | 3.4% | 98.4% |
| Office Technology | 13,961 | 14.8% | 3.2% | 8.1% | 3.8% | 2.9% | 90.2% | 8.1% | 5.1% | 1.6% | 8.1% | 4.6% | 2.1% | 64.8% |
| Dance | 11,660 | 21.2% | 4.7% | 11.6% | 5.4% | 4.2% | 90.3% | 11.6% | 7.3% | 2.3% | 11.6% | 5.9% | 3.7% | 79.4% |
| HE: Food | 9,183 | 15.8% | 3.3% | 8.7% | 4.0% | 3.1% | 93.5% | 8.7% | 5.4% | 1.7% | 8.7% | 4.7% | 2.3% | 69.7% |
| Latin | 8,850 | 71.5% | 44.2% | 19.2% | 38.1% | 14.3% | 32.3% | 19.2% | 30.3% | 22.1% | 19.2% | 21.9% | 30.5% | 69.1% |
| General Studies | 8,764 | 10.1% | 2.2% | 5.5% | 2.7% | 1.9% | 87.0% | 5.5% | 3.5% | 1.1% | 5.5% | 3.4% | 1.1% | 52.1% |
| D&T Electrnc.Prods | 8,195 | 23.3% | 7.8% | 10.8% | 7.9% | 4.6% | 58.6% | 10.8% | 8.6% | 3.9% | 10.8% | 8.2% | 4.3% | 54.7% |
| Art & Des(Textles) | 7,926 | 22.1% | 8.3% | 9.7% | 8.0% | 4.4% | 53.0% | 9.7% | 8.3% | 4.1% | 9.7% | 8.5% | 4.0% | 47.8% |
| Humanities: Single | 7,835 | 9.8% | 2.5% | 5.1% | 2.8% | 1.9% | 73.9% | 5.1% | 3.5% | 1.3% | 5.1% | 3.6% | 1.1% | 43.7% |
| Art & Des(Graphcs) | 7,610 | 17.5% | 6.5% | 7.7% | 6.3% | 3.5% | 53.8% | 7.7% | 6.6% | 3.2% | 7.7% | 7.0% | 2.7% | 42.4% |
| Film Studies | 6,316 | 14.8% | 3.2% | 8.1% | 3.8% | 2.9% | 88.7% | 8.1% | 5.1% | 1.6% | 8.1% | 4.6% | 2.1% | 63.7% |
| Health & Soc Care | 5,893 | 10.2% | 2.4% | 5.5% | 2.7% | 2.0% | 83.6% | 5.5% | 3.5% | 1.2% | 5.5% | 3.5% | 1.2% | 50.7% |
| Economics | 5,080 | 32.2% | 7.5% | 17.3% | 8.6% | 6.4% | 84.3% | 17.3% | 11.2% | 3.8% | 17.3% | 7.6% | 7.4% | 97.7% |
| Performing Arts | 4,515 | 18.8% | 8.2% | 7.5% | 7.6% | 3.7% | 45.9% | 7.5% | 7.3% | 4.1% | 7.5% | 8.3% | 3.1% | 37.8% |
| App Engineering | 4,187 | 5.4% | 1.0% | 3.1% | 1.3% | 1.0% | 100.0% | 3.1% | 1.8% | 0.5% | 3.1% | 1.8% | 0.5% | 48.8% |
| Class.Civilisation | 4,097 | 38.5% | 12.8% | 18.0% | 12.9% | 7.7% | 59.7% | 18.0% | 14.1% | 6.4% | 18.0% | 10.5% | 10.1% | 78.3% |
| Bus.Stds&Econ | 3,973 | 25.1% | 5.4% | 13.8% | 6.3% | 5.0% | 92.1% | 13.8% | 8.6% | 2.7% | 13.8% | 6.4% | 4.9% | 89.8% |
| Urdu | 3,744 | 34.5% | 10.8% | 16.6% | 11.0% | 6.9% | 63.8% | 16.6% | 12.5% | 5.4% | 16.6% | 9.6% | 8.3% | 77.4% |
| Italian | 3,740 | 57.0% | 37.1% | 14.0% | 31.7% | 11.4% | 30.7% | 14.0% | 24.5% | 18.5% | 14.0% | 22.9% | 20.2% | 54.5% |
| Prep for Work | 3,262 | 9.6% | 1.2% | 5.9% | 1.8% | 1.9% | 160.5% | 5.9% | 3.1% | 0.6% | 5.9% | 2.6% | 1.1% | 94.7% |
| D&T Sys & Cont | 3,232 | 21.5% | 8.0% | 9.5% | 7.8% | 4.2% | 53.1% | 9.5% | 8.0% | 4.0% | 9.5% | 8.3% | 3.8% | 47.3% |
| Sci: Environmental | 3,044 | 2.5% | 0.2% | 1.6% | 0.4% | 0.5% | 300.1% | 1.6% | 0.8% | 0.1% | 1.6% | 0.7% | 0.2% | 120.0% |
| Chinese | 2,947 | 78.5% | 62.2% | 11.4% | 51.4% | 15.7% | 25.2% | 11.4% | 36.0% | 31.1% | 11.4% | 30.8% | 36.3% | 58.3% |
| Performance Stds | 2,531 | 27.7% | 11.1% | 11.6% | 10.6% | 5.5% | 49.3% | 11.6% | 10.5% | 5.6% | 11.6% | 10.4% | 5.7% | 51.4% |
| Polish | 2,393 | 76.3% | 36.4% | 27.9% | 33.2% | 15.2% | 41.7% | 27.9% | 30.2% | 18.2% | 27.9% | 14.0% | 34.4% | 94.3% |

| | Entries | A*-A | A* | 20% A*-A rule | | | | 50% A* rule | | | Tailored rule | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 7 | 8 | 9 | % A* | 7 | 8 | 9 | 7 | 8 | 9 | % A* |
| Arabic | 2,253 | 49.2% | 29.5% | 13.8% | 25.8% | 9.5% | 32.4% | 13.8% | 20.6% | 14.7% | 13.8% | 20.3% | 15.0% | 51.1% |
| Law | 2,158 | 11.8% | 3.2% | 6.0% | 3.6% | 2.2% | 68.1% | 6.0% | 4.2% | 1.6% | 6.0% | 4.4% | 1.4% | 43.5% |
| ESOL | 2,120 | 17.6% | 4.1% | 9.5% | 4.8% | 3.3% | 82.6% | 9.5% | 6.1% | 2.0% | 9.5% | 5.5% | 2.6% | 65.1% |
| Art & Des(3D Stds) | 1,913 | 19.7% | 6.7% | 9.1% | 6.7% | 3.9% | 58.1% | 9.1% | 7.3% | 3.3% | 9.1% | 7.3% | 3.3% | 48.8% |
| Science: Astronomy | 1,883 | 26.9% | 9.8% | 11.9% | 9.7% | 5.3% | 53.5% | 11.9% | 10.1% | 4.9% | 11.9% | 9.6% | 5.4% | 54.6% |
| Russian | 1,661 | 80.1% | 63.6% | 11.6% | 52.5% | 16.0% | 25.2% | 11.6% | 36.7% | 31.8% | 11.6% | 30.9% | 37.6% | 59.2% |
| Portuguese | 1,185 | 57.7% | 14.9% | 30.0% | 16.3% | 11.5% | 76.8% | 30.0% | 20.3% | 7.4% | 30.0% | 7.2% | 20.6% | 137.9% |
| Classical Greek | 1,165 | 83.7% | 62.4% | 14.9% | 52.0% | 16.7% | 26.8% | 14.9% | 37.6% | 31.2% | 14.9% | 27.9% | 40.9% | 65.5% |
| Turkish | 1,145 | 74.2% | 37.5% | 25.8% | 33.6% | 14.8% | 39.6% | 25.8% | 29.8% | 18.7% | 25.8% | 15.7% | 32.8% | 87.4% |
| Ancient History | 1,057 | 39.4% | 16.1% | 16.3% | 15.4% | 7.7% | 47.6% | 16.3% | 15.0% | 8.0% | 16.3% | 12.9% | 10.2% | 63.5% |
| Applied Art & Des | 1,020 | 14.2% | 2.9% | 7.9% | 3.4% | 2.8% | 96.7% | 7.9% | 4.8% | 1.5% | 7.9% | 4.3% | 2.0% | 66.7% |

We include a column on Table 1 that shows the % awarded a grade 9 as a share of those awarded an A* when the 20% A*-A rule is applied. It clearly shows the subjects for which there is some concern about the rule. There are some subjects with high difficulty, high ability entrants and also some languages where the numbers awarded the grade 9 appear to be very low: French, Spanish, Polish, Turkish, Arabic, Latin, Italian, Classical Greek, Chinese and Russian. There is also a set of subjects with low ability entrants where the numbers awarded the grade 9 appear to be too high: combined English, core and additional science, environmental science, psychology, preparation for work, citizenship, sociology, business studies, applied engineering, media and film studies, PE, HE, applied art and design, dance, office technology, and film studies. Many of the latter list are GCSEs that are part of a wider subject grouping, which suggests that any approach chosen should simultaneously consider all subject mappings within a broad subject area when agreeing the grade 9 boundary.

The final column on the table shows the % awarded a grade 9 as a share of those awarded an A* when the tailored rule is applied. It does produce less variation in this metric across different subjects. For example, there are only two instances where the % awarded a grade 9 is higher than that currently awarded an A* (Portuguese and environmental science). It is only in the performing arts GCSE where fewer than 40% of those achieving an A* might be awarded a grade 9 under this tailored rule.

Figure 2 summarises the impact of the grade 9 boundary rules by subject group. Note that in this diagram we do not adjust the grade 8 boundary in light of the grade 9 rule and we discuss this further in the last section of this report. It shows that choice of grade 9 rule is important for community languages and somewhat material for the EBacc subjects.

Overall, the 20% A*-A rule awards grade 9 to 4.8% of entries, compared to 4.2% for the 50% A* rule and 5.1% for the tailored rule.

*Figure 2: Awarding of grade 7, 8 and 9 according to alternative rules*
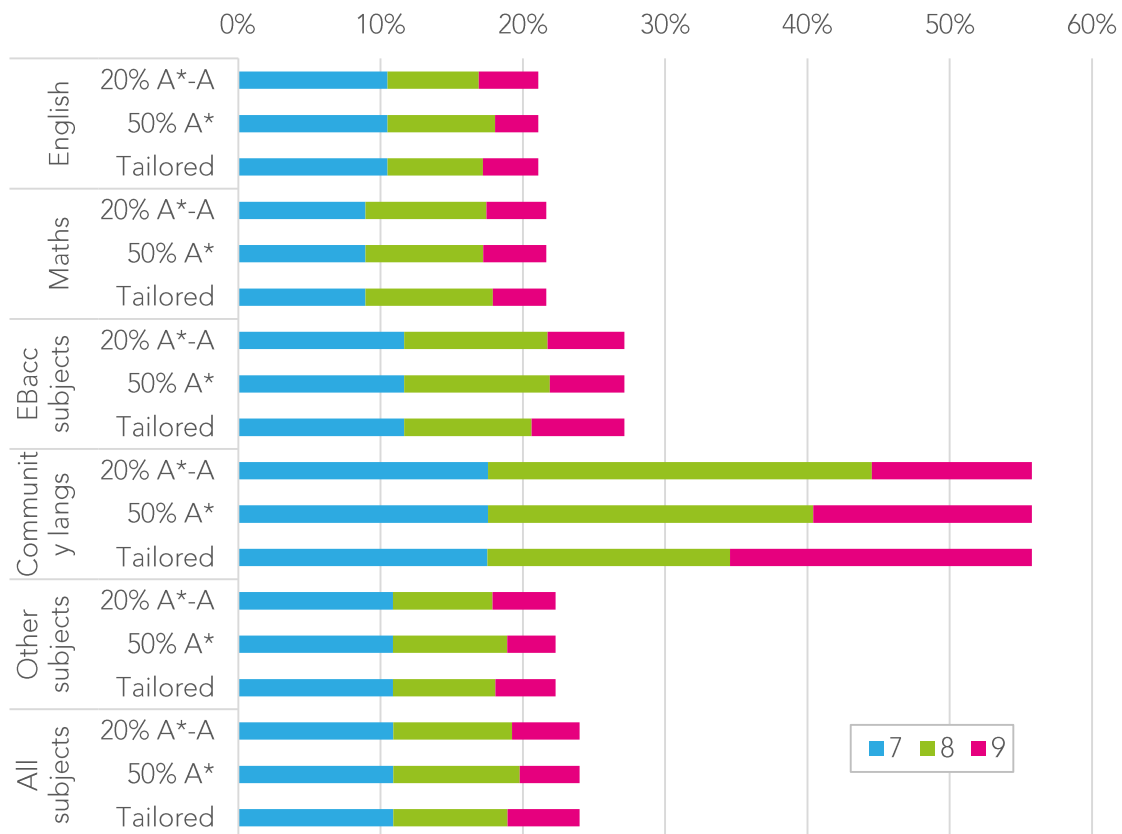
## Overall variation in grades awarded by school type

Here we explore whether the grade 9 rule decision materially affects the distribution of grades across different schools. Figure 3 divides the total allocation of grade 9s awarded under different rules across the nine regions of England. Overall the regional distribution of grade 9s will be very similar to that of A*s, regardless of boundary rule used.

*Figure 3: Regional allocation of grades awarded by different grade 9 allocation rules*
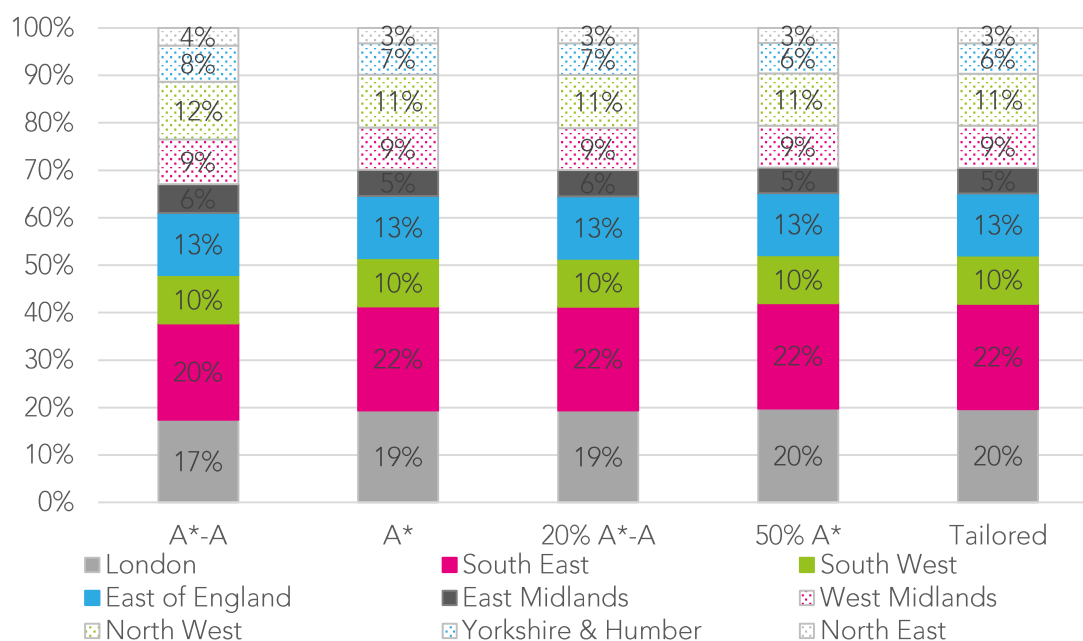


Table 2 shows that the choice of grade 9 rule does differentially affect different types of schools. Independent and state grammar schools benefit the most from the tailored rule and the least from the 50% A* rule.

*Table 2: Grade 9 boundary rules by type of school*

|  | Entries | A*-A | A* | 20% A*-A | 50% A* | Tailor-ed |
|---|---|---|---|---|---|---|
| Independent schools | 406,329 | 58.7% | 31.5% | 17.5% | 16.5% | 19.7% |
| State-funded grammar schools | 235,823 | 61.5% | 27.7% | 15.9% | 14.6% | 17.5% |
| Sponsored academies and free schools | 514,421 | 11.0% | 2.5% | 1.3% | 1.1% | 1.4% |
| All other state-funded mainstream schools | 3,700,834 | 19.8% | 5.6% | 3.2% | 2.7% | 3.2% |
| Other state-funded non-mainstream schools | 40,020 | 3.2% | 0.9% | 0.4% | 0.3% | 0.4% |
| All schools | 4,897,427 | 24.0% | 8.4% | 4.8% | 4.2% | 5.1% |

In Table 3 we show how the grade 9 boundary rules affect different types of schools in major subject mappings. Largely, the impact is not particularly significant with the ratio of grades allocated between state-funded and independent sectors varying very little. This stands in contrast to some small, but noticeable, differences in the overall allocation of grade 9s in Table 2 above. This occurs because independent and grammar schools more frequently enter students for subjects that are allocated greater numbers of grade 9s under the tailored rule (particularly the separate sciences).

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*Table 3: Grade 9 boundary rules by type of school for major subject mappings*

| | Independent | | | State-funded mainstream | | | State-funded non-mainstream | | |
|---|---|---|---|---|---|---|---|---|---|
| | 20% A*-A | 50% A* | Tailored | 20% A*-A | 50% A* | Tailored | 20% A*-A | 50% A* | Tailored |
| Biology | 22% | 23% | 33% | 7% | 7% | 10% | 1% | 1% | 1% |
| Chemistry | 22% | 23% | 32% | 7% | 7% | 11% | 2% | 3% | 4% |
| Physics | 22% | 24% | 33% | 7% | 8% | 11% | 2% | 2% | 2% |
| Science (Core) | 6% | 3% | 4% | 2% | 1% | 1% | 0% | 0% | 0% |
| Science: Additional | 6% | 3% | 4% | 2% | 1% | 1% | 1% | 0% | 0% |
| Mathematics | 17% | 18% | 16% | 3% | 3% | 3% | 0% | 0% | 0% |
| Geography | 16% | 15% | 17% | 4% | 4% | 5% | 0% | 0% | 0% |
| History | 19% | 18% | 21% | 4% | 4% | 5% | 1% | 1% | 1% |
| English | 5% | 2% | 2% | 0% | 0% | 0% | 0% | 0% | 0% |
| English Language | 19% | 14% | 17% | 3% | 2% | 3% | 0% | 0% | 0% |
| English Literature | 20% | 15% | 19% | 3% | 2% | 3% | 1% | 0% | 1% |
| French | 17% | 20% | 17% | 3% | 4% | 3% | 2% | 3% | 2% |
| German | 17% | 17% | 17% | 4% | 3% | 3% | 8% | 8% | 8% |
| Spanish | 18% | 21% | 21% | 4% | 5% | 4% | 5% | 9% | 8% |

In Table 4 we show how the allocation of grade 9s varies according to the FSM6 decile of the school. We do this for the four largest entry subjects as an example. For many subjects, including those not shown here, the steepness of the school social gradient in grade 9 allocations does not depend on the grade 9 rule. The exceptions are science (core), English (combined) and English language where the 20% A*-A rule has the flattest gradient and the 50% A* rule has the steepest gradient. It also matters for history and French, but these follow quite a different pattern with the 20% A*-A rule producing the steepest gradient.

*Table 4: Grade 9 boundary rules by FSM6 decile of school for largest four subjects*

| Subject mapping | FSM6 decile | Grade A | Grade A* | 20% A*-A | 50% A* | Tailored |
|---|---|---|---|---|---|---|
| English Language | 1 | 12% | 2% | 1% | 1% | 1% |
| English Language | 2 | 12% | 2% | 1% | 1% | 1% |
| English Language | 3 | 13% | 2% | 2% | 1% | 1% |
| English Language | 4 | 14% | 3% | 2% | 1% | 2% |
| English Language | 5 | 16% | 3% | 2% | 1% | 2% |
| English Language | 6 | 17% | 4% | 2% | 2% | 2% |
| English Language | 7 | 20% | 4% | 3% | 2% | 3% |
| English Language | 8 | 21% | 5% | 3% | 2% | 3% |
| English Language | 9 | 25% | 6% | 4% | 3% | 4% |
| English Language | 10 | 41% | 13% | 10% | 7% | 9% |
| English Literature | 1 | 12% | 2% | 2% | 1% | 1% |
| English Literature | 2 | 13% | 3% | 2% | 1% | 2% |
| English Literature | 3 | 13% | 2% | 1% | 1% | 1% |
| English Literature | 4 | 15% | 3% | 2% | 1% | 2% |
| English Literature | 5 | 16% | 3% | 2% | 2% | 2% |
| English Literature | 6 | 18% | 4% | 3% | 2% | 2% |
| English Literature | 7 | 20% | 5% | 3% | 2% | 3% |
| English Literature | 8 | 23% | 5% | 3% | 2% | 3% |
| English Literature | 9 | 27% | 6% | 4% | 3% | 4% |
| English Literature | 10 | 43% | 14% | 10% | 7% | 9% |
| Mathematics | 1 | 10% | 3% | 1% | 1% | 1% |
| Mathematics | 2 | 11% | 3% | 1% | 1% | 1% |
| Mathematics | 3 | 11% | 3% | 1% | 1% | 1% |
| Mathematics | 4 | 13% | 4% | 2% | 2% | 1% |
| Mathematics | 5 | 14% | 4% | 2% | 2% | 2% |
| Mathematics | 6 | 16% | 5% | 2% | 2% | 2% |
| Mathematics | 7 | 18% | 6% | 3% | 3% | 2% |
| Mathematics | 8 | 21% | 7% | 3% | 4% | 3% |
| Mathematics | 9 | 27% | 10% | 5% | 5% | 4% |
| Mathematics | 10 | 45% | 22% | 11% | 12% | 10% |
| Science (Core) | 1 | 7% | 1% | 1% | 0% | 1% |
| Science (Core) | 2 | 6% | 1% | 1% | 0% | 1% |
| Science (Core) | 3 | 6% | 1% | 1% | 0% | 0% |
| Science (Core) | 4 | 8% | 1% | 2% | 1% | 1% |
| Science (Core) | 5 | 8% | 1% | 1% | 1% | 1% |
| Science (Core) | 6 | 8% | 1% | 1% | 1% | 1% |
| Science (Core) | 7 | 9% | 2% | 2% | 1% | 1% |
| Science (Core) | 8 | 10% | 2% | 2% | 1% | 1% |
| Science (Core) | 9 | 13% | 2% | 3% | 1% | 2% |
| Science (Core) | 10 | 20% | 4% | 5% | 2% | 3% |

## Overall variation in grades awarded by pupil group

The introduction of grade 9 differentially affects pupils according to their background. Figure 4 shows estimates of how many pupils are likely to be awarded a grade 9 by their pupil premium status (proxied using whether they received free school meals in the past six years). Those not in receipt of pupil premium are 2.4 times more likely to be awarded an A* or A and 3.2 times more likely to be awarded an A*. The odds will increase to 3.5 times under each of the grade 9 rules proposed. Both the tailored rule and the 20% A*-A rule marginally favour the FSM6 group over the 50% A* rule.

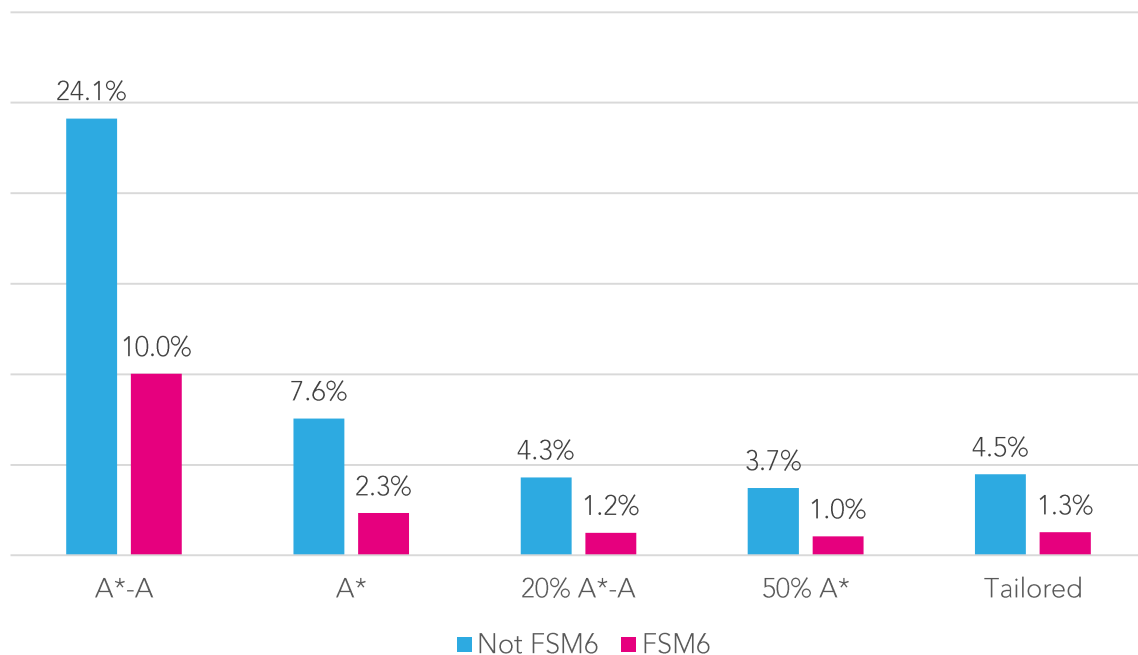*Figure 4: Grade 9 awarded by pupil premium group (FSM6)*



Figure 5 shows that, perhaps not surprisingly, grade 9s will overwhelming be awarded to those scoring in the top decile in tests at the end of Key Stage two (age 11). Although this KS2 gradient in awards appears least steep for the 50% A* rule, this is largely because this rule awards the least grade 9s overall.

*Figure 5: Grade 9 awarded across all GCSE entries by Key Stage two decile of candidate*



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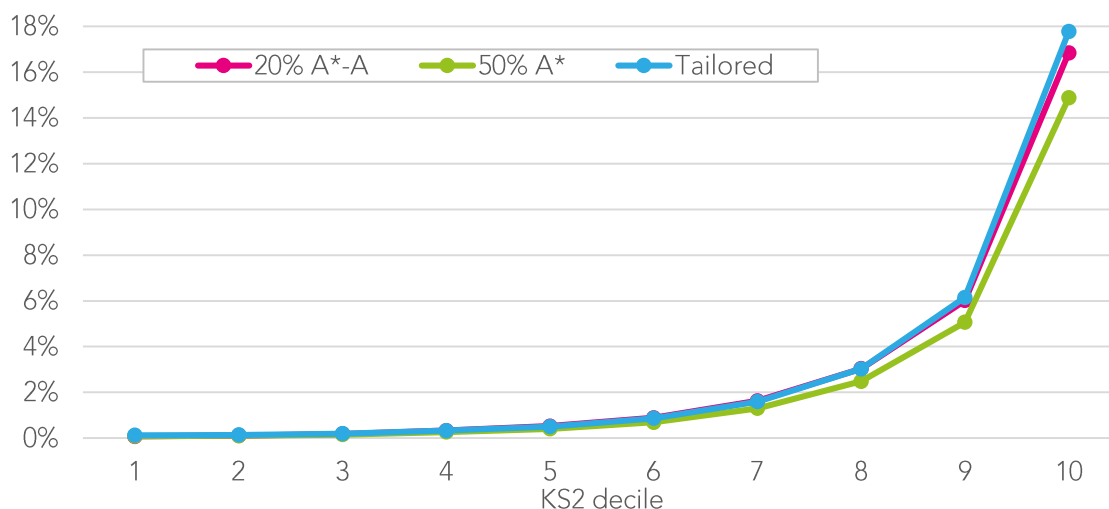
## Impact on School Performance Measures

We explore the impact of the different grade 9 boundary rules on the new school performance measures of Attainment 8 and Progress 8. Attainment 8 judges each pupil across eight GCSE subjects – maths, English, best 3 EBacc entries and best other entries. Progress 8 is a residual that compares a pupil's Attainment 8 score to the average achieved by all pupils with the same Key Stage 2 fine grade.

In order to model the impact of different types of grade 9 boundaries on these measures, we must form a view about how to adjust the grade 8 boundary. We cannot model it based on published intentions since it will be set arithmetically as equidistant from the grade 7 and grade 9 mark boundaries, which we do not have. Clearly the underlying ability distribution of candidates should determine the proportion of candidates who should be awarded a grade 8 or better. The arithmetic setting of this boundary may or may not work well, depending on the paper difficulty. Since FFT has needed to produce estimates for schools in the absence of paper information, we have internally used the rule of thumb that the top 30% of those achieving a grade A will be awarded a grade 8. We maintain this rule of thumb throughout here, rather than adjusting the grade 8 in light of the grade 9 boundary rule.

Using the imputed grades, Attainment 8 (and therefore Progress 8) for 2014 are calculated using the "best entry" method. Figure 6 shows that the switch from A*-G to 9-1 will widen the gaps between the schools with the most able intakes and the rest. There is very little difference in the extent to which this will happen by different grade 9 boundary rules.

*Figure 6: Progress 8 score by school KS2 decile*
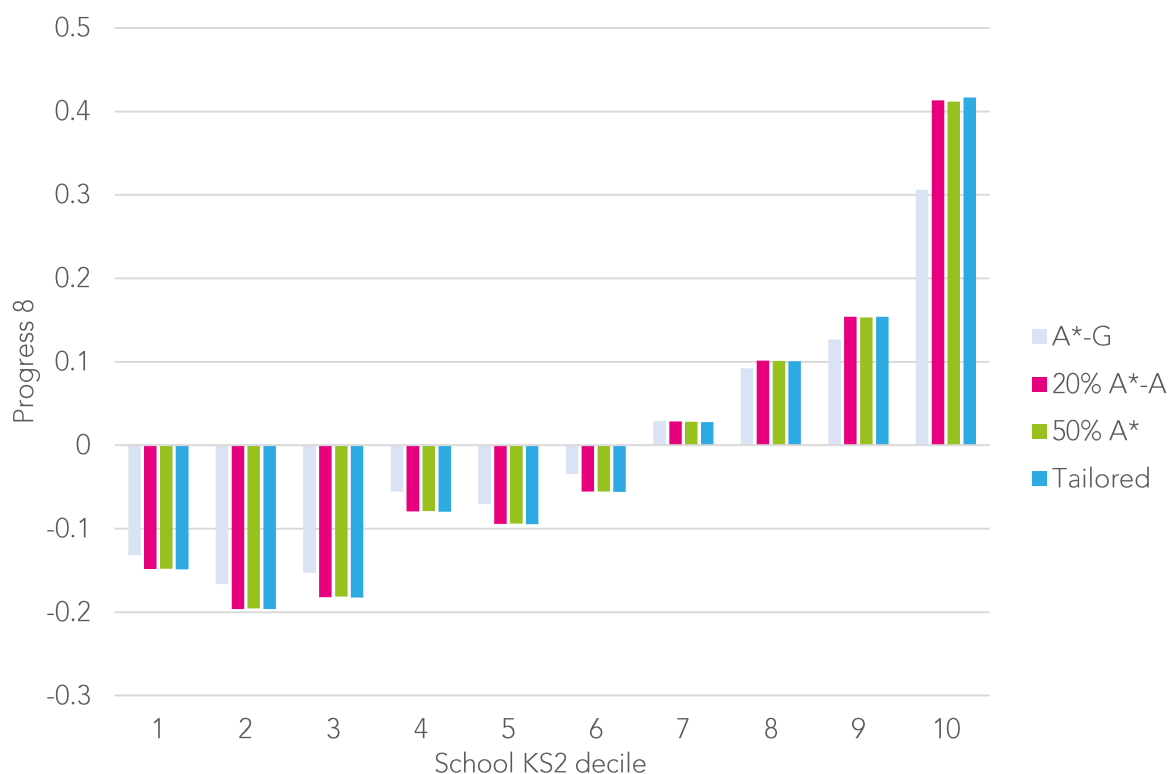


Note: A*-G converted on a 8 (=A*) to 1 (=G) scale

Table 5 shows that, again, whilst the introduction of the new 9 to 1 scale will widen differences between different types of schools and types of pupils on Attainment 8 and Progress 8, the decision as to which grade 9 boundary rule is used is immaterial.

*Table 5: Attainment 8 and Progress 8 by type of school*

| | Attainment 8 | | | | Progress 8 | | | |
|---|---|---|---|---|---|---|---|---|
| | A*-G | 20% A*-A | 50% A* | Tailor-ed | A*-G | 20% A*-A | 50% A* | Tailor-ed |
| **Type of school:** | | | | | | | | |
| State-funded grammar schools | 68.9 | 71.2 | 71.0 | 71.3 | 0.37 | 0.52 | 0.52 | 0.53 |
| Sponsored academies and free schools | 43.2 | 38.7 | 38.7 | 38.7 | -0.22 | -0.25 | -0.25 | -0.25 |
| All other state-funded mainstream schools | 49.4 | 45.8 | 45.8 | 45.8 | 0.02 | 0.01 | 0.01 | 0.01 |
| | | | | | | | | |
| **Pupil premium:** | | | | | | | | |
| Not FSM6 | 52.5 | 49.5 | 49.4 | 49.5 | 0.12 | 0.13 | 0.13 | 0.13 |
| FSM6 | 40.5 | 35.8 | 35.8 | 35.8 | -0.33 | -0.36 | -0.36 | -0.36 |

Note: only state-funded mainstream schools are included here

Finally, we look at the frequency with which subjects appear in the EBacc Attainment 8 slots, according to grade 9 rule. We have to model a certain amount of arbitrariness in which subjects are used because students frequently have multiple subjects at exactly the same grade. Overall, Table 6 shows the selection of the grade 9 rule does not substantially affect subject inclusion in EBacc slots. Languages are included most frequently under the 20% A*-A rule and least frequently under the 50% A* rule. Triple science subjects are least frequently used under the tailored rule.

*Table 6: Frequency of qualification use in the three EBacc Attainment 8 slots, by grade 9 boundary rule*

|  | 20% A*-A | 50% A* | Tailored |
|---|---|---|---|
| Biology | 82,793 | 82,977 | 82,274 |
| Chemistry | 80,011 | 80,027 | 78,908 |
| Physics | 80,448 | 80,361 | 79,617 |
| Science (Core) | 294,454 | 295,146 | 295,611 |
| Science: Additional | 221,960 | 222,367 | 222,732 |
| Science Double Awd | 1,194 | 1,184 | 1,186 |
| Com.Stds/Computing | 7,928 | 8,011 | 8,081 |
| Geography | 138,760 | 138,938 | 139,434 |
| History | 160,635 | 161,350 | 161,628 |
| Dutch | 138 | 139 | 140 |
| French | 76,326 | 75,156 | 75,663 |
| German | 26,537 | 25,987 | 26,291 |
| Italian | 2,085 | 2,120 | 2,103 |
| Modern Greek | 224 | 225 | 226 |
| Portuguese | 882 | 885 | 887 |
| Spanish | 43,909 | 43,485 | 43,642 |
| Arabic | 1,027 | 1,014 | 1,027 |
| Bengali | 536 | 536 | 539 |
| Chinese | 913 | 917 | 917 |
| Gujarati | 237 | 219 | 223 |
| Japanese | 400 | 417 | 421 |
| Modern Hebrew | 226 | 233 | 216 |
| Punjabi | 458 | 455 | 458 |
| Polish | 2,331 | 2,328 | 2,328 |
| Russian | 488 | 490 | 484 |
| Turkish | 1,257 | 1,262 | 1,256 |
| Urdu | 2,199 | 2,233 | 2,237 |
| Persian | 177 | 177 | 175 |
| Ancient History | 657 | 648 | 655 |
| Classical Greek | 27 | 34 | 19 |
| Latin | 1,361 | 1,277 | 1,222 |
| Other Class. Langs | 86 | 87 | 83 |