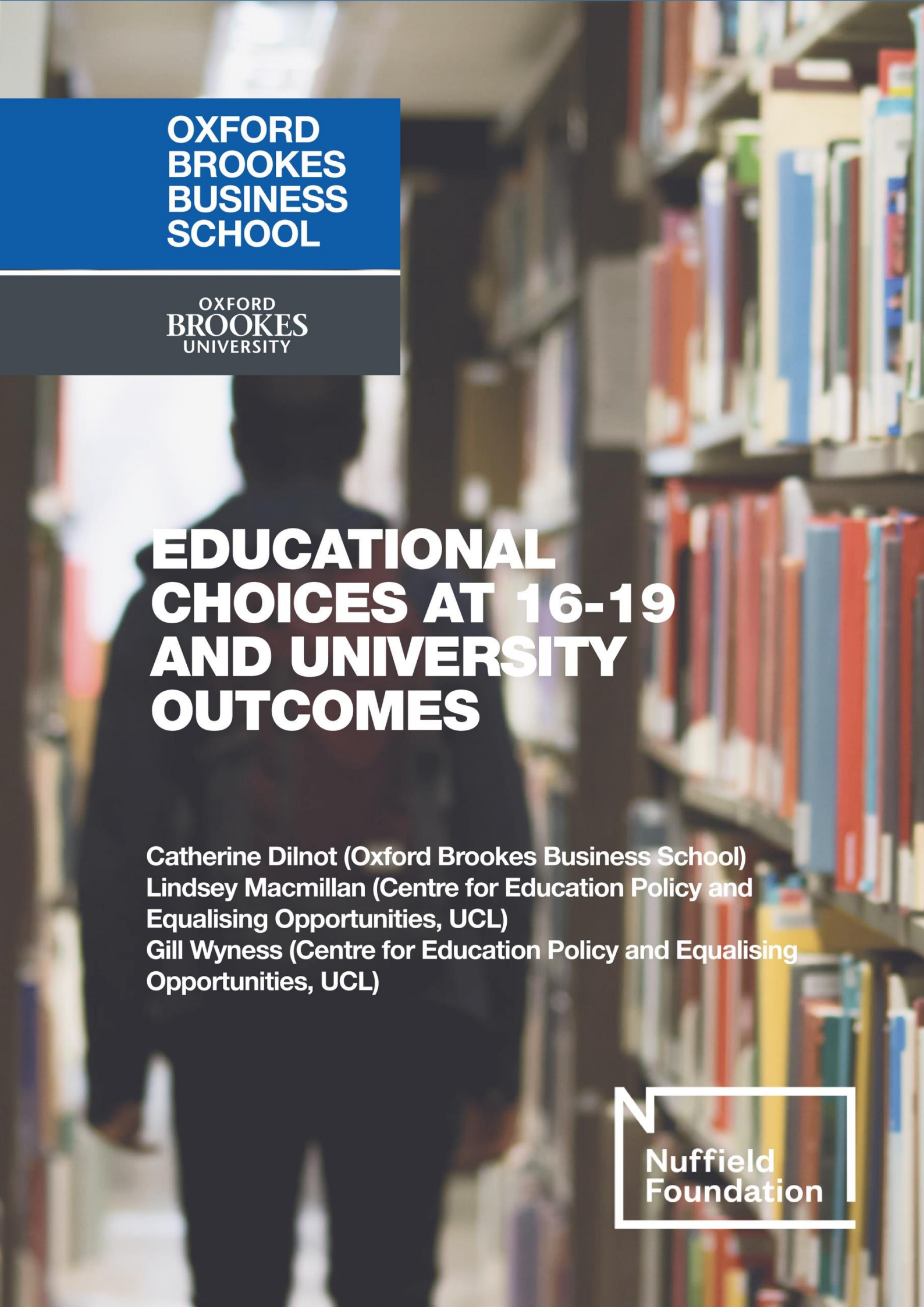

OXFORD BROOKES BUSINESS SCHOOL

OXFORD BROOKES UNIVERSITY

EDUCATIONAL CHOICES AT 16-19 AND UNIVERSITY OUTCOMES

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Nuffield Foundation

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We are also grateful to the seven universities providing datasets of the entry qualifications and outcomes of their students, including results of modules.

In addition, we use data relating to mature students provided by the Higher Education Statistics Agency (ref 59642) and are grateful to HESA staff for their assistance in providing this.

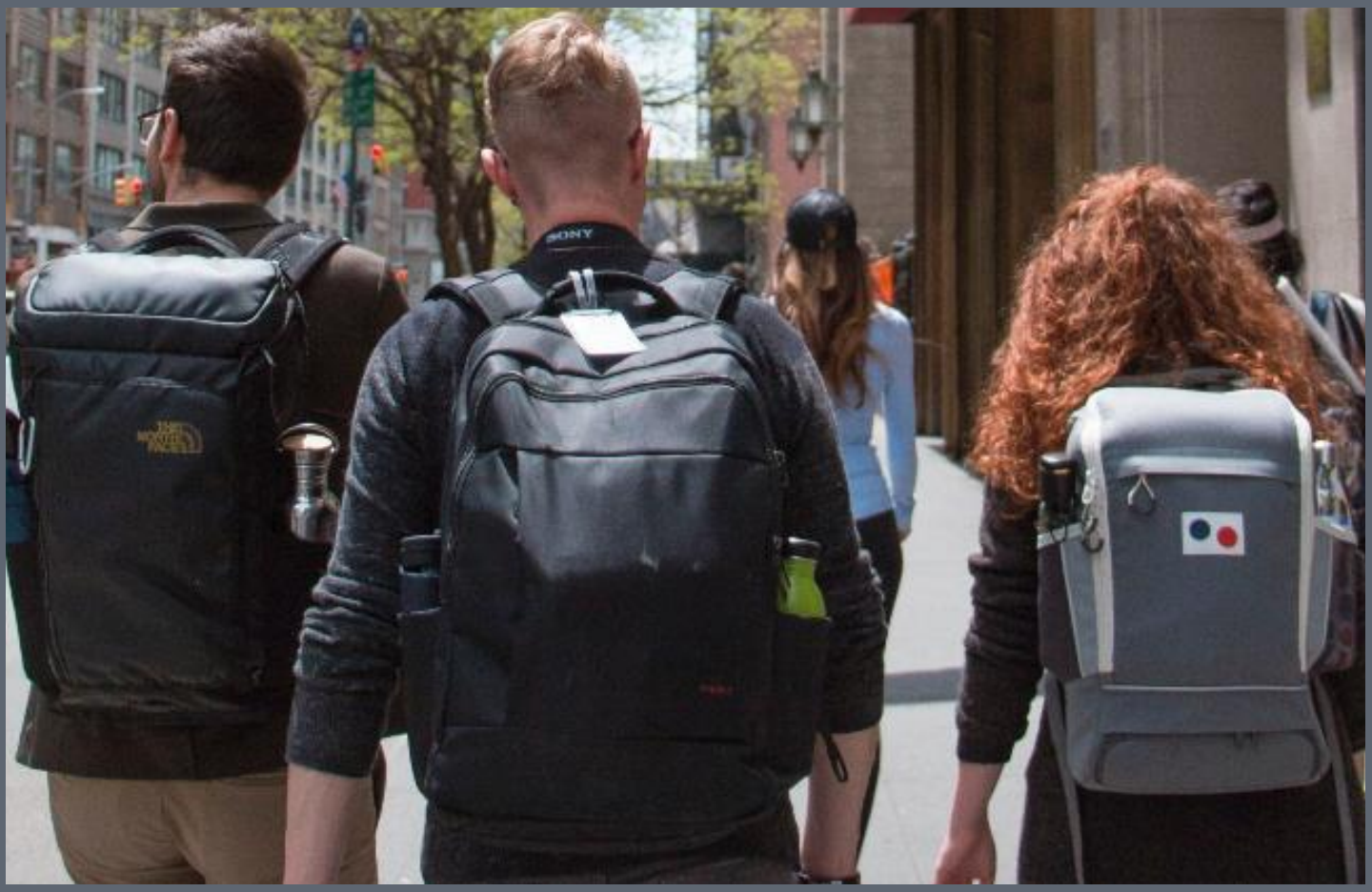
The views expressed in this report are those of the authors and all errors and omissions remain their sole responsibility.

60 SECOND SUMMARY

Traditionally, students in the UK entered university having studied A-levels (the main 'level 3' qualification in England) at age 16-19. But this has changed in recent cohorts with nearly one in four English students entering with just BTECs or a mixture of BTECs and A-levels. This flexibility in entry routes is important for the widening participation by disadvantaged groups seen in recent years, with 40% of the least privileged quintile of recent cohorts entering with BTECs compared with less than a tenth of the most privileged.

English first degree students at UK universities have largely successful outcomes, with high proportions of first years continuing to their second year of study and high proportions of final year students graduating with a first or upper second class degree. But we find differences in university outcomes between those students entering with just BTECs rather than just A-levels, even when comparing students with similar backgrounds and prior achievement, on the same course and at the same university. Those students who have just BTEC qualifications are:

- Almost twice as likely (11.4% chance compared with 6.0% chance) to drop out as a similar 'average' student with just A-levels;
- Around 1.7 times as likely to repeat the first year in the same subject at the same university as a similar 'average' student with just A-levels (5.9% compared with 3.4%);
- Around 1.4 times more likely to graduate below a 2:1 than a similar student with A-levels (24.9% chance compared with 17.7%).



However, it is very important to note that the overwhelming majority of students entering with BTECs or combinations do not drop out or repeat, and the majority of those graduating do so with at least a 2:1. These are considerable successes for these students, who without the availability of BTECs might not have had the opportunity to attend university at all. So while it is clearly important to address these differences in outcomes, we support the existence of routes into higher education that students from non-traditional backgrounds successfully use. We therefore have concerns about recently published Department for Education proposals to reduce significantly the number of Level 3 BTEC qualifications that it will fund.

The differences in outcomes we find can be almost entirely explained by differences in academic performance in module scores throughout university, implying that the lower success rates of BTEC students is reflecting lower academic performance, as opposed to non-academic reasons, such as BTEC students deciding that university is not for them. More work is needed to establish the reasons for these patterns of lower success among BTEC students, for example examining differences in methods of assessment, and evaluating whether the increased external assessment of reformed BTECs will address these gaps in outcomes. Further support throughout their studies for BTEC students, together with further joint working between schools, colleges, universities and qualification providers seems the appropriate response.

Our work also includes an analysis of how holding A-level subjects described as ‘preferred’ and ‘non-preferred’ for entry to university, which also varies by social background, is related to these outcomes at university, and whether having a non-required entry subject in an A-level or BTEC in the same subject as the university course for ten popular degrees is related to student outcomes.

"We aim to understand the relationships between entry qualifications and subjects, socioeconomic status and university outcomes, with the hope of mitigating adverse outcomes for vulnerable students from disadvantaged backgrounds."

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TEAM

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1. Executive summary

1.1. Introduction

The qualifications with which young people enter UK Higher Education (HE) have changed considerably over recent years. In 2008, more than seven times as many 18 year olds entering UK university held A-levels as held BTECs (Business and Technology Education Council - the most popular 'applied general' qualification) , or a mixture of BTECs and A-levels. By 2017 the ratio had fallen to 3:1, following a slight increase in the proportion of 18 year olds entering with A-levels, but a more than doubling of those entering with just BTECs or a BTEC/A-levels mix. This increase in students entering with non-traditional qualifications has been credited with enabling widening in participation of students from lower socio-economic backgrounds, as they are much more likely to take BTECs than their more privileged peers.

But although this alternative route has enabled tens of thousands of BTEC students per year to enter HE and to graduate successfully, students entering with BTECs or BTEC/A-level combinations are more likely than those with A-levels to drop out before the start of their second year, and less likely to graduate with a first or upper second class (2:1) degree. In the context of widespread reforms to the funding of qualifications at this level (known as Level 3, and commonly taken age 16-19), the Department for Education (DfE) in July 2021 published a policy statement proposing significant reductions in the number of BTECs that it will fund, citing these differential drop out and graduation outcomes as a reason. This reduction is in the context of the DfE's aim to create a clear academic pathway to university (mostly A-levels) and a clear technical pathway (mostly T-levels) to employment.

Those entering university with BTECs are on average from less privileged backgrounds and have lower attainment at age 16 than those with A-levels, both of which characteristics mean that BTEC students are more likely to drop out and graduate below a 2:1. We take account of these and other characteristics of groups of students with different entry qualifications to estimate differences in outcomes that relate to their entry qualifications. We focus on A-levels and BTECs, as the largest entry routes for English students to UK universities.

Even amongst those with A-levels, subjects studied vary by socio-economic status (SES), so our study also examines the way that subjects at A-level are related to university outcomes.

This study is important both in the context of planned changes to the level 3 qualifications landscape, and also in identifying the extent to which entry subjects and qualifications are contributing to the known higher risks of drop out, taking longer to complete and attaining lower class degrees that lower SES students experience compared with their more privileged peers.

This project aims to help:

- schools and colleges to improve Information, Advice and Guidance (IAG) strategies to help students better to navigate different qualification options;
- universities understand that the ways in which the qualifications and subjects with which students enter may be associated with differential progress, and therefore to understand which students to target for extra support;
- policymakers understand how the types of qualifications and subjects may relate to SES gaps in university attainment, and thus how to work with stakeholders to improve the rates of success of non-traditional students at university.

1.2. Project aims

We build on existing evidence by examining how post-16 choices are related to differential university outcomes. Specifically, we ask how level 3 qualifications (A-level and equivalent) and subjects relate to three key university outcomes for English domiciled UK first degree students: dropout before the start of the second year of the university programme; repetition of the first year in the same subject and at the same institution; and graduating below a 2:1 degree.

We focus our report on young entrants (those under 21) with A-levels and BTECs as these are the most commonly held types of qualification held by English students entering UK universities. Analysis of mature learners and those entering with other qualification types (e.g. IB, Pre-U and other level 3 qualifications) can be found in the appendix.

1. Qualification type, social background and university outcomes

Here we are interested in whether entry qualification type is associated with differential university outcomes of students. In particular, we ask:

1.1. To what extent are students entering with BTECs at higher risk of adverse university outcomes than those with A-levels?
1.2. To what extent does having BTECs rather than A-levels account for differences in university outcomes by social background?
1.3. Can measured academic performance throughout university (annual module scores) account for any of the differences in university outcomes by level 3 qualification type? In other words, are students with BTECs more likely to drop out or more likely to get a lower class degree because of poorer academic performance throughout their university experience (as opposed to for non-academic reasons)?

2. Subject choice and university outcomes.

Here we focus on A-levels. We ask whether having 'preferred' subjects rather than non-preferred ones is related to better outcomes at university, across all degree/university combinations, whether they are required or not. We define 'preferred' subjects as those originally labelled as 'facilitating' by the Russell Group of highly selective universities because holding them keeps options open for university entry, and because it considered them good preparation for university study. We test the

latter of these claims. On the other hand, some universities describe particular subjects as 'less suitable' for university study, and we examine these too[1]. Specifically, we ask:

2.1. Is entering with preferred A-level subjects associated with lower chances of adverse university outcomes, and vice-versa for non-preferred subjects?
2.2. What role does academic performance (as opposed to non-academic factors) during university play in accounting for differences in university outcomes?

3. Subject choice, qualification types, and university outcomes for popular courses without a pre-requisite in the related subject

Finally, we are interested in whether A-levels and BTECs in subjects related to, but not generally required for, their degree offer students better preparation than more general subjects[2]. We therefore ask:

3.1. Is having a (non-required) A-level in a subject related to the university course associated with reduced risk of these adverse outcomes?
3.2. Is having a (non-required) BTEC in a subject related to the university course associated with reduced risk of these adverse outcomes?

1.3. Data

To examine the relationship between types of qualifications and subjects with which students enter university and their university outcomes we explore two main sources of data for recent entrants and graduates.

- We use individual level administrative data from universities in the UK, linked to school and college records at age 16 and 18+ for students in England. This gives us detailed information on the level 3 qualification types with which students enter university[3], and allows us to track their subsequent university performance. It also provides detailed information on the subjects of A-levels, which we use to construct measures of how many 'preferred' and 'non-preferred' A-levels those students have. We can also use this data to identify those with A-levels and BTECs in subjects related to their degree.
- However, this dataset does not include annual module score performance of students. To gain an understanding of how students with different entry qualification types and subjects

[1] In our study we define 'preferred' subjects as the Russell Group's facilitating subjects (maths, further maths, English Literature, modern and classical languages excluding community languages, history, geography, physics, chemistry and biology) and 'non-preferred' as the combination of 'limited suitability' and 'less effective preparation' subjects in the taxonomy developed by Dilnot (2015), based on the expressed preferences of the Russell Group and its members. We refer to these as 'less suitable' subjects. The taxonomy is described in section 3.1.3 and a full list of subjects is given in Appendix 3.

[2] We are able to identify those with A-levels and BTECs in subjects related to their degree, for 10 popular degree subjects which generally do not have required entry subjects. We chose to examine the eight most popular degree courses for which there are generally no required entry subjects but there is a related A-level, plus nursing and drama because of the popularity of the related BTECs.

[3] As described, we focus throughout the report on comparisons between A level and BTEC students, though this dataset provides us with information on 1) those with just A-levels, 2) those with a mixture of A-levels (or AS levels) and BTECs in any combination, 3) those with BTECs, of any size, and no other types of level 3 qualification 4) Those with any mixture of A-levels, Pre-U and International Baccalaureate qualifications, 5) Access to Higher Education qualifications, 6) Any other combinations of level 3 qualifications – which we explore in the appendix.

perform in their annual modules, we use individual level data from seven universities (comprising data on their entry qualifications, performance and retention, and details of their annual module scores).

- Our main dataset examines three first year entry cohorts from 14/15 to 16/17 and three cohorts graduating from 15/16 to 17/18. These cohorts largely predate reformed BTECs. We are therefore unable to say anything about how much the increased proportion of external assessment in the new BTECs, introduced for teaching from 2016 onwards, would change our findings.

1.4. Methods

We use statistical models to compare university outcomes for students with different entry qualifications (i.e. A-level versus BTEC) or subjects (preferred versus non-preferred, etc.).

To ensure we are comparing students who are as similar as possible, differing only (as far as we can measure) in the entry qualifications or subjects they take, we control for students' detailed prior attainment at age 16, demographic information, socio-economic status, university and degree subject.

By running these models to compare university outcomes for similar students who differ only (as far as we can measure) in the entry qualifications or subjects they hold, we are able to assess whether students who hold BTECs (versus A-levels) or have preferred (versus non-preferred) subjects, have different levels of success at university.

1.5. Findings

Qualification types and university outcomes

Relative to many other countries (such as the US), those who enter university in the UK are highly likely to go on to complete their degrees, and to do so in good time. Just 8% of students in our sample of young English students drop out before the start of their second year (compared to some 19% enrolling on four year degrees in the US (National Center for Education Statistics, 2021) and only 4.3% repeat the first year[4] . Of those who continue to graduation, 80% go on to get a first or upper second class (2.1) degree – a standard measure of university success in the UK (Naylor et al., 2016).

Against this backdrop of relatively high performance on average, we find large differences in dropout rates, repeating first year, and final university classification, between students entering university with just BTECs and those with A-levels. These differences persist even when detailed prior attainment and a large set of demographic variables are accounted for. They can be partly further explained by differences in academic performance in university modules, suggesting that those entering with qualifications other than A-levels have lower academic performance throughout university.

- An 'average' student entering with just BTECs is almost twice as likely (11.4% chance compared with 6.0% chance – a difference of 5.4 percentage points (pp)) to drop out as an 'average' student with just A-levels. But note that despite this significant difference, BTEC students are still highly likely to continue to the second year of their programme.
- Because BTEC students are typically from lower SES backgrounds than A-level students, taking account of individual entry qualifications reduces the observed gap in dropout between top and bottom SES quintiles to 1.6pp when all the variables including qualification type are accounted for. There is evidence that students in the bottom SES quintile are at a small

[4] Taking the first year in the same subject and the same university two years running.

additional disadvantage from having BTECs rather than A-levels than top quintile students (0.7pp) on average, once all controls are taken into account.

- The probability of repeating the first year for all students is lower than of dropping out, at 4.3%, but we find the same patterns in relationships with qualification types, with students with BTECs 1.7 times as likely to repeat as those with A-levels.[5]
- The adverse outcomes associated with entering university with BTECs rather than A-levels persist to graduation. An 'average' student with just BTECs is 1.4 times more likely to graduate below a 2:1 than a similar student with A-levels (24.9% chance compared with 17.7%). This average difference of 7.2pp is 1.5pp wider for bottom SES quintile students than for top.
- For those with a mixture of A-levels and BTECs we find that their average outcomes lie between those who enter with just A-levels and just BTECs.
- We find evidence that an average student entering with a 'large' BTEC (the equivalent in size of 3 A-levels) is slightly (0.7pp) more likely to drop out than similar students with a combination of smaller BTECs. But no significant difference was found for the repetition or graduation outcomes.
- We see a weakening of the relationship between entry qualifications and outcomes once comparing individuals with similar module scores, implying that the adverse relationship with outcomes of having a BTEC versus A-levels is being driven by academic performance at university, rather than for other non-academic reasons, such as students deciding university (or this particular university) is not for them, or because BTEC students are doing differentially badly on modules that count more towards the degree class. For the one university for which we have data on assessment method by first year module, we find that the performance gap between students with A-levels and BTECs is larger for modules assessed at least in part by written examination, compared with modules assessed by coursework only.

Facilitating and 'less suitable' subjects

Again, against a backdrop of relative success among students who enter university, our findings suggest that among students entering with at least one A-level, having more facilitating subjects is associated with beneficial university outcomes, although the relationships are smaller than for qualification type. Our analysis suggests that these differences are entirely explained by differences in academic performance in module scores throughout university.

- Each additional facilitating A-level studied is associated with a reduced chance of dropout of 0.5pp, and of repeating 0.1pp, compared with an otherwise similar student with a non-facilitating A-level instead. The relationship with subjects and dropout varies across university type, seemingly making a bigger difference at less selective universities where students have fewer facilitating subjects. For repetition the differences are largely not significant.
- The beneficial relationship with facilitating A-levels continues to graduation, with each additional facilitating rather than non-facilitating A-level held associated with a 0.6pp reduction in chances of graduating below a 2:1, corresponding to a 8% decrease compared with the mean for someone with three compared with no facilitating A-levels, across all subject/university combinations. As with dropout, the least selective university group shows the strongest relationship.
- We find similar relationships of the same size but in the opposite direction for 'less suitable' A-levels for dropout and graduation. Here having three or more 'less suitable' subjects rather

[5] 5.9pp gap for BTEC students with a baseline chance of repetition for A-level students of 3.4%.

than A-levels from any other category relates to poorer outcomes than having just two. The gaps are very small for repetition and we conclude that this relationship is not important.

- Once we compare individuals with similar annual module scores, those with facilitating A-levels are just as likely to drop out as those without them. In other words, it is annual academic performance that is the key driver of the differences in dropout at university observed in those with and without facilitating A-levels.
- For the graduation outcome, using our module scores data we do not find significant gaps by number of facilitating subjects for our most selective universities, but for less selective universities we do. These gaps are largely removed by the inclusion of annual module scores, suggesting that students with fewer facilitating subjects are not doing disproportionately badly in modules weighted highly in their degree classification in these universities.
- We also find that those with less suitable A-levels are more likely to drop out or graduate below a 2.1 (although the effect is not significant for most of the universities we examine).

Choice of related A-level and BTEC subjects for ten popular degree courses generally not requiring the related entry subject

The ten popular degree subjects examined are accounting, business, computer science, law, media studies, psychology, sociology, sports science, nursing, drama.

Having related A-levels rather than an A-level in any other subject is generally associated with beneficial outcomes among those studying the these degree courses, with a lower probability of dropping out, repeating the first year, and graduating below a 2:1 for a number of the courses considered, amongst those with A-levels. The picture is more mixed for having the related BTEC qualification rather than any other BTEC subject, amongst those with BTECs.

- For all of these degree subjects, having the related A-level (none of which is facilitating) rather than any other A-level is beneficial in terms of lower associations with chances of dropping out, repeating or graduating below a 2:1, or else no association is found.
- For dropout, having the related A-level for computing, psychology, sociology and sports science degrees reduces the chances of an adverse university outcome by a multiple of between 0.6 and 0.8. For avoiding repetition, related A-levels in computing, psychology and sports science, plus accounting and law, are beneficial. For graduating with a 2:1 or above, computing, psychology, sports science, and law A-levels are found to be beneficial.
- Our results suggest that choosing a non-facilitating A-level subject related to, but not compulsory for, what they go on to study at university may be beneficial (or at worst neutral) for the students on the courses we have examined. It may be that by choosing one of these subjects at A-level students' eyes are opened to a new discipline with new enthusiasm, which persists through university, as well as providing helpful subject knowledge. On the other hand these observed relationships may be a consequence of unmeasured factors, such as motivation to study a particular subject.
- There are few significant relationships between university outcomes and subject of BTEC entry qualification for the five degree subjects considered that have a related BTEC.
- Having a performing arts[6] BTEC qualification for drama students is the only example among the degrees we examine where having a related BTEC rather than any other BTEC subject is associated with a better outcome, with a higher probability of graduating with a 2:1 or above.

[6] acting, music theatre, speech and drama, dance.

On the other hand, holding a health and social care or health studies BTEC appears to be a disadvantage for those studying nursing degrees, in terms of both dropout and graduating with below a 2:1, compared with someone with BTEC, or mixed BTEC and A-level qualifications in a different subject.

- We are not suggesting that the content or assessment methods of the qualifications and subjects we examine here are causing the differences in outcomes – for example as noted above unmeasured early motivation towards a subject may be important. But it is useful evidence for universities as they select students and provide support for those who may be more likely to struggle.

1.6. Key recommendations for policy and practice

Recommendations for schools and colleges:

- Schools and colleges should work to improve IAG strategies to help students better to navigate different qualifications. BTECs provide UCAS tariff points and students may choose them at age 16 as an equivalent to A-levels, potentially increasing their chances of securing a university place. But it is important that they weigh this up against the issue that the preparation for university study from BTECs is different from A-levels (through both content and assessment methods) and that they may find the traditional qualification and subjects route better aligned with expectations and assessment methods they will currently encounter at university.

Recommendations for universities:

- Universities should be aware that the qualifications with which students enter may have an effect on their progress. Students with different qualifications will be better or worse prepared for different aspects of university and are likely to need different support, particularly in terms of academic support. Bearing in mind that high proportions of BTEC students are from low SES backgrounds, supporting these students, alongside recruiting them, could be a key part of universities' widening participation agendas.

- Universities should monitor the outcomes of students with different entry qualifications, in particular taking account of differences in performance by assessment type, and consider the alignment of assessment methods with students' previous experience across all entry qualification types. Broadening the range of such methods would allow students with different strengths and experiences to demonstrate their learning.

- Universities should be aware that even among students with A-levels, those with larger numbers of 'less suitable' subjects (particularly where the A-level subject is not in the same subject as the degree) may struggle more than those with facilitating subjects. The gap may be greater in universities which have smaller proportions of students with facilitating subjects.

Recommendations for policy makers:

- Although the vast majority of students in the UK do end up completing their degrees, policy makers should be aware that the proportion of students with BTECs who experience these adverse outcomes, while still low, is higher than for A-level students. But restricting university entry purely to those with traditional academic qualifications could risk damaging widening participation. A large proportion of low SES students gain entry to university with non-traditional qualifications. For example, in our sample 39.5% of low SES young full time students enter university with BTECs or BTEC/A-level mix compared to just 9.6% of high SES students.

- Policy makers should work with other stakeholders to improve the rates of success of non-traditional versus A-level students at university, for example on ensuring appropriate support at university for those entering with different qualifications, and working with other stakeholders on the alignment of entry qualifications with university courses. Such collaboration might include agreeing common expectations in areas of skills, such as academic writing and learning to think critically, and also subject content, such as the amount of science in a sport qualification.

- More research is needed to understand why we see these patterns of lower success among BTEC students, even after accounting for prior GCSE attainment. For example, more work should be commissioned to understand whether methods of assessment are a driver of differences in university success rates with findings fed back to post-16 providers and universities for greater alignment between courses. The cohorts examined here largely predate reformed BTECs. It is as yet unclear how much the increased proportion of external assessment in the new BTECs will address the gap in outcomes we measure. It will also be important to examine the role of T-level qualifications, currently being introduced as the principal technical post-16 route into employment but also into further study. These qualifications may be used for entry to HE by those who might before their introduction have taken BTECs. The outcomes of entrants with T-levels should be monitored to see whether this route might address the issues we have identified with BTECs.

2. Introduction

Having an honours degree from a high tariff university has been shown to be related to significantly increased future income (Walker & Zhu, 2013), but evidence from recent cohorts shows that university outcomes in the UK differ by socio-economic status (SES), with students from lower SES backgrounds being more likely to drop out (Crawford, 2014; Crawford et al., 2016; HESA, 2017; Vignoles & Powdthavee, 2009), less likely to complete their degree within five years (Crawford, 2014; Crawford et al., 2016) and less likely to obtain a 2:1 or above (Crawford, 2014). These studies used rich measures of prior attainment, but did not examine the role of subjects and qualification types separately from grades. Students from different social backgrounds take different subjects at A-level (Dilnot, 2016) and different types of qualification (Moulton et al., 2018), and there is some evidence these are related to degree class (Gill, 2017). This report builds on the body of existing evidence by examining directly how subjects and qualifications relate to university outcomes, including degree class, dropout and repetition.

This is important as alternative qualifications to A-levels have become more widely used for university entry. For example, the proportion of the UK 18-year-old cohort accepted into university with 'applied general' awards such as BTECs (Business and Technology Education Council) only, or a mixture of BTECs and A-levels has more than doubled in the last ten years, to 6.1% in 2017. By comparison, 20.5% of the cohort was accepted with A-levels only in 2017, with only a 2 percentage point (pp) increase over the previous ten years (UCAS, 2017). The ratio of just A-level to BTEC/combined BTEC and A-level acceptances has gone from around 7:1 to 3:1 in ten years. This increase in BTEC qualified students has been welcomed, as they are typically from more diverse SES backgrounds than those with just A-levels (Gicheva & Petrie, 2018) and the increase in student numbers from low participation neighbourhoods is related to this change in entry qualifications (Kelly, 2017). We find this ratio of qualifications reflected in the young English entrants in our sample entering first degrees in the three years to 2016/17; 23% enter with BTECs or a BTEC/A-level mixture, compared with 70% with just A-levels. 90% of our first year sample are on courses where there are both A-level and BTEC students represented. The proportions with different qualifications vary across university types, with negligible numbers at Oxbridge entering with BTECs or a mixture of BTECs and A-levels, 6.7% entering other Russell Group and 'most old' universities, and a third of students entering new universities.

Basic descriptive analysis indicates that students with BTECs are significantly more likely to drop out (HESA, 2017) and fail to get a 2:1 degree than those with traditional entry qualifications (Kelly, 2017). But, as discussed by Banerjee (2019), we do not know whether this is driven by the prior attainment or other characteristics of those with BTEC qualifications, who may differ from A-level students across multiple attributes. Typically, BTEC courses are assessed using continuous assessment and portfolios (Kelly, 2017) rather than by examination, and students may therefore be less well prepared for university courses where summative assessment is by high stakes examination sittings. This is important as these students may need additional or different support at university. There has been very little work considering the outcomes for students entering with other qualifications such as through access courses, other vocational awards and the Extended Project Qualifications.

In the context of widespread reforms to the funding of qualifications at Level 3 the Department for Education has in July 2021 published a policy statement proposing significant reductions in the number of Level 3 qualifications that it will fund in accordance with its stated aim of creating a clear academic pathway to university (mostly A-levels) and a clear technical pathway (mostly T-levels) to employment. It cites higher dropout rates and poorer graduation outcomes for those with BTECs compared to those with A-levels amongst reasons for the proposed reductions, alongside arguments

about duplication and complexity of choice. It does, however, note that the evidence on HE outcomes relates to 'older' style BTECs. From 2018 onwards BTECs must include an element of external assessment, including some by examination, in order to count in performance tables for schools and colleges, as well as other attributes. BTECs now meeting the criteria for inclusion in performance tables are described as 'reformed'.

The thrust of the 2021 proposals as they relate to the academic pathway is to remove most 'large' BTECs (in size the equivalent of three A-levels, such as the Extended National Diploma) and fund only some of the existing suite of smaller BTECs (generally the size of one A-level) to be taken alongside A-levels, rather than in combination with each other. It is important to note that the effects of the reformed BTECs are not yet properly assessable: for this study the most recent cohorts available had taken mostly old style BTECs and later cohorts have had their studies interrupted by the Coronavirus pandemic.

Alongside choices about qualification types, less privileged university entrants are less likely to have A-levels in subjects that universities seem to favour (Dilnot, 2016), and for some popular degree subjects, holding the related (generally 'non-preferred') A-level is associated with admission to a lower ranking university. To illustrate, 11% of English state school students with three A-levels from the lowest SES quintile have law A-level, compared with 4% of the top quintile, but having law rather than a 'preferred' A-level for law students is associated with being at a significantly lower ranked university (Dilnot, 2018).

This project makes four new contributions to our understanding of relationships between entry qualifications and university outcomes. First, we consider the relative importance of entry qualification type to university outcomes. We establish how these qualification types relate to three adverse university outcomes; dropping out, repetition, and achieving below a 2:1, taking into account the prior attainment and other characteristics of these students. Second, we consider the importance of A-level subject choice for university outcomes. We do not yet know whether having a non-preferred A-level in the same subject as the university course or having 'preferred' (but unrelated) subjects is protective against the adverse outcomes considered here. Our third contribution is to consider a new, underused outcome measure at university. New data suggest the number of students repeating their first year in the same subject and institution is increasing and is of the same order of magnitude as those dropping-out (HEFCE, 2017) yet little attention has been paid to repetition to date. Finally, we use not only linked administrative data, but also, for our fourth contribution, new individual level university datasets including module results to refine the outcome measures and explore mechanisms by which subjects and qualifications might affect outcomes. With unprecedentedly rich and large data it becomes possible to investigate in detail the subject and qualification choices of students pre-university, the trajectories of these students throughout their university experience, and document systematic variations in outcomes for the first time.

Specifically we ask:

1. Qualification type, social background and university outcomes
    1.1. To what extent are students entering with BTECs at higher risk of adverse university outcomes than those with A-levels?
    1.2. To what extent does having BTECs rather than A-levels account for differences in university outcomes by social background?
    1.3. Can measured academic performance throughout university (annual module scores) account for any of the differences in university outcomes by level 3 qualification type? In other words, are students with BTECs more likely to drop out or more likely to get a lower class degree

because of poorer academic performance throughout their university experience (as opposed to for non-academic reasons)?

2. Subject choice and university outcomes.
   2.1. Is entering with preferred A-level subjects associated with lower chances of adverse university outcomes, and vice-versa for non-preferred subjects?
   2.2. What role does academic performance during university (as opposed to non-academic factors) play in accounting for differences in university outcomes?

3. Subject choice, qualification types, and university outcomes for popular courses without a pre-requisite in the related subject
   3.1. Is having a (non-required) A-level in a subject related to the university course associated with reduced risk of these adverse outcomes?
   3.2. Is having a (non-required) BTEC in a subject related to the university course associated with reduced risk of these adverse outcomes?

We find that there are significant differences in the university outcomes of those students taking different qualifications and subjects at level 3, even when comparing students with similar backgrounds and prior achievement. Students who study BTEC qualifications at level 3 are significantly more likely to drop out of university, repeat the first year, and graduate below a 2:1, compared to similar students who study A-level qualifications. We find evidence that gaps in university outcomes between those studying BTECs compared with A-levels are slightly larger for those from lower compared with higher social backgrounds. Our analysis of individual universities' data suggest that the gaps we observe are driven by lower academic performance throughout university, rather than any other particular reason for BTEC students experiencing adverse outcomes, such as feelings of not belonging for example. These qualifications are also less beneficial when studying on a related degree subjects relative to their A-level counterparts: a related BTEC in health and social care or health studies is associated with more adverse outcomes for the related nursing degree than having a BTEC in a different subject.

For those studying A-levels, there is a consistent picture of experiencing fewer adverse outcomes the greater number of facilitating subjects studied at level 3, and the fewer less suitable A-levels studied. The findings are more pronounced in institutions where these types of A-levels are rarer – so in newer universities there is a more pronounced benefit to having more facilitating A-levels. These findings hold in our analysis of individual institutions, where we again find a compelling role for academic performance while at university in driving these trends. The beneficial association of having more facilitating A-levels at post-1992 institutions, in terms of university outcomes, is again driven by higher module scores throughout university. There is also evidence that having a related A-level subject for the degree course is associated with reduced risk of adverse outcomes at university – those entering with related A-levels for a range of popular degree courses where the related entry subject is not required were found to be less likely to drop out, repeat the year, and graduate below a 2:1, relative to those studying another non-related A-level with similar observed characteristics including prior achievement.

The report proceeds as follows. In the next section we discuss the data that we use to analyse our research questions and briefly explain our method and approaches. Section 4 presents our findings on the relationship between qualification type and university outcomes, while Section 5 presents the findings on A-level subject choice and university outcomes. Section 6 presents our in-depth look at

the role of related subjects for 10 popular degrees. We end with some conclusions and policy implications in Section 7.

3. Data and methods

In this section we describe the data and methods we use, and define the outcomes we measure. We include tables and graphs describing the students by different sorts of outcomes, qualifications and subjects. More technical detail of the data and methods is given in Appendix 4.

We use two datasets to investigate the relationship between level 3 qualifications and subjects studied and the three outcomes we examine: dropping out before the start of the second programme year; repeating the first year in the same degree subject and at the same institution; and graduating below a 2:1.

The first dataset is linked administrative school, college and HEI (Higher Education Institution) data in England for three recent cohorts of first years and graduating students; the National Pupil Database (NPD) linked to Individual Learner Record (ILR) and Higher Education Statistics Agency (HESA) data. The second is individual level data for seven universities which, unlike the linked data, also contain individual module scores throughout university. These data are described in detail in sections 3.1 and 3.2 respectively.

An additional unlinked dataset of HEI data for three recent cohorts of mature students is used to examine outcomes for students entering university at least three years after the most common school leaving age of 18. Our analysis follows UCAS definitions of students as being 'young entrants' who are examined in the main linked dataset, and 'mature entrants' entering at age 21 or older. We concentrate in this report on young entrants. A summary of the data and findings for mature entrants is included in Appendix 10.

3.1. Linked administrative NPD HESA data

Our linked sample is defined for first year students as those entering a full time or sandwich first degree[7] lasting two years or more, at the age of 20 or below, for three cohorts from 2014/15 to 2016/17 for every higher education establishment in the UK[8]. The graduating sample is those on full time or sandwich courses who left university in the three cohorts 15/16 to 17/18 in all HEIs, and are under age 25 at the start of their final year to allow for four year degree courses. We can link 743,900 English domiciled first years[9] and 614,580 graduating students[10] to their school records at age 16 and their school or college records at age 18 or 19 (Table 1).

3.1.1. Outcomes

Dropout

We define dropout as those students in our sample of first years who are not found in the HESA data in the following year, including those who have repeated their first year one or more times and then drop out.

[7] not foundation degree or foundation year

[8] Excluding the Open University which is predominantly for mature students taking part-time courses and without the linear progression over a small number of years needed to examine our research questions.

[9] The total number of English domiciled first year young entrants in the HESA data is 764,800. Of these 19,610 have no school records at KS4 and 1,290 are in neither the KS5 or ILR data.

[10] There are 681,350 English domiciled students in their final year in our three cohorts, of whom 22,745 have no KS4 records and 1,215 cannot be matched to KS5 or ILR. Of the remaining 657,390, 42,810 (6.5%) are not included in the graduating students sample either because their degree had no classification (for example, medicine) or because they left university with no qualification, or below a third/pass degree.

Repetition

Students repeating are those recorded as being in the first year of their degree programme in the second year after their entry to their HEI, studying the same main subject at the same HEI. It is therefore a measure of lack of academic progression.

Graduating below a 2:1

For our third outcome, our sample is all graduates with a classified degree. HESA data categorises results in first degrees in UK universities as first class, upper second class (commonly described as 2:1), lower second class (2:2) and third class/pass (pass being a degree without honours). The outcome we examine is whether a student graduates below a 2:1, rather than with a first class or 2:1 degree. Note we only consider those who graduated for this outcome, so dropouts are excluded – i.e. the outcome is conditional on graduating.

3.1.2. Qualification types

Table 1: Linked administrative data descriptives: outcomes, achievement, and social background by qualification

	All level 3 qualifications	A-level only	Mixed A-level and BTECs	BTECs only	Other academic	Access	Other L3 including other mixtures
First years							
N	743,900	518,710	54,530	115,850	8,355	1,685	43,260
Dropout %	7.6[11]	4.6	9.9	17.8	3.9	19.4	13.6
Repeats %	4.3	2.8	5.5	9.6	2.7	13.5	6.9
GCSE points	427	470	360	304	445	261	329
Total L2 points	534	554	521	471	516	403	493
Mean SES quintile	3.2	3.5	2.7	2.5	4.2	2.4	2.6
Non White %	26.5	23.9	29.7	34.8	21.7	37.0	31.1
Female %	55.6	57.3	56.2	49.1	52.5	65.9	53.5
Graduates							
N	614,580	460,245	35,935	71,420	6,860	2,360	36,345
Graduating below 2:1 %	19.8	14.9	29.0	39.5	11.4	36.5	33.8
GCSE points	439	475	358	309	485	278	331
Total L2 points	542	558	535	476	541	374	494
Mean SES quintile	3.3	3.5	2.7	2.6	4.2	2.5	2.7
Non White %	23.5	21.9	27.6	29.6	19	27.4	27.6
Female %	56.6	57.5	56.8	52.2	52.6	67.7	54.4

[11] As described above, this includes students who stay in the first year for more than one year, then drop out before the second programme (rather than chronological) year. Excluding these students gives us a rate of 6.3%. This is close to the HESA published non-continuation rates of 6.5%, 6.6% and 6.5% for these three cohorts; the published rates are for UK domiciled students at UK universities, rather than English domiciled at UK universities (HESA, 2021).

The proportions of students entering university by qualification type are set out in Table 1. Students are classified according to records of their level 3 qualifications in the KS5 and ILR datasets[12]as follows:

1. Those with **just A-levels** (or AS levels) and no other types of level 3 qualification, unless they have at least three A-levels in which case they are counted in the 'A-levels only' category
2. Those with a **mixture of A-levels (or AS levels) and BTECs** in any combination, but with no other types of level 3 qualification
3. Those with **just BTECs**, of any size, and no other types of level 3 qualification - further split between those taking 'large' BTECS (the equivalent of 3 A-levels in size) and those with a combination of smaller size BTECs. .
4. Those with **any mixture of A-levels, Pre-U and International Baccalaureate** qualifications[13]
5. **Access to Higher Education** qualifications[14]
6. **Any other** combinations of level 3 qualifications

Table 1 shows how the three outcomes we study differ across the six qualification categories listed above. Around 8% of the sample of first years drop out before the start of their second year, but under 5% of those with just A-levels do, compared with nearly four times the proportion of those with BTECs.

Repeating the first year in the same subject at the same university has been little studied so far. The descriptive statistics in Table 1 show that the proportion of all first years repeating is smaller than those dropping out, at 4.3% of these cohorts compared with 7.6%. But this is still a considerable number of students, with more than 10,000 repeating per year. As with dropout, we see a large variation in rates of repetition by qualification type, with more than three times the proportion of those with BTECs than A-levels repeating their first year. Among those graduating, just under 20% overall graduate below a 2:1, but students with just BTECs were two and a half times more likely to (40%) than A-level entrants (15%).

Students with a mixture of A-levels and BTECs have university outcomes somewhere between those for entrants with A-levels or BTECs alone, and those with Access qualifications and other level 3/other combinations also seem at a disadvantage, in terms of raw figures, compared with A-level entrants, although to a lesser extent than those with BTECs only. Access entrants have on average worse first year outcomes than BTEC students, but are slightly more likely to graduate with at least a 2:1.

Different degree subjects and university types have widely differing profiles of level 3 entry qualifications, as well as different proportions of students dropping out, repeating and graduating below a 2:1, which we take into account in our formal analysis. Distributions of BTECs and A-level entry by university type, and outcomes by degree subject and university type are shown in Appendix 2. Universities are classified by type in Appendix 1, based on a cluster analysis of university attributes developed by Boliver (2015) which is further discussed in Appendix 4.

[12] The HESA dataset also contains records of highest qualification on entry to university, but the KS5 and ILR data give much more detail, including codes allowing matching to subjects, so are preferred.

[13] unless they had at least three A-levels, in which case they were included in category 1.

[14] from ILR data only. Access qualifications are not included in KS5 data, and the criterion for students with other qualifications to appear in KS5 data for this period was to have at least one level 3 qualification at least the size of an A-level: students below this threshold are thus only found in the ILR data, and their subjects and qualifications types and levels are identified using learning aims codes which are identified using the Learning Aims Reference Service (LARS) (Education and Skills Funding Agency, 2021). There are few Access students in our sample (which is young entrants only) as they need to be aged 19 or over to have an Access course funded.

3.1.3. Facilitating and 'less suitable' A-levels

We then examine the relationship with outcomes of having particular types of A-level using all those in the main linked dataset with at least one A-level. This is 79% of first year entrants to university in these three cohorts (N=588,740).

Previous work suggests that entering university with 'preferred' A-levels is associated with attending a more highly selective university, and that a group of 'non-preferred' A-levels exists for which the converse is true (Dilnot, 2018). Higher SES students are more likely to take 'preferred' A-levels and less likely to take 'non-preferred' subjects than their less privileged peers (Dilnot, 2016), although the gap is entirely accounted for by differential prior attainment. This earlier work concentrates on the role of A-level subjects for entry at university, rather than how they relate to progress through university, the focus of this project. We use the taxonomy developed for the earlier work by Dilnot to define A-level subjects as 'preferred' and 'non-preferred'. The taxonomy is based on an analysis of the following sources of information; 'Informed Choices' guidance for applicants (Russell Group, 2016), DfE guidance on facilitating subjects for the AAB Key Stage 5 Performance Table Indicator (DfE, 2017), the general admissions webpages of the 24 Russell Group universities including five which publish general statements about suitability of A-levels, and the webpages detailing specific course requirements for a range of Russell Group degree courses as described in Dilnot (2015). From this analysis, the following categories are determined:

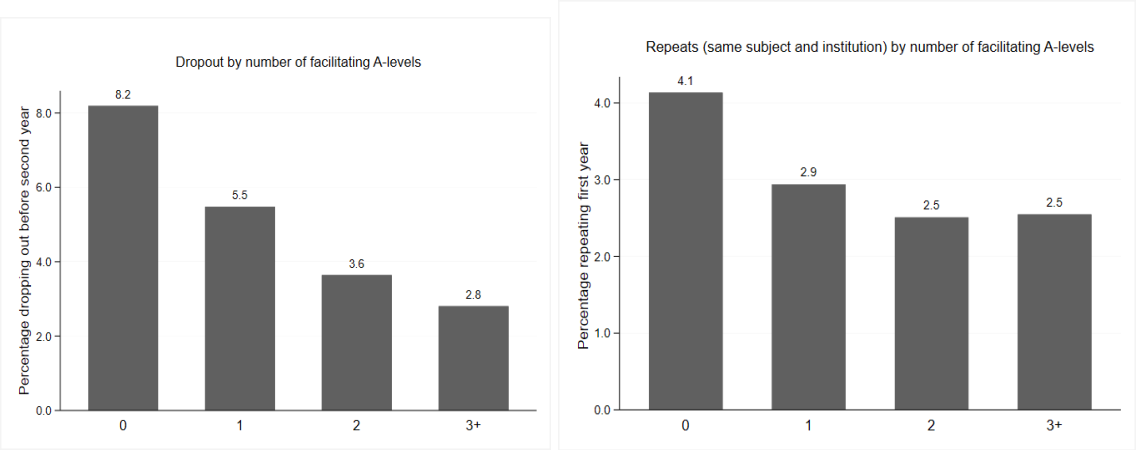
1. **Facilitating** - as identified in 'Informed Choices' with lists of modern and classical languages supplemented by DfE guidance for the AAB performance indicator.
2. **Useful** - not appearing on any non-preferred lists or appearing on approved lists.
3. **More limited suitability** – appearing on at least one non-preferred list or absent from approved lists but also described as essential, useful, alternative required or preferred for related degree courses for at least one Russell Group university.
4. **Less effective preparation** – appearing on at least one non-preferred list or absent from approved lists and never described as essential, useful, alternative required or preferred for related degree courses at any Russell Group university.
5. **Non-counting** – general studies and critical thinking are described by many Russell Group universities as not counting towards an A-level offer, and others exclude them from counting within individual course requirements.

Since this taxonomy was developed the Russell Group has developed a more nuanced approach to advice on A-level choice via an interactive website (Russell Group, 2021) rather than a single publication, but the Government continues to use the measure of achieving AAB in at least two facilitating subjects as a KS5 school performance indicator. All but two of the 'less effective preparation' and the 'non-counting' A-levels were withdrawn in reforms between 2015 and 2018, but were available to students in the cohorts in our data. We use the category of 'facilitating' subjects (excluding the 20 community languages) as our measure of 'preferred' subjects, and combine 'more limited suitability' and 'less effective preparation' into a 'less suitable' category as the measure of 'non-preferred' subjects.

The taxonomy is set out in Appendix 3.

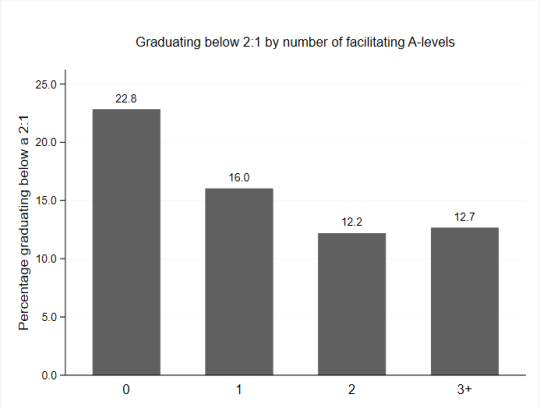
Figure 1 shows that the raw proportion of dropout and repetition outcomes for these students varies with the number of facilitating A-levels they hold.

Figure 1: First year outcomes by number of facilitating A-levels, among those with at least one A-level



8.2% of those with at least one A-level but no facilitating subjects drop out, compared with 5.5% of those with one, 3.6% with two and 2.8% with at least three facilitating subjects. For repetition the raw gaps are smaller[15] but having one rather than no facilitating A-levels makes a similar proportional difference (32% for dropout between no and one facilitating subject, and 29% for repeating). The proportion repeating drops only slightly further for those with two or more faciliating subjects, with no difference between two and three or more.

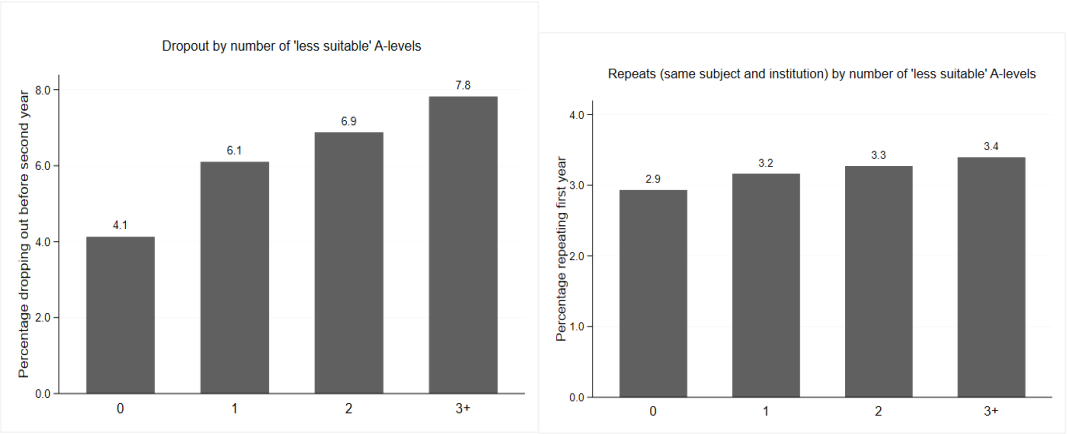
Figure 2: Graduating below a 2:1 outcome by number of facilitating A-levels, among those with at least one A-level



Having more facilitating subjects is also related to graduating with a first or 2:1, as shown in Figure 2. Having one rather than no facilitating subjects reduces the chance of graduating below a 2:1 by about a third. Both the scale of the outcome and the pattern are similar to the first-year outcomes, with no further advantage in outcome seen beyond two facilitating subjects.

[15] as the percentage of those repeating is smaller than for dropout – at 4.1% of those with at least one A-level but no facilitating subjects, compared than 8.2% for dropout.

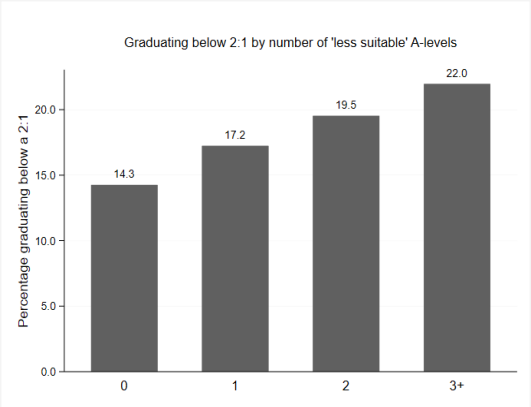
Figure 3: First year outcomes by number of less suitable A-levels, among those with at least one A-level



In Figure 3 and Figure 4 outcomes are plotted against increasing numbers of less suitable A-levels. Here the adverse raw gaps increase steadily up to three or more less suitable A-levels. The increases are less steep for the repetition outcome but substantial for the dropout and graduation outcomes.

These two sets of graphs are of course related. One set is not the converse of the other because of the remaining large category of A-levels – 'useful' and the smaller categories of community languages and 'non-counting', set out in Appendix 3.

Figure 4: Graduating below a 2:1 outcome by number of less suitable A-levels, among those with at least one A-level



The proportions of facilitating and 'less suitable' subjects held by students entering with at least one A-level vary considerably by degree subject group and university type. Graphs of these distributions are given in Appendix 5. They also vary by socio-economic status and prior attainment. Untangling subject choice from prior attaiment is important in seeing whether the subjects that the Russell Group suggest are useful for gaining entry to highly selective university also seem useful in preventing adverse outcomes, and to what extent SES gaps in outcomes can be explained by choice of subjects. We consider these conditional differences in our formal models.

3.1.4. Popular degree subjects with related A-levels and BTECs

For our third set of research questions we turn to whether having an A-level or BTEC in the same subject as the degree course is related to outcomes, for ten popular degree subjects (at JACS principal subject level) where a qualification in the related subject exists at level 3 but is generally not required for entry.

We choose to examine the eight most popular degree courses for which there are generally no required entry subjects but there is a related A-level, plus nursing and drama (which also has a related

A-level although is a less widely taken degree subject) because of the suggestion that having a BTEC in a 'practical' subject might be better preparation for related practical degree courses than BTECs related to less practical courses (DfE, 2020b).

The degree subjects examined are:

- Accounting (A-level)
- Business (A-level and BTEC)
- Computing (A-level)
- Drama (A-level and BTECs in related subjects)
- Law (A-level and BTEC)
- Media studies (A-level)
- Nursing (BTEC health and social care and related)
- Psychology (A-level)
- Sociology (A-level)
- Sports science (A-level and BTEC)

We examine whether, amongst students with at least one A-level, holding the related A-level rather than any other is associated with better or worse outcomes. Similarly, for those with BTECs or a mixture of A-levels and BTECs, we determine whether having a related BTEC rather than a BTEC in any other subject is associated with better or worse outcomes. Between them these subjects account for just under 38% of our first year sample and 36% of graduates.

Table 2: Proportions of students with related A-level or BTEC for 10 popular degree courses

	All subjects	Accounting /finance	Business	Computing	Law	Media studies	Psychology	Sociology	Sports science	Nursing	Drama
First years											
N	743,900	17,425	47,550	34,315	31,550	17,395	40,270	21,165	31,080	23,640	12,965
Dropout % (any qualification)	7.6	8.8	9.3	13.4	7.2	9.5	6.6	9.1	14.8	7.9	8.2
Repeats % (any qualification)	4.3	6.6	4.9	7.9	4.9	4.1	3.3	3.8	6.4	5.8	2.6
Has related A-level		11%	38%	15%	30%	40%	76%	50%	27%	N/A	46%
Has related BTEC[16]		N/A	28%	N/A	5%	N/A	N/A	N/A	49%	40%	37%
N A-level sample		13,540	34,015	19,200	27,505	12,980	35,240	17,065	14,680	N/A	9,000
N BTEC sample		N/A	15,525	N/A	5,075	N/A	N/A	N/A	17,655	10,835	5,215
Graduates											
N	614,580	13,260	38,495	24,185	25,400	14,150	32,825	16,715	23,475	19,290	11,735
Graduating below 2:1 %	19.8	22.3	18.7	23.1	22.2	20.7	16.9	23.4	34.2	26.7	13.6
Has related A-level		15%	43%	15%	34%	42%	79%	52%	36%	N/A	49%
Has related BTEC[17]		N/A	21%	N/A	2%	N/A	N/A	N/A	42%	28%	34%
N A-level sample		11,475	29,690	15,470	23,185	10,910	29,750	13,860	13,220	N/A	8,440
N BTEC sample		N/A	9,360	N/A	2,410	N/A	N/A	N/A	10,520	6,180	4,215

[16] Of any size

[17] Of any size

Table 2 shows outcomes and related entry qualifications across these ten subjects. Dropout proportions vary considerably across subjects, from 6.6% in psychology to 13.4% in computing and 14.8% in sports science. Appendix 2 shows the distribution across the 19 JACS subject areas recorded in the HESA data; computing is an area on its own and has the largest overall dropout amongst whole subject areas. Both Sports Science and Psychology are included in the Biological Sciences JACS subject area, which has an overall dropout rate of 8.5%. The proportion of repeaters is also very variable, with only 2.6% of drama students repeating, but 7.9% of computing students.

As we would expect given that a level 3 qualification in a related subject is generally not required for these degree courses, many entrants do not have a related subject A-level or BTEC, and the proportion of those that do varies considerably by subject. For the ten subjects of interest, nine have a related A-level (nursing does not) and five have a related BTEC or BTECs[18]. Three quarters of those first years studying psychology have psychology A-level, but only 11% of those studying for an accounting degree have an A-level in accounting. In sports science and business, both a related A-level and BTEC exist, and two thirds of first year business students and three quarters of sports science students enter with one or the other. Similar proportions are seen in the graduating sample.

Figure 5: Graphs of dropout percentages by whether the related A-level held, and whether the related BTEC held

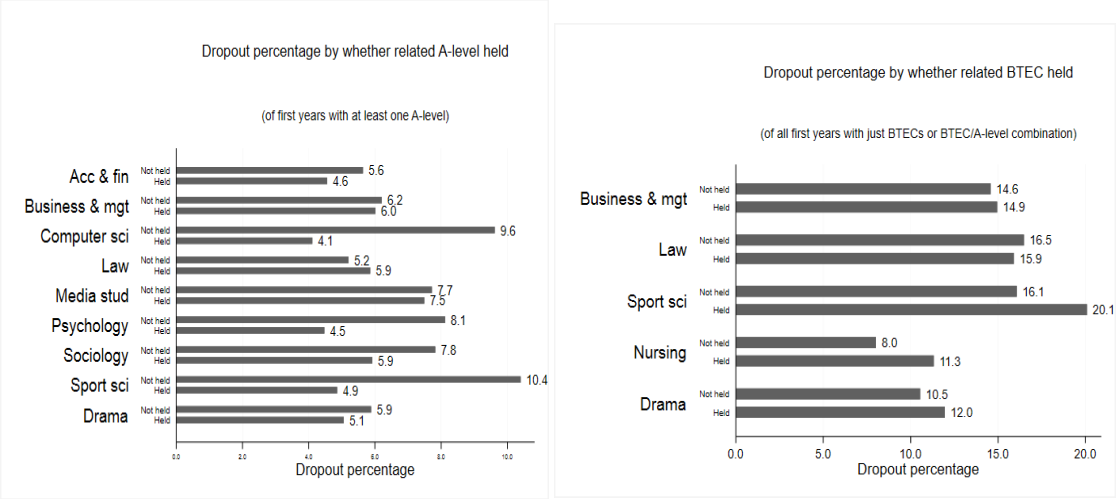
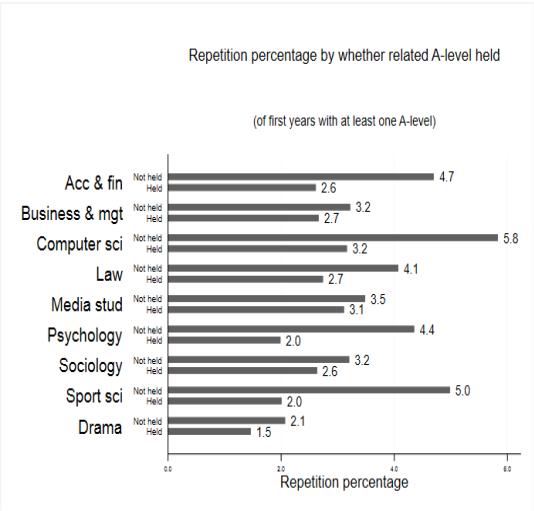
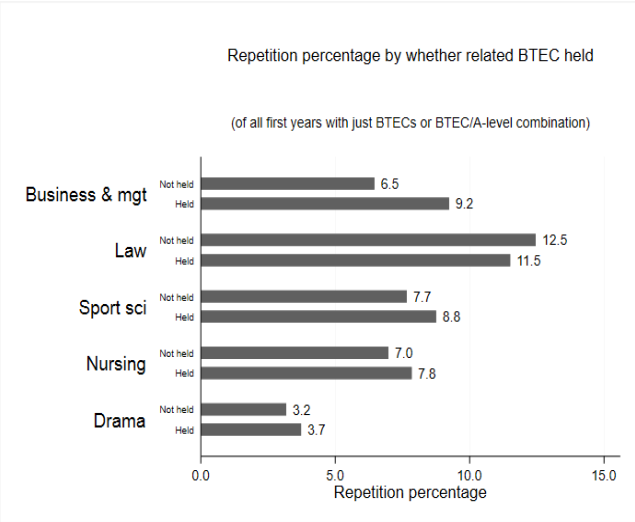


Figure 5 shows first among those with at least one A-level, and then for those with all BTECs or a combination of A-levels and BTECs, what the raw differences in outcome are between those who do or do not hold the respective qualification in the subject related to their degree course. The overall picture from the left hand graph is that those holding the related A-level are less likely to drop out – considerably so in the case of computing and sports science. The only gap in the opposite direction is for law A-level. The opposite picture is shown for BTECs. The raw gaps are almost all in favour of those without the related BTEC, among those with just BTECs, or with a mixture of BTECs and A-levels. Law is again the exception, although the gap is small. But note the difference in scales between the two graphs: on average as we have seen in data for all first years, those with at least one A-level are less likely to drop out for all subjects than those with BTECs or a BTEC/A-level combination.

[18] From the KS5 mapping database, BTEC subjects were identified as follows: Business "Business Studies", Computing "Computing and IT Advanced Technician", Law "Legal Studies", Sports science "Sports Studies", Drama "Acting Skills" "Acting, Music Theatre" "Speech and Drama" "Dance: General" (predating the reformed BTEC now called "Performing Arts"), Nursing "Health Studies" (predating the reformed BTEC "Health and Social Care"). For the small number of BTECs identified only in the ILR data the subjects were identified by searching for the name of the related subject in the linked learning aim title from the LARS database.

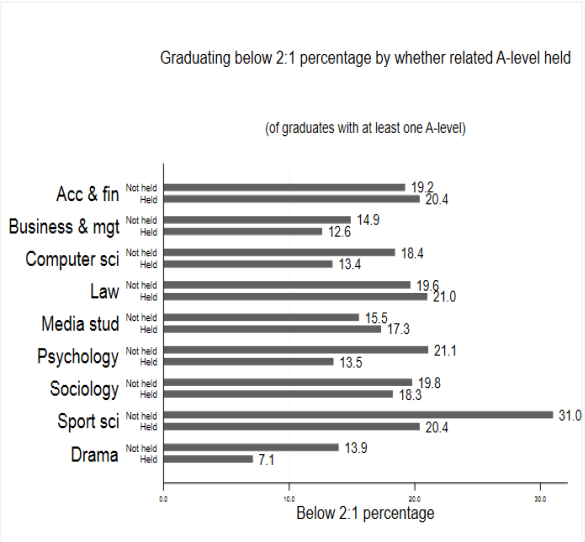
Figure 6: Graphs of repetition percentages by whether the related A-level held, and whether the related BTEC held

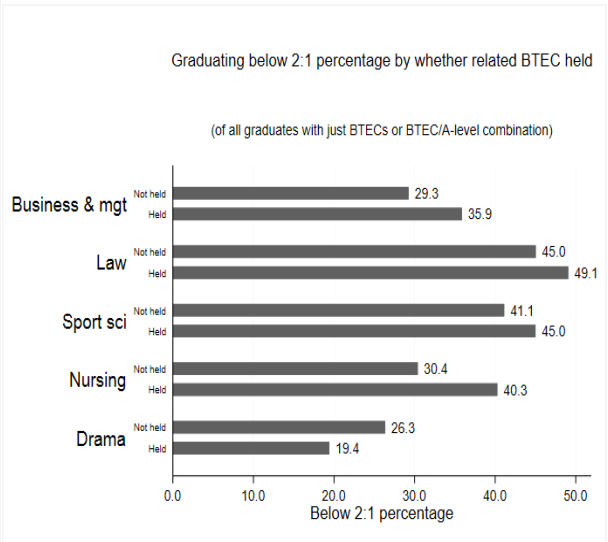




Very similar patterns are seen in the proportions of first years who repeat, shown in the graphs in Figure 6. Once again the better raw outcomes are seen in those with the related A-level (excluding law) and the opposite is true for those with BTECs, although the gaps are smaller.

Figure 7: Graphs of graduating below 2:1 percentages by whether the related A-level held, and whether the related BTEC held





By the time students graduate, the picture for those with A-levels is slightly different. The raw gaps as a proportion of those graduating below a 2:1 between those with and without the related A-levels have reduced, and in the case of accounting and media studies A-level have reversed to join those with law in being slightly less likely to gain a 2:1 than those without the related subject. The story with BTECs remains for business, sports science and nursing the same as for the first year outcomes: those with the related BTEC are less likely to achieve a 2:1, now including law, and only students with a drama BTEC are more likely to get a 2:1 than their peers with BTECs or A-level/BTEC combinations in any other subject.

3.1.5. Measuring socio-economic status

To construct a measure of students' SES we use pupil level KS4 data (age 16). We use the same approach as Chowdry et al (2013) in constructing SES quintiles based on a combination of whether a student was eligible for free school meals (FSM) at aged 16 and neighbourhood data. The free school meals indicator is effectively a measure of whether students' families were in receipt of benefits, and the neighbourhood data captures a broader set of indicators of socio-economic background; it includes the proportions of individuals working in managerial or professional occupations, the proportion holding a level 3 qualification or above, and the proportion of home-owning households.

Table 1 shows that the mean SES quintile for first years is 3.2 and for graduates is 3.3. The mean is not 3 because of adding the private school students (for whom neighbourhood and FSM data is not available) to the top quintile, which skews the distribution upwards. In thinking about SES for these samples it is important to note that the SES quintiles are calculated for those who are at university, so the samples we examine are already more privileged on average than the total KS4 cohorts (see, for example, Chowdry et al (2013)). But among those going to university, Table 1 shows that students with BTECs, Access or other level 3 qualifications are on average considerably less privileged than those doing A-levels, and less privileged again than those doing other academic qualifications, which are predominantly taken at private schools. Of the top SES quintile, 84.8% of our joiners sample have just A-levels and 9.6% have just BTECs or a BTEC/A-level mix. Of the bottom quintile the corresponding proportions are 49.9% for A-levels and 39.5% for BTECs. There is also an SES gradient by number of facilitating subjects; the mean SES quintile for all students with at least one A-level is 3.4, but this varies from 3.0 for those with no facilitating subjects to 3.7 for those with three or more. The opposite pattern, although not quite so marked, is seen for less suitable subjects, with mean SES falling from 3.5 for those with no less suitable subjects to 3.1 for those with three or more.

In Table 3 we see that lower SES students are more likely to experience adverse outcomes than their more privileged peers. Students in the bottom SES quintile of university attendees are over two and half times as likely to dropout or repeat their first year, and two and a quarter times as likely to graduate below a 2:1 as students in the top SES quintile.

Table 3: Outcomes by SES quintile and prior attainment

	Dropout	Repeats	Graduates below 2:1
Bottom SES quintile %	11.9	7.2	30.8
Top SES quintile % (including private school students without SES data)	4.6	2.7	13.6

In our formal models we explore how the inter-relationships between qualifications and subject choice discussed above drive SES gaps in university outcomes.

3.1.6. Measuring prior attainment

A great benefit of using linked data to measure prior attainment is that we can construct common measures across students at age 16, before their qualification types at level 3 diverge. Our aim is to compare university outcomes for students who have similar academic profiles up to age 16, but take divergent paths in post-16 education. The level 3 qualifications we consider, for example, have varying assessment methods, breadth of subjects studied and emphasis on transferable skills versus

knowledge (qualification attributes). Using scores available across qualifications at level 3 (UCAS tariff scores) would therefore conflate prior academic achievement with differences in qualification types in post-16 education, as these scores were developed to inform universities about the performance they might expect from entrants with equivalent tariff scores. These measures reflect not just prior achievement but also the appropriateness of qualification attributes for university study, which is what we aim to study. The position is further complicated as research shows that the UCAS equivalence scales are imperfect in predicting degree outcomes (Gill, 2015; Green & Vignoles, 2012).

We therefore link our sample to their attainment at age 16, using the Qualifications and Curriculum Authority (QCA)[19] points available in the KS4 data, which is much more comparable across the whole sample. We include the points from GCSEs, the points from GCSE equivalents (level 2 equivalents to GCSEs), and the points from English language GCSE (or English language and literature if held instead) and maths GCSE. Separating out the points from GCSEs and equivalents allows for any non-equivalence in tariff between GCSEs and other level 2 qualifications (which include level 2 BTECs and vocational qualifications) to be taken into account in our modelling.[20] Work by Crawford et al (2017) suggests that taking the subjects and individual grades in which GCSEs are earned is also important in determining educational trajectories including entry to university: we therefore also include controls for the numbers of GCSEs at A*, A, B, C , and D-G held in EBacc[21] (excluding English and maths, which are included separately) and Non-EBacc subjects.

As might be expected, the level 2 prior attainment of entrants varies considerably by qualification type. As we saw earlier in Table 1, entrants with A-levels have on average some 1.5 times as many QCA points from GCSEs than those with BTECs, but only 1.2 times as many points from GCSEs and equivalents combined. Those who drop out, repeat, and graduate below a 2:1 have lower level 2 scores on average than all students, by around 7 or 8% (detail in Appendix 4). This emphasises the importance of comparing individuals with the same prior achievement in our models – by conditioning on prior achievement, we are only considering university outcome differences between those who study different qualifications or subjects with *the same performance at KS4.* Prior attainment at level 2 also varies considerably by subject type among those with at least one A-level: those with three or more facilitating subjects have on average 521 QCA points from GCSEs, compared with 388 for those with none, a multiple of over 1.3. Those with three or more less suitable subjects have an average of 385 QCA points from GCSEs, compared with 482 for those with none (multiple of 0.8).

We are also able to calculate QCA points in the KS5 and ILR data for level 3 qualifications, but the comparability of these points between types of qualification is more uncertain, as noted above. We construct quintiles from these points, and use them in tests of robustness, which are discussed in the methods section.

3.2. Module scores data

To investigate whether the relationship between qualification type and subject type is mediated by academic performance of the student at university, we make use of a subset of a unique administrative dataset collected from 25 UK universities (for more details, see Murphy and Wyness,

[19] These go from 16 points for a Grade G GCSE, to 58 for an A* in steps of 6 (grades are pre recent reforms to the grading system which post date the students in our samples)

[20] Because we are dealing with young entrants who will have taken their level 2 qualifications over relatively few years we do not adjust for any grade inflation.

[21] The EBacc is a set of GCSE subjects defined by the DfE for English students which effectively mirrors the list of facilitating subjects at A-level. It includes English language and literature, maths, the sciences including computing, geography or history and a language.

2015). The data comprise the entire undergraduate population of UK and EU students for up to six cohorts of students beginning their studies between 2006 and 2011. As we are interested in the mediating role of student module score performance between level 3 qualification and subject choices and their outcomes, we discard universities who did not provide us with module score information. Thus, for the purposes of this analysis we focus on seven universities in total (N=39,085). While all of the universities provided us with data on A-level subject type (enabling us to look at the impact of facilitating and less suitable A-levels), 4 of the 7 datasets either contained no information on qualification entry type (apart from A-levels), or had so few entrants with non A-level entry qualifications as to be non-viable. Therefore, when looking at the impact of qualification type, we restrict our sample to just these 3 universities.

Since we only have 7 universities in our sample, we do not argue that this sample is representative of the sector as a whole. However, as can be seen in Table 4, our sample covers both Russell Group and new universities, across a range of regions of England, although particularly those in London / South East.

Table 4: Sample of universities with module score information

University	Region	University type (Boliver cluster)	Sample size
1	London	Russell Group and most old	8,511
2	North East	Russell Group and most old	10,471
3	London	Russell Group and most old	630
4	East Midlands	Russell Group and most old	7,257
5	South East	Most new	7,732
6	South East	Most new	2,550
7	South East	Most new	1,934

While this is clearly a more limited dataset, we are still able to construct the key variables required to replicate the analysis undertaken using the full administrative dataset described above.

In terms of the outcomes of interest, we are able to observe two of the three outcomes of interest: student dropout and final degree classification (constructed in the same way as for the main dataset). However, we hold no information on whether students repeat the year or not, so we cannot provide analysis here.

For measures of subject and qualification choices at level 3, we are able to construct the qualification type variable for 3 of our universities (see Table 4 above), and we are able to construct the facilitating and less suitable subject choices variable for all of our universities.

In terms of demographic and prior attainment information, again our information is more limited. We have key demographic information (age, gender, ethnicity), but our prior attainment information is limited to total UCAS tariff points (which includes points for A-level equivalents). We do not hold sufficient information to construct an SES measure, but we do hold information on the students' parental income. The lack of good quality prior attainment information prior to age 18 is potentially problematic. Therefore the results from this part of the analysis should be used to understand the role of module scores data in explaining gaps in outcomes between those with different qualification and subject types, rather than the absolute size of the relationship between qualification and subject types, and outcomes, which is better answered by the administrative data.

Unfortunately, because of data protection requirements, we are unable to merge these datasets together. So in the analysis contained in this report, we present results for each university separately. Table 5 presents for each university, average module score for year 1 (standardized by year and major JACS subject type to mean zero, standard deviation 1), presented for each of our variables of interest. Across each university, module scores are higher for those participants who enter with only A-levels, and are lower for those who enter with purely BTECs. Similarly, with the exception of university 3, module scores follow an upward trend with the number of facilitating A-levels the student has.

Table 5: Sample of universities with average first year module score by key explanatory variables

University	1	2	3	4	5	6	7
A-levels	0.042				0.147	0.094	
	(0.969)				(0.885)	(0.949)	
A-level / BTEC mix	-0.241				-0.286	-0.280	
	(1.12)				(0.980)	(0.791)	
BTEC	-0.641				-0.603	-0.403	
	(1.136)				(1.141)	(0.979)	
Facilitating A-level							
0	-0.262	-0.072	0.316	-0.2791	-0.231	-0.084	-0.060
	(1.246)	(0.8214)	(0.409)	(0.9648)	(1.091)	(0.958)	(0.951)
1	-0.028	-0.1808	-0.189	-0.0951	0.0627	0.187	0.008
	(0.932)	(0.9299)	(0.828)	(0.9907)	(0.9126)	(0.873)	(0.959)
2	0.009	-0.1159	-0.267	-0.0304	0.231	0.077	0.125
	(0.927)	(0.9205)	(1.262)	(0.9291)	(0.8456)	(0.986)	(0.977)
3+	0.087	0.0517	-0.048	0.0837	0.345	0.245	0.431
	(0.925)	(0.9774)	(0.984)	(0.9928)	(0.8831)	(0.942)	(0.704)

Notes: module scores are available each year, and are standardized by subject-year, to mean=0 and standard deviation=1. Standard deviations in brackets.

3.3. Methods

We are interested in how qualification types and subjects at level 3 are related to three adverse outcomes at university, and to what extent differences in entry qualifications and subjects account for the fact that, on average, lower SES students have a greater chance of experiencing these adverse outcomes. To do this we estimate the difference in probability of experiencing each outcome for students with the various entry qualifications and subjects in which we are interested. Our aim is to compare outcomes for students of the same social background, educational profile, and with the same demographic characteristics doing the same degree subject at the same university. This means that we are comparing a very similar group of students, with different types and subjects of entry qualifications.

We cannot claim that these qualification types and subjects cause the outcomes, because we cannot account for all unobserved differences between people who take different qualifications and subjects. But our models include a range of background measures which reduce the role of these unobserved differences between individuals in our analysis.

We run a series of models for the first two sets of research questions (questions 1.1, 1.2, and 2.1) for each outcome, starting with the 'raw' difference in outcomes between people taking different qualifications or subjects, taking only the cohort and university/degree course context into account. We then take a series of other observable differences into account, starting with SES and noting for

each the extent to which any gaps in the probability of the outcome between qualification types/subjects are accounted for by the new variables.[22]

In our first set of models for questions 1.1 and 1.2, the full models include controls for age group, gender, whether students have had a gap year, ethnicity, declared disability at university, whether they had persistent absence at KS4, their type of school, their parental education, their term time accommodation (a proxy in part for being a local/commuting rather than a resident student) and the type of university attended (Boliver cluster), as well as SES quintile and prior attainment. More detail of the categories within these variables and how they were derived is given in Appendix 4, together with the model equations.

To try to answer question 1.2 more fully, we rerun the full model including interactions which allow the relationship of qualification with outcome to vary by SES quintile.

We also run the full models splitting those doing just BTECs between those entering with 'large' BTECs (the size of three A-levels) and a combination of smaller BTECs.

The models for 2.1 are slightly different from those for 1.1 and 1.2, as the emphasis is on choice of subject among those with A-levels, rather than between types of qualifications. Because we are comparing students with particular subjects within A-levels we do not have the same scale problem of comparing achievement at level 3 across different sorts of qualification, where we know the points awarded for various grades may not be strictly comparable. Therefore when we are looking at the relationship between the number of facilitating and 'less suitable' subjects with our three outcomes of interest we control not only for prior attainment at KS4 (age 16) but also include A-level points and the number of A-levels taken. We can then interpret our estimate of having an additional facilitating (or less suitable) A-level as comparing two otherwise similar students on the same university course with the same number of A-levels and same grades, but one with one more facilitating (or less suitable) subject than the other.[23]

To gain further insights into question 2.1 we again rerun the models including interactions, but this time allowing the relationships of subject types with outcomes to vary by type of university.

For the analysis which looks at the mediating effect of module scores on the relationship between qualification type and subject type on university outcomes, we follow similar methods. We run regression models that replicate the non-interacted analyses above for 1.1, 1.2 and 2.1 – modelling the relationship between qualification type / number of facilitating A-levels and a range of background controls – and then add controls for module scores in years 1-3. The main difference is that each university is modelled separately, so we do not need to control for the contextual effect of being at a particular university.[24]

The third set of research questions (questions 3.1 and 3.2) looks within the populations of students doing ten popular university courses where a related level 3 qualification exists, but is generally not a

[22] We compare the marginal effects rather than odds across models for ease of interpretation and to avoid the problems of lack of comparability discussed in Mood (2010).

[23] We treat the number of A-levels of each type as a continuous variable, rather than a category. This is in order to be consistent with our data from the universities with module scores for which there are fewer observations, and for which we need to be as parsimonious as possible in our models. This has the effect of computing an average relationship per A-level. Robustness checks putting the number of facilitating (or less suitable) A-levels in the models as categorical variables, thus allowing the relationships to vary non-linearly, are discussed in the findings section.

[24] We present the analysis in chart format, with summary regression results in the appendix.

required subjects for entry according to the Russell Group's Informed Choices website (Russell Group, 2021). For question 3.1 we use the same approach taken for our second set of models to examine the relationship of having the related A-level with our three outcomes, comparing those with and without the related A-level among all those with at least one A-level, and controlling for the number of A-levels, as well as the grades, and whether the student has just A-levels or a mixture. Then we do the same for those with BTECs to answer 3.2, including in our sample those with just BTECs and those with a mixture of BTECs and A-levels, taking account of all level 3 points and the total BTEC qualification size, and whether the students have just BTECs or a mixture of A-levels and BTECs.[25]

For all our models we report the marginal effects, which are the difference or gap in probability of an outcome between two groups, calculated with all the other characteristics of the sample set to their average level. For example, for the dropout model in question 1.1, the marginal effects are the difference in probability of dropping out for an average student entering with BTECs rather than with A-levels, comparing people with similar prior achievement, and background characteristics.

Given that our outcomes of interest are binary outcomes – for example, students either dropout or they do not – we use a non-linear probability model (logit) model.[26] It is important to take into account that individual students are clustered on degree courses and within universities, each of which may have different progression rules and methods for calculation of degree results, and different expectations and degrees of support for students with different entry qualification types/subjects. These differences will affect the three outcomes we are interested in, but are not recorded in the data. There may also be broader relationships between qualifications and university outcomes at the level of university type that are of intrinsic interest to policy makers and practitioners. We deal with these issues by using multilevel random effects modelling, which takes into account why individuals in the data have different outcomes as a result of being on their particular degree course at their particular university. Random effects modelling also allows us to examine whether these outcomes differ by university type, once all other characteristics of their students have been taken into account.[27]

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[25] For robustness, the models are rerun including the number and points from A-levels separately in case our results are being affected by students with different proportions of A-level/BTEC mixtures and the results are unchanged to the second decimal place of probability.

[26] This is beneficial so that we can link the results from models which can take any value to a probability, which by definition has to fall between 0 and 1. Although it has been shown that linear models (which are much less computationally intensive) can be run as an approximation where average probabilities of outcomes fall between 0.25 and 0.75 (Chowdry et al, 2013) in this work the average outcomes are outside these limits (for example Table 1 shows the mean probabilities of the outcomes are approximately 0.08 for dropout, 0.04 for repetition and 0.20 for graduating below a 2:1), so logit models are used throughout.

[27] As well as being efficient (allowing high levels of precision of estimation), and computationally less intensive than the alternative fixed effects. This is important when we are dealing with such large samples and several thousand course/university cluster combinations. But in order to do this type of modelling without getting biased results on an individual level we need to be happy that there is no relationship between the 'effects' of a particular university and course on an outcome (for example that a higher than average proportion of students gain a 2:1) and the individual level variables (for example GCSE scores). Common sense would suggest that there is such a relationship, which statistical tests confirm (the 'contextual effect'). We deal with this problem by including university/course level averages of all the individual level variables in the modelling, known as the correlated random effects model. Then the remaining university/course level effects, unaccounted for by anything else in the models, are no longer correlated with the individual level variables. For robustness, the models are rerun adding dummy variables for university and degree subject (fixed effects). The outcome results are unchanged to 2 significant figures.

4. The relationship between qualification types and university outcomes

4.1. Results from linked data

In this section we present our findings for differences in university outcomes between students entering with different qualification types at level 3. Here we concentrate on the differences in outcome for first year students entering with just BTECs, compared with those with just A-levels. We have examined the full range of qualifications set out in Table 1 and a summary of our findings is given in Appendix 6.

For each outcome we give a graph showing the average difference in modelled probability of the outcome between students with just A-levels (set at 0 as the comparison qualification) and with just BTECs. The difference is read off the x axis. A marker on the graph at point 0.04 means a 4 percentage point (pp) higher probability of the outcome for an average student with BTECs than a student with A-levels. The family of models described in the methodology section for each outcome is shown on the same graph with markers of different types. The round markers show the average difference in probability taking only the cohort and university/course into account. The diamonds show what happens to the difference when SES quintile is added to the model. Then prior attainment is added too, shown by squares, and the triangle shows the difference given by the final model, which includes all other demographic measures. The markers are listed in the legend below each graph. The horizontal lines through each marker show the 95% confidence intervals for the estimated difference.

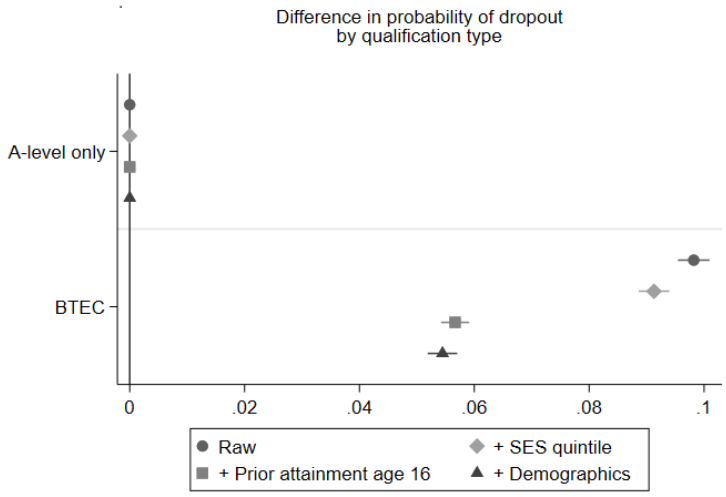
We then include a graph showing the predicted probabilities of the outcome for four groups of students for the model which includes all the control variables, and also allows the relationship of outcome with qualifications to vary with SES. The four markers represent those in the top and bottom SES quintiles with just A-levels, and those in the top and bottom SES quintiles with just BTECs. The probabilities are read off the x axis, and a marker at point 0.08, for example, means the predicted probability of the outcome for that group of students is 0.08, or 8%.

Dropout

Figure 8 starts by looking at differences in the probability of dropout between those with just A-levels and just BTECs. The mean actual dropout rate for those with A-levels is 4.6% (from Table 1), and the graph shows that when we take just the year, and clustering of students within universities and courses into account, the chances of dropping out are just below 10pp higher (round marker – just above the '.1' representing 10pp) for a student on a typical university course with BTEC qualifications at level 3, relative to those taking A-levels – so three times as high.[28]

[28] Note that this raw gap is somewhat smaller than the 13.2pp gap between BTEC and A-level dropout rates shown in Table 1. This is because in all our models we include the cluster means for all the predictor variables (allowing us to model the 'contextual effects'), in order to deal with the associations between mean entry qualifications at course/university level and our outcomes, as discussed in the methodology. These contextual effects account for some of the raw gap.

Figure 8: Gaps in probability of dropout between first years with BTECs only compared with A-levels only



In the second model, we compare individuals with the same social background, and find that differences in social background account for only a small part of this gap in dropout rates between those taking BTECs compared to A-levels at level 3, as shown by the diamond shape point estimates on the graph. We noted in Table 3 that students from the least privileged quintile were between two and three times more likely to experience dropout, repetition or graduating below a 2:1 than their peers from the most privileged quintile. But although students from lower SES backgrounds are less likely to enter with A-levels and more likely to enter with BTECs, as we can see from the mean SES figures in Table 1, this association only accounts for a relatively small part of the gap in the dropout outcome between those with BTECs and A-levels.[29]

In the third model, shown as a square on Figure 8, we compare individuals with the same prior attainment at age 16, using the rich set of measures described in section 3. Of all our models, prior attainment accounts for the largest share of the average difference in dropout rate between students with A-levels and BTECs. Given that we know that the attainment of students entering BTECs is lower, on average, than those doing A-levels, it is not surprising that once we are comparing students with a common measure of attainment as they approach their level 3 studies, the difference in dropout narrows. But although the gap closes somewhat, it remains at 5.7pp. So, comparing two students with the same achievement up to age 16, from the same social background, on the same university course, we find that those studying BTECs at level 3 are 5.7 percentage points more likely on average to drop out than those studying A-levels.

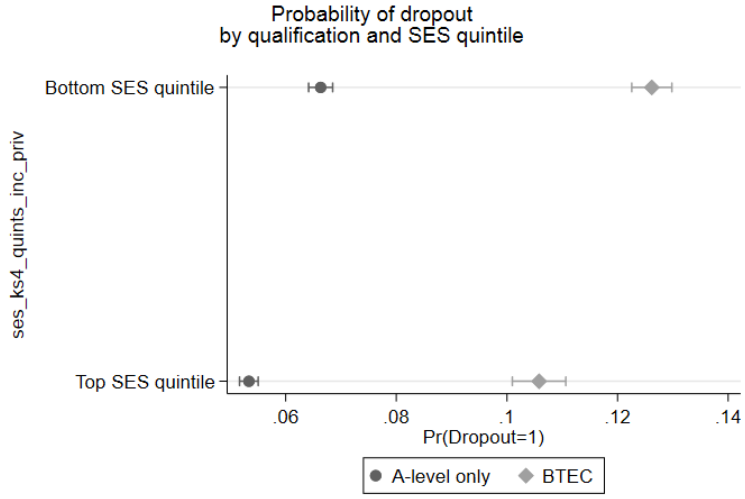
Accounting for the full range of demographic variables described in section 3 reduces the gap a little more, but only to 5.4pp. Our full model suggests that a variety of characteristics of students are significantly related to dropping out. These include coming from an ethnic minority, all of which ethnicities are less likely to dropout than White students; a declared mental health problem or two or

[29] Looking at it from the other angle, the entry qualifications for students from the bottom SES quintile explains some, but by no means all of the gap by SES. The raw SES gap in dropout between top and bottom quintiles is 7.3pp (Table 3). Taking account of the contextual effect of SES by adding in the proportions of students from different SES backgrounds at each university/course combination in the model reduces the gap in dropout to 4pp. This is a large difference, but of course also reflects the association between attainment and SES. Taking into account the qualifications held by students and their demographic characteristics reduces the gap between the top and bottom quintiles to 1.6pp.

more disabilities; whether the student was persistently absent at school; and whether or not the student is living in university accommodation. Yet these differences have little effect on the relationship between qualification type and dropping out. **Even after taking account of the rich set of prior attainment and demographic characteristics in our models an 'average' student entering with just BTECs is almost twice as likely to drop out as a similar 'average' student entering with just A-levels (11.4% compared with 6.0% - a gap of 5.4pp).**[30] In section 4.2 we use module scores data from individual universities to try to explain this persistent gap.

In figure 9 we consider whether the gap in dropout between students with A-levels only or BTECs is the same for students across SES quintiles. The bottom points on the graph are for top quintile students, and bottom SES quintile students are at the top. For each qualification, higher SES students are at an advantage in terms of being less likely to drop out overall. **The raw gap in dropout rates between bottom and top quintile students is 7.3pp (11.9% for bottom and 4.6% for top) but this gap is reduced to 1.6pp when all the variables including qualification type are accounted for** (not illustrated). There is evidence that students in the bottom SES quintile are at a small additional disadvantage from having BTECs rather than A-levels than top quintile students, on average, once all controls are taken into account. Figure 9 shows **the difference between predicted dropout probabilities for just BTEC students (diamond markers) and just A-level students (round markers) is 0.7pp wider for those in the bottom quintile than the top (6.0pp compared with 5.3pp).**

Figure 9: Gaps in probability of dropout between first years with just BTECs and A-levels, full model plus interactions between qualification type and SES quintile



We further check whether the difference we find in outcomes for students with just BTECs is the same for those with 'large' BTECs (such as the Extended Diploma, the size of three A-levels) as for those with a combination of smaller BTECs. Because part of any difference we find could be because on average students doing a combination do fewer BTECs, we run our full model just for those with

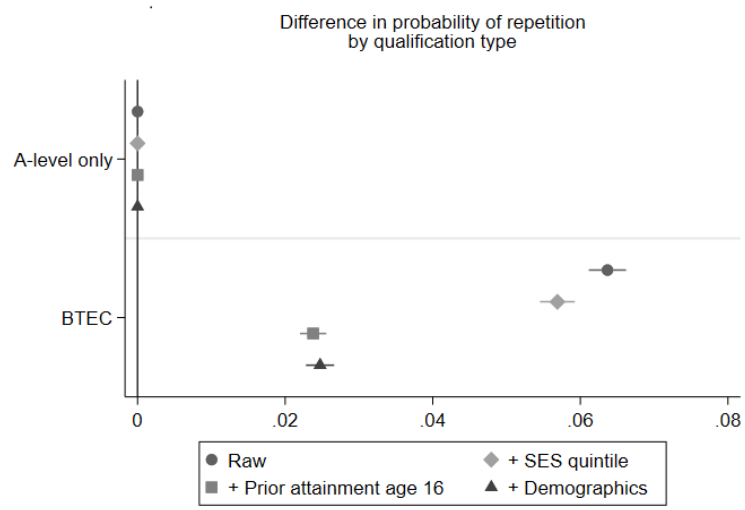
[30] We run robustness checks using quintile of QCA points at level 3 rather than detailed attainment at level 2 for comparison with our main specification, and for the results from the university datasets containing module scores, where only level 3 points are available. The gap in dropout between those with A-levels and BTECs using level 3 attainment quintiles is slightly larger, at 7.4pp rather than the 5.4pp we find using attainment at age 16. This larger gap is consistent with BTECs being somewhat more generously awarded QCA points than A-levels (Ofqual, 2018) so better outcomes given attainment would be expected for BTEC students than are observed. Using level 3 points thus slightly over-estimates the gap.

A-levels, a mixture of A-levels and BTECs or just BTECs, as for the other qualifications we do not have full size of level 3 qualification data[31]. **We find that those with 'large' BTECs are slightly more likely to drop out than otherwise similar students with a mixture of smaller BTECs, but the difference is only 0.7pp** on average.

Repetition

Next we consider the differences in the probability of repeating the first year at university for those taking different qualifications at level 3. The probability of repetition is somewhat smaller than for dropout as shown in Table 1, but the patterns of relationship with qualification type are similar. Students with BTECs are 6.4pp, or about three times as likely, to repeat as students with A-levels (probabilities 9.2% and 2.8%).[32] Figure 10 shows that, as for the dropout outcome, taking account of the SES quintile of our sample (diamond marker) reduces this gap a small amount. Comparing individuals with similar prior achievement in the third model, shown by the square, accounts for the largest part of the gap, reducing it to 2.4pp. Comparing individuals with similar demographics (triangle) makes negligible further difference to the gap by qualification type (now 2.5pp), although some demographic characteristics are related to repetition[33]. **Even comparing those with similar prior achievement and from similar social backgrounds, the probability for repetition for those with BTECs (5.9%) is 1.7 times that of those with A-levels (3.4% for an 'average' student), although it should be noted that the rates of repetition are low in both cases.**

Figure 10: Gaps in probability of repetition between first years with BTECs only compared with A-levels only



[31] These students account for 93% of our main entry cohort sample.

[32] The contextual effect of the proportion of students with different qualification types by university/course combination is smaller for repetition, so at 6.4pp the 'raw' difference in probability of repetition between those with BTECs and A-levels (circle marker in Figure 10) is closer to the difference of 6.8pp we can compute from Table 1.

[33] A robustness check using quintiles of level 3 QCA points to measure prior attainment rather than detailed level two qualifications shows a somewhat larger gap of 4.2pp for the repetition outcome – for the same reason we describe for the dropout outcome.

Figure 11: Gaps in probability of repetition between first years with just BTECs and A-levels, full model plus interactions between qualification type and SES quintile

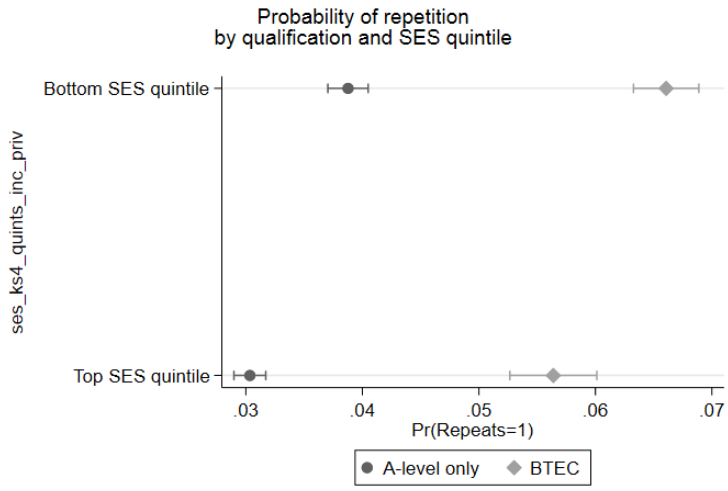


Figure 11 illustrates the gaps in differences in repetition for the full model, comparing students with different SES backgrounds. As we have already seen, those with BTECs are much more likely to repeat than those with A-levels for both top and bottom SES quintile students. The gap between qualification type is very similar – 2.6pp for top quintile students and slightly larger (2.7pp) for bottom quintile, which is not a significant difference at conventional levels.

We do not find any significant difference in average chances of repetition between students entering with 'large' BTECs and a combination of smaller ones.

Graduating below a 2:1

The last of the outcomes we examine in this section is graduating below a 2:1. We can see from Table 1 that over two and a half times as many BTEC students graduate below a 2:1 as A-level students (39.5% compared with 14.9%). This gap of nearly 25pp is reduced in our raw model to 20.2% in figure 12 (round marker) when we compare individuals graduating from typical university courses. As for the first two outcomes considered, comparing individuals from the same SES quintiles reduces the gap, but only by a small amount – in this case by 1.6pp (diamond marker).

Again, comparing individuals with similar prior attainment at age 16 makes the biggest contribution to closing the gap in graduating below a 2:1 between those with BTEC qualifications versus A-levels, considerably reducing it (square marker), while adding demographics slightly widens the gap (triangle), with some individual characteristics significantly related to chances of graduating below a 2:1. **This remaining gap, once accounting for all observable differences between students with different qualification types, is 7.2pp, so BTEC students are on average 1.4 times more likely to graduate below a 2:1 than similar students with A-levels (24.9% compared with 17.7%), even when we are comparing 'average' students with the same attainment at age 16 and a large range of characteristics, within the same university/course combination**.[34]

[34] A robustness check using quintiles of QCA points at level 3 rather than level 2 performance shows an even larger persistent gap in the full model of 15.4pp. Tariff quintile has only a small effect on the BTEC gap (less than 2pp compared with 10pp for level 2 attainment). This is consistent with BTECs being marked more generously than A-levels, but also that there may be attenuation bias in the use of quintiles, which are a poorer measure of attainment than the detailed set of level 2 variables in our models.

Figure 12: : Gaps in probability of graduating below a 2:1 between graduates with BTECs only compared with A-levels only

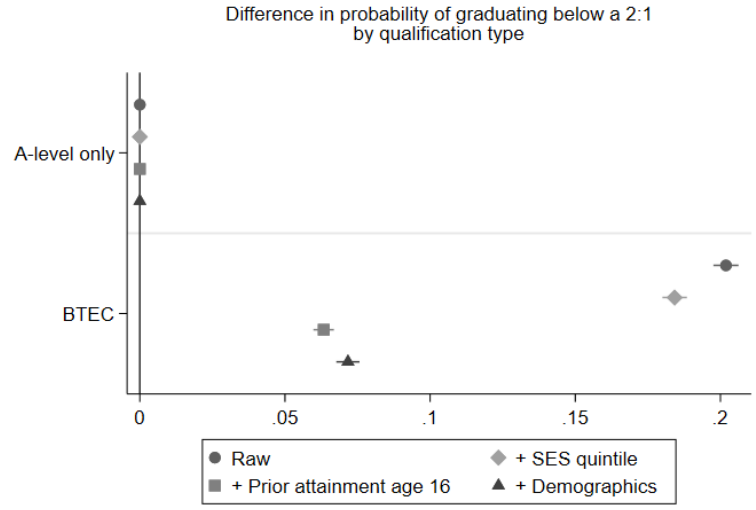
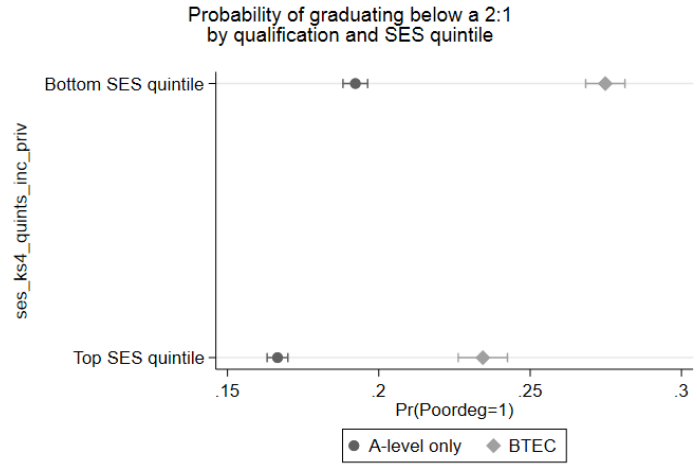


Figure 13: Gaps in probability of graduating below a 2:1 between graduates with just BTECs and A-levels, full model plus interactions between qualification type and SES quintile



As with dropout, Figure 13 suggests that there is evidence of a significant additional qualification gap in graduating below a 2:1 for graduates coming from a low rather than high SES background. The mean SES gap in the full models for graduating below a 2:1 is 3.1pp (not illustrated). **The estimated gap between those with just BTECs and just A-levels is larger for bottom SES quintile than top SES students (8.3pp compared with 6.8pp) – in other words low SES students seem to experience a 1.5pp worse penalty if they have BTECs rather than A-levels than their top quintile peers.**

For the graduation outcome, we do not find any significant difference in outcome between those with 'large' BTECs and a combination of smaller BTECs.

4.2 The mediating role of module scores

In this section, we try and "explain" the greater probability of dropping out and graduating below a 2.1 experienced by BTEC students, versus those with A-levels, using our data from individual universities.

In particular, we include students' annual module score performance in our models (alongside controls for SES, prior attainment and demographics), observing how their inclusion diminishes any differences in relationship between level 3 choices and our outcomes of interest. This will tell us whether academic performance at university is a key driver of the gaps we observe between A-level and BTEC students.

Note that for the most part we are able to include the same controls as in the main models described in the previous section. However, as described in Section 3.2, we do not hold age-16 attainment data in our module scores dataset, only the entry tariff of students at age 18 (i.e. their A-level or equivalent Level 3 scores). We note that in the main models, the inclusion of age 16 attainment reduced the performance gap between A-level and BTEC students, though substantial gaps remain even once these controls are included. Therefore, we would expect to see bigger gaps remaining in this data in the absence of Key Stage 4 data, giving us an upper bound estimate of the university outcome gaps. As we will see, these gap are, for the most part, eliminated by the inclusion of module scores, suggesting that academic performance at university is a key driver in differences in university outcomes for those taking different level 3 qualifications.

Figures 14 and 15 present differences in the probability of dropout between students with just BTECs and just A-levels, first for post 92 universities (Figure 14) and then for the one Russell Group university where we can perform this analysis (Figure 15). We follow the same convention as above, first looking at the raw correlation between qualification type and dropout, then controlling for SES (in the form of parental income), prior attainment, demographics, and then finally module scores at university (with the same symbols used in the previous sections).

First, looking at the post 1992 universities, there is a substantial raw gap in the dropout rate for BTEC students versus A-level students. This gap decreases very slightly, but remains substantial, with the addition of controls for SES, prior attainment (at age 18), and demographics (age, gender and ethnicity). However, the addition of module scores eliminates this gap altogether for both post 1992 universities that we analyse. This suggests that the gap in dropout rates between BTEC and A-level students is correlated with academic failure at university (rather than, for example, BTEC students deciding that university is "not for them" and dropping out). For the Russell Group university, we observe the same patterns (though note in most cases, the error bars are quite large in these estimates, which is unsurprising given they are for single universities).

Figure 14: Gaps in probability of dropout in any year between students with just BTECs and A-levels (Post 92 universities)

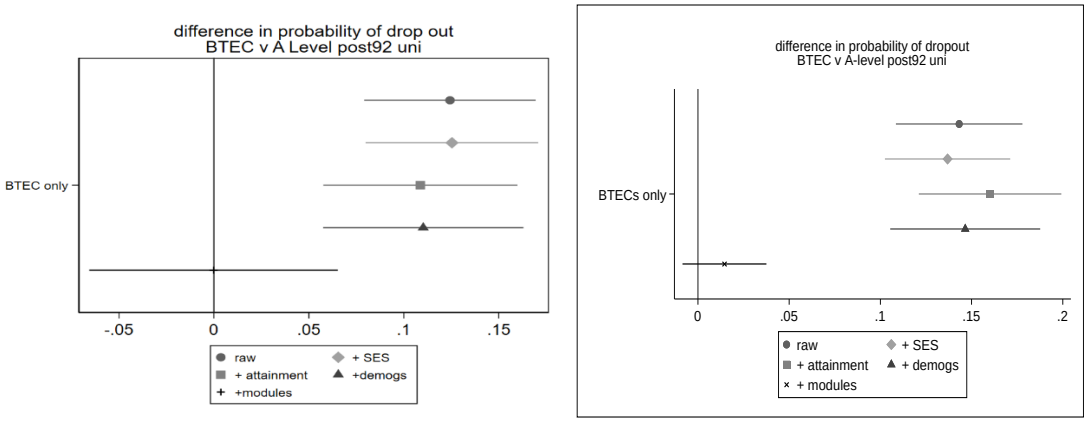
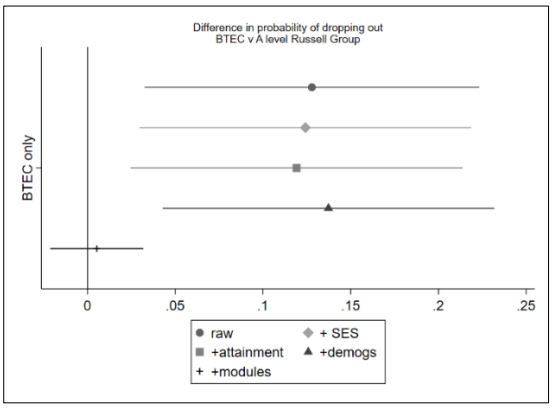


Figure 15: Gaps in probability of dropout in any year between students with just BTECs and A-levels (Russell Group universities)



Turning to the probability of graduating below a 2.1, Figures 16 and 17 (for post 1992 and Russell Group universities), show the same pattern for the post 1992 university for which we have data on this outcome, with BTEC students significantly more likely to graduate below a 2.1, relative to those studying A-levels at level 3. As with our findings for dropout rates, this difference in experience between BTEC and A-level students seems to be entirely explained by university module scores. However, for the Russell Group university the substantial gap between BTEC and A- Level students remains. This could be because while we control separately for average module scores each year, we do not have available to us the weighting of each module score used in the calculation of the degree classification. The persistent gap we find could be because BTEC students are doing less well on average in modules that are more heavily weighted in the calculation, perhaps for modules such as dissertations, but we are unable to confirm this with our data.

Figure 16: Gaps in probability of graduating below a 2.1 between students with just BTECs and A-levels (Post 1992 universities)

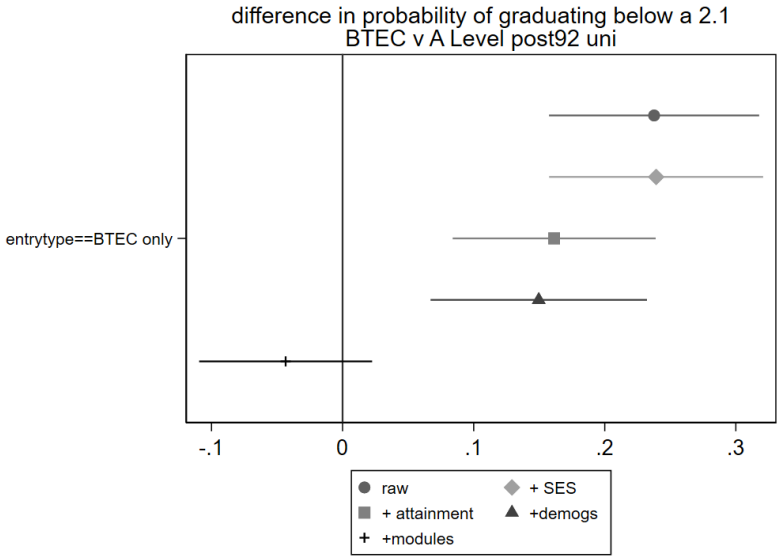
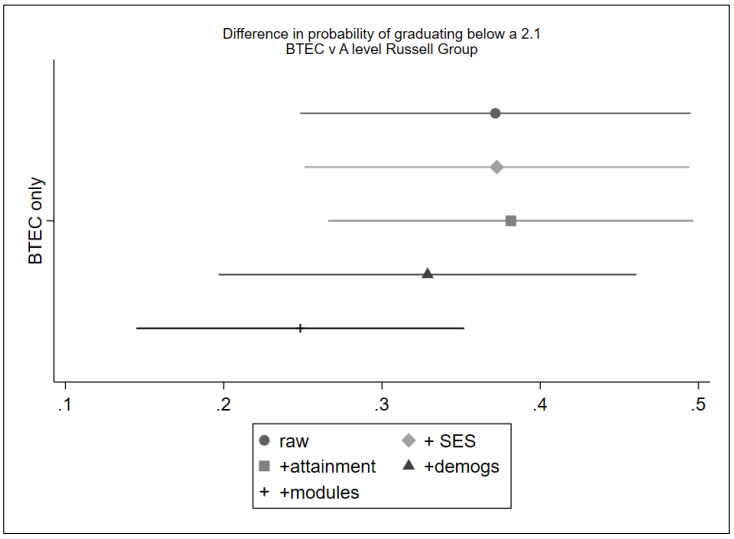


Figure 17: Gaps in probability of graduating below a 2.1 between students with just BTECs and A-levels (Russell Group universities)



For one 'most new' (Post 92) university we were able to distinguish between first year module scores assessed entirely by coursework, and those assessed either by examination or a mixture of examination and coursework. For students taking at least one of each sort of module, the difference between entrants with BTECs only and A-levels only was compared, also taking into account prior attainment, social background and demographics in modelling. Students with BTECs on average performed 0.8 standard deviations worse on their (at least partly) exam-assessed modules than A-level entrants, but only 0.6 standard deviations worse on modules assessed entirely by coursework. There was no significant difference in mean standardized marks by assessment method for A-level students. BTEC students will on average have less experience of examinations than A-level students and presumably also less training in examination study techniques. **The evidence from this university suggests that at least part of the gap in outcomes we observe is narrowed when assessment methods are more closely aligned to those students are used to. It should also be noted that the BTECs taken by students in our samples predate the new reformed BTECs which have increased**

proportions of external assessment (40% in order to be included in performance tables), although the external assessment does not necessarily have to be a written examination.[35] It may be that these reforms will align BTEC students' preparation more closely with the assessment methods they encounter at university.

[35] External assessment can also include research or an investigation or tasks carried out under supervision over a number of sessions (UCAS, 2019).

5 The relationship between 'Facilitating' and 'Less suitable' A-levels and university outcomes

5.1 Results from linked data

Dropout

We start by examining whether having more facilitating A-levels is related to a lower chance of dropping out of university. Here we consider a more restricted sample than in the previous section; just people with at least one A-level. In our model we take account of the total number of A-levels taken by each individual, so that we can interpret our results as comparing two otherwise similar students with the same total number of A-levels, where one student has one more facilitating A-level than the other.

The left-hand panel of Figure 18 shows that the baseline, or raw gaps, per A-level are relatively small, at -0.8pp per facilitating A-level. This means that, on average, a student with three facilitating A-levels will be 2.4pp less likely to drop out than a student with no facilitating A-levels.[36] The second model (diamond markers) additionally includes SES quintile, which makes no difference to the gap. Students with the same levels of prior achievement, both at level 2 (GCSEs and equivalents) and level 3 (post-16) are compared in the third model (squares). This reduces the association with having an additional facilitating rather than any other A-level, to -0.5pp.

Other demographic characteristics (triangle markers), are added in the fourth model. These characteristics combined make negligible difference to the relationship of dropping out with facilitating subjects. **Overall, comparing two students with the same number of A-levels, same prior achievement at GCSE and post-16 education, and same SES and demographic characteristics, the one taking an additional facilitating subject has 0.5ppt lower probability of dropping out than the student taking an A-level in a non-facilitating alternative, where the mean chance of dropout for this sample is 4.7% for a student with no facilitating subjects and otherwise average characteristics.**

For robustness we rerun the full model treating the number of facilitating subjects as categories rather than continuous (none, one, two, three or more) to allow the relationship of dropout with number of facilitating subjects to be non-linear, to compare with the average of -0.5pp per facilitating A-level we show in Figure 18. **This model suggests a beneficial relationship of having one rather than no facilitating subjects of 0.7pp and two rather than none of 1.4pp with a negligible greater benefit from having three or more rather than two.**.

In the right-hand panel of Figure 18 we examine A-levels classified as 'less suitable' - where at least one Russell Group university expresses reservations about their suitability for university entry, and which are never required for the related degree at a Russell Group university. This is not the converse of the results for 'facilitating' A-levels because of the other categories which exist (full list in Appendix 3). Thus the models are examining the relationship of outcomes with having a 'less suitable' rather than any other A-level, which could be from any other category, including facilitating A-levels.

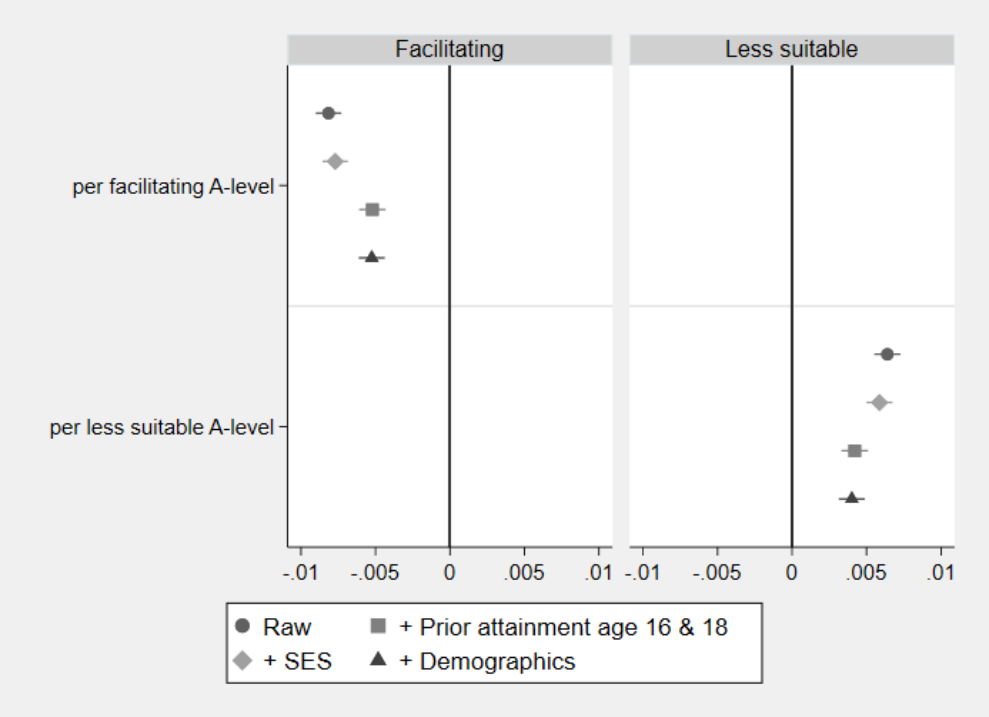
This right-hand panel of Figure 18 shows the probability of dropout for each additional less suitable A-level held, rather than one from any other category, among first year students entering with at least one A-level. **The raw difference[37] suggests that each less suitable A-level rather than one of any**

[36] This is smaller than the gap suggested in Figure 2 because we include the number of A-levels in the raw model, as well as the contextual effects of proportions of students with different numbers of facilitating subject A-levels at each course/university combination in our models, and these effects are significantly associated with the chances of dropping out.

[37] taking into account cluster means

other type is related to a 0.6pp increased chance of dropping out. Taking into account SES, prior attainment and demographics makes a small difference to this gap, reducing it to 0.4pp, or 1.2pp for those with three less suitable A-levels rather than none. The baseline probability in this sample for someone with no less suitable subjects is 3.9%, so on average having three rather than no less suitable subjects is related to an increase in the chances of dropout to 5.1%, significant, although still low in absolute terms.

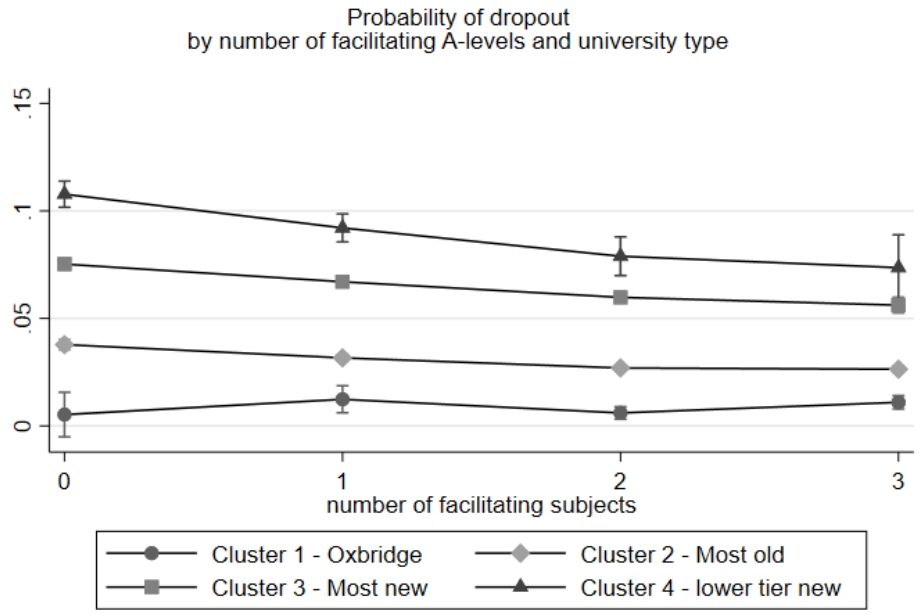
Figure 18: Gap in probability of dropout by number of facilitating A-levels, and by number of less suitable A-levels



Our models suggest that the relationship between dropout and number of facilitating A-levels varies by university type. Figure 19 plots the average dropout rate by number of facilitating A-levels among those with any A-levels for students at four different groups of universities: Oxbridge (Boliver cluster 1), 'most old' (cluster 2), 'most new' and 'lower tier new'. For Oxbridge and most old universities the overall probability of dropout is lower than for the two other categories, and the differences in probability of dropout by the number of facilitating subjects are small.[38] **In the 'most new' and 'lower tier new' groups, where a smaller number of facilitating subjects are held by students, having more facilitating A-levels is associated with bigger differences than when they are more widely held. So the beneficial relationship of more facilitating A-levels increases as the university type becomes less selective**.

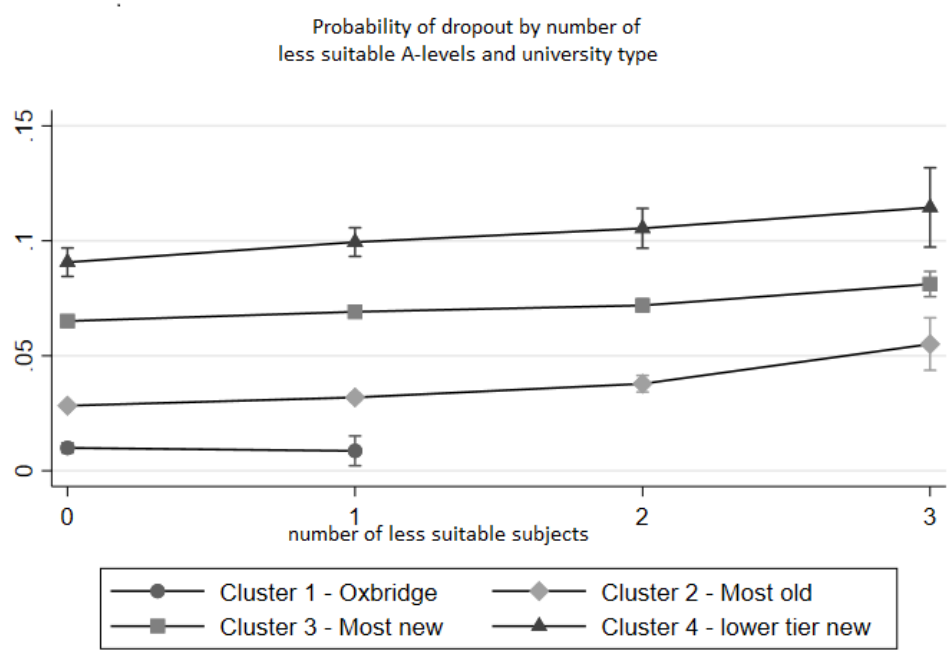
[38] The average number of facilitating subjects held varies considerably by university type, as shown in Appendix 4, varying between 2.9 for Oxbridge to 0.8 for 'lower tier new'. This reflects the proportion of degree courses for which facilitating subjects are required by university type, as well as the association between choice of facilitating subjects and prior attainment.

Figure 19: Probability of dropout by number of facilitating A-levels and university type



For less suitable subjects in Figure 20 we see the same ordering of dropout probability by university type that we noted for facilitating subjects, but here we see an upwards slope for all three of the larger groups of universities we examine. The relationship is similar for all three groups, although slightly steeper for 'most old' universities (those with the fewest less suitable A-levels) than the two groups of newer universities.

Figure 20: Probability of dropout by number of less suitable A-levels and university type

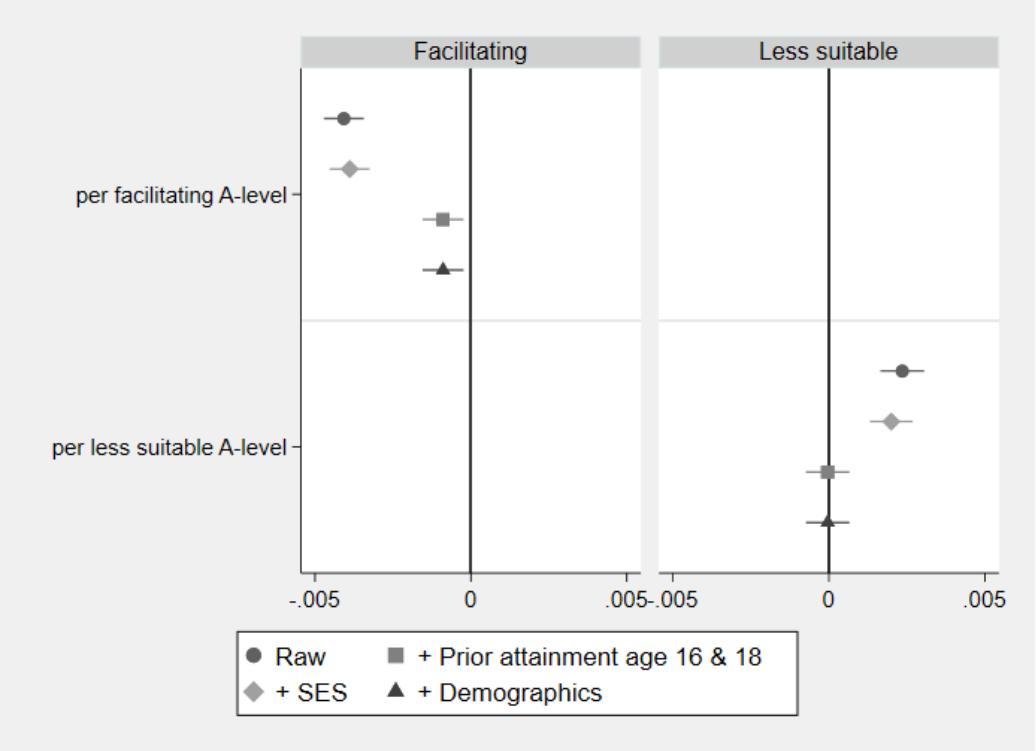


Repetition

Turning to our second university outcome, we can see in the left-hand panel of Figure 21 that the more facilitating A-levels an entrant has, the less likely they are to repeat the year, although the relationship is small once prior achievement and demographics are accounted for. **Comparing two students with similar SES, prior achievement and demographics, the student with three facilitating A-levels has a 0.3pp reduced chance of repetition, relative to the student with no facilitating A-levels. The mean repetition proportion for this sample is 3.1%.**

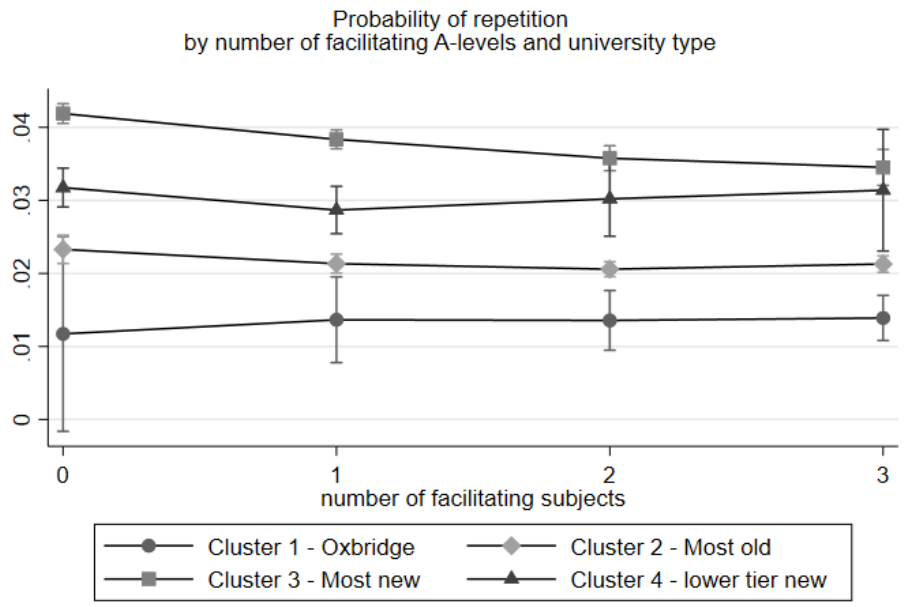
The relationship between less suitable A-levels and repeating the first year shown in the right hand panel of Figure 21 is non significant after controlling for SES, attainment and demographics). The small gaps for repetition observed in Figure 3 are completely accounted for in our models so we cannot conclude that there is any relationship between studying less suitable A-levels and repeating the year at university.

Figure 21: Gap in probability of repetition by number of facilitating and less suitable A-levels



As we saw for our dropout outcome, the pattern in the association between facilitating subjects and university outcomes varies by university type. Figure 22 shows that **the 'most new' universities category has the highest proportion of students repeating, amongst those with A-levels, and that the more facilitating subjects are held, the less the probability of repetition for this group. For the other three groups of universities the differences were not significant**.

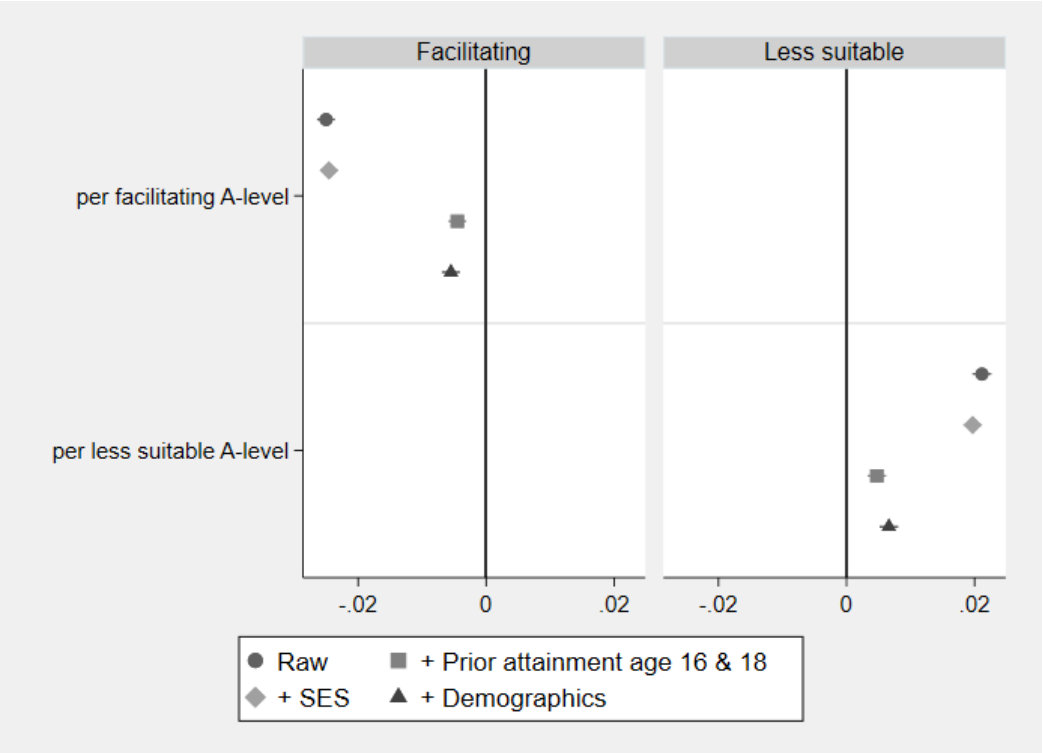
Figure 22: Probability of repetition by number of facilitating A-levels and university type



Graduating below 2:1

For the probability of graduating below a 2:1, we see larger gaps between those with facilitating compared to non-facilitating subjects at A-level in the left-hand panel of figure 23 (although of course the probability of graduating below a 2:1 is also larger than the probability of the other outcomes). The raw gap (circle marker) shows that each additional facilitating A-level rather than an A-level of any other type is related to having a 2.5pp reduced chance of graduating below a 2:1.

Figure 23: Gap in probability of graduating below a 2:1 by number of facilitating and less suitable A-levels

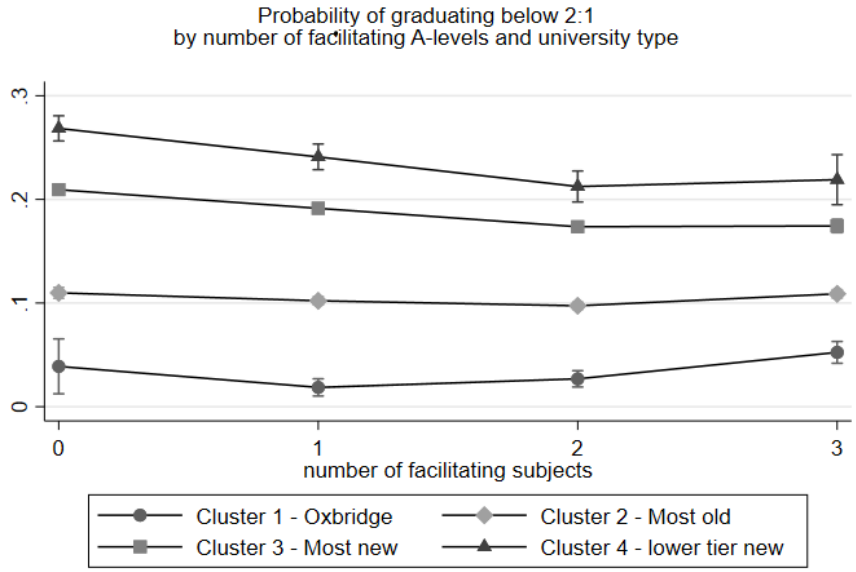


Taking account of SES makes no difference to the estimate, then adding in prior achievement (diamond markers) and demographics (square markers) reduces the difference to 0.6pp. **The mean graduating below 2:1 proportion for this sample of students with at least one A-level but none facilitating is 22.8%, so having three rather than no facilitating levels is associated with reducing the chances of graduating below 2:1 by 8% on average – a relatively small but significant relationship**.[39]

Conversely, the difference in outcome between those studying less suitable compared to other A-levels is shown in the right-hand panel of figure 23. The raw gap of 2.1pp per A-level is reduced to 0.7pp, slightly larger than the relationship with each facilitating subject, but with the opposite sign. **The mean below 2:1 graduation rate for students with no less suitable A-levels in this sample is 14.3% (Figure 4), so there is a 15% increase in the chance of graduating below a 2:1 for someone having three rather than no less suitable A-levels, on average**.[40]

Figure 24 shows that the probability of graduating below a 2:1 varies considerably by university type, with more selective university groups having lower proportions of students graduating below a 2:1 than less selective ones. As we have seen for dropout and repeating the year, **the beneficial relationship of having more facilitating subjects with the graduation outcome is most obvious for the least selective groups of universities, 'lower tier new' and 'most new' where the average number of facilitating subjects held is smaller**.

Figure 24: Probability of graduating below 2:1 by number of facilitating A-levels and university type

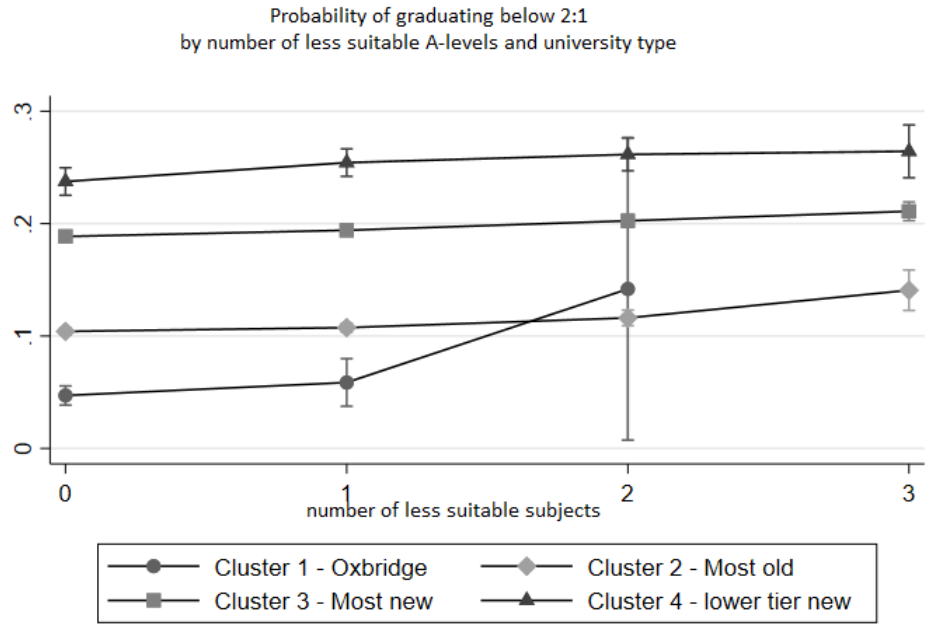


[39] A robustness test allowing the number of facilitating A-levels to vary non-linearly with graduation suggests that on average having one rather than no facilitating A-levels is associated with a 1.6pp gap, but having two rather than none is 2.9pp and having three is 1.6pp. In other words there seems to be benefit in having one or two facilitating A-levels, but having three rather than two is related to a slightly worse graduation outcome, on average.

[40] A robustness test allowing numbers of A-levels to vary in a non-linear way gives substantially unchanged estimates of the relationship, with each additional less suitable A-level contributing around 0.7pp to the gap, as estimated for the main model.

We see the same sort of pattern by university type for the relationship of graduation with number of less suitable A-levels, but this time with an upward rather than downward sloping set of lines (Figure 25), and similar slopes on each suggesting there is not much difference in the association between graduating below a 2:1 and taking less suitable A-levels between university types. The exception is Oxbridge, where so few students have two less suitable A-levels that the estimates are too imprecise to interpret.

Figure 25: Probability of graduating below 2:1 by number of less suitable A-levels and university type



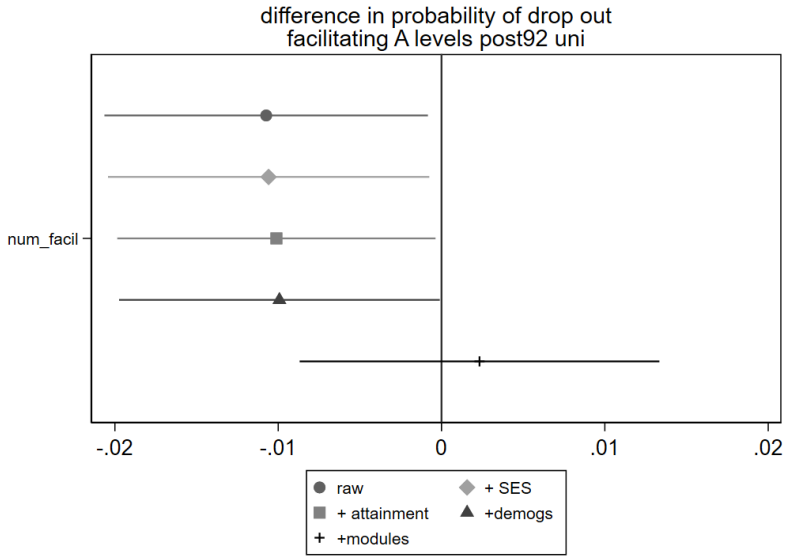
5.2 The mediating role of module scores

Facilitating subjects

As we did with qualification types, we can attempt to explain the relationship between possession of facilitating and less suitable A-levels and degree outcomes using our individual universities dataset, including detailed information on the module scores of students while at university.

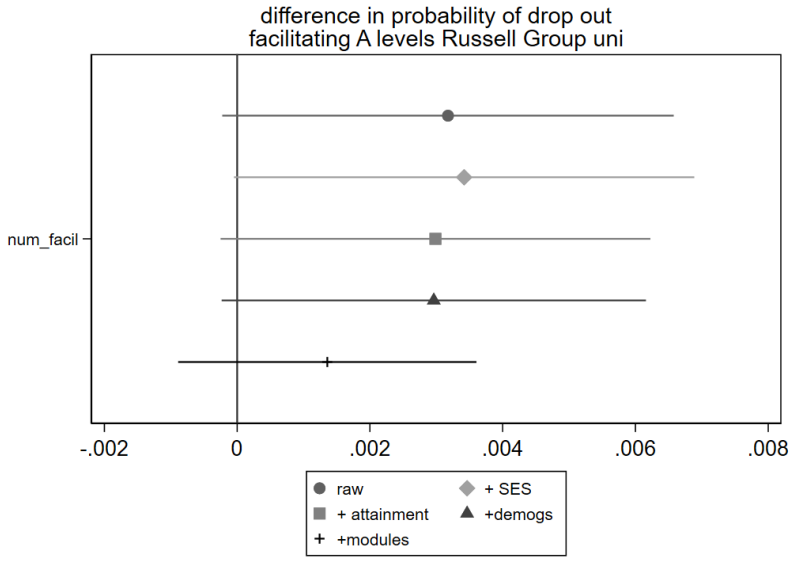
In Figure 26 we show these relationships for a representative post 1992 university (see Appendix 8 for estimates across all separate universities in our dataset). Here, though the estimates are subject to higher levels of uncertainty, we can see that the number of facilitating A-levels is negatively related to dropout as we saw in the administrative data in the previous section, and that these estimates associations disappear with the inclusion of module scores (though note the confidence intervals around these estimates are quite large suggesting a high degree of uncertainty).

Figure 26: Gap in probability of dropout by number of facilitating A-levels – Post 1992 universities



Interestingly, however, for Russell Group universities the findings are less clear. Figure 27 shows one example of this (other estimates for Russell Group universities in Appendix 8), where the relationship between facilitating A-levels and dropping out of university is far less obvious. Indeed, there are no significant differences between additional facilitating subjects and dropping out across models, and the inclusion of module scores data doesn't change this. This would seem to suggest that facilitating A-levels are more important for post 1992 universities than they are for Russell Group universities, perhaps because such students are more likely to "stand out" in post 1992 universities. This is consistent with our findings from the administrative data (see Figure 19) where holding facilitating subjects has a larger association with reduced chances of dropping out at newer institutions.

Figure 27: Gap in probability of dropout by number of facilitating A-levels – Russell Group universities



We next look at the degree classification outcome, in Figure 28 for a representative Post 1992 university, and in Figure 29 for a Russell Group university. As with the dropout outcome, there is a clear negative relationship between facilitating subjects and graduating below a 2.1, which is eliminated by module scores, for post 1992 universities. But the results are less clear for the Russell Group where the results are insignificant across the board. Again, this is consistent with our findings from the administrative data where the association between facilitating A-levels and graduating below a 2:1 is stronger in newer institutions (see Figure 24).

Figure 28: Gap in probability of graduating below a 2.1 by number of facilitating A-levels, post 1992 universities

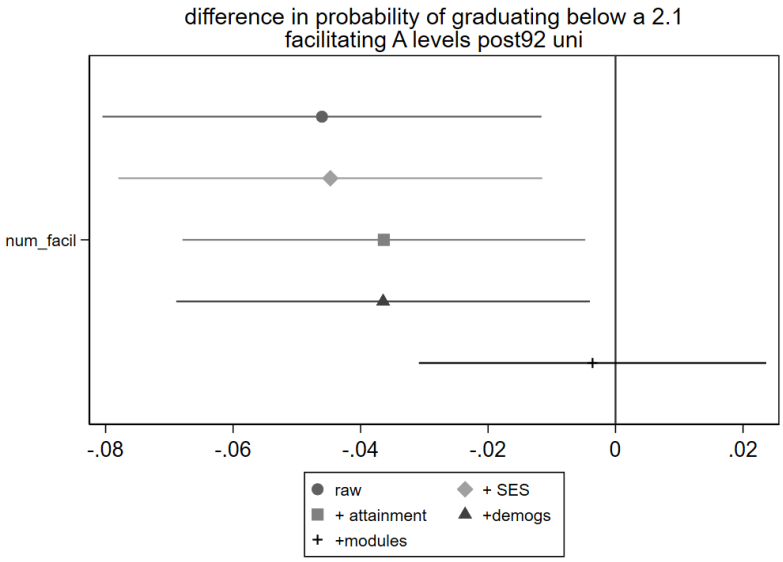
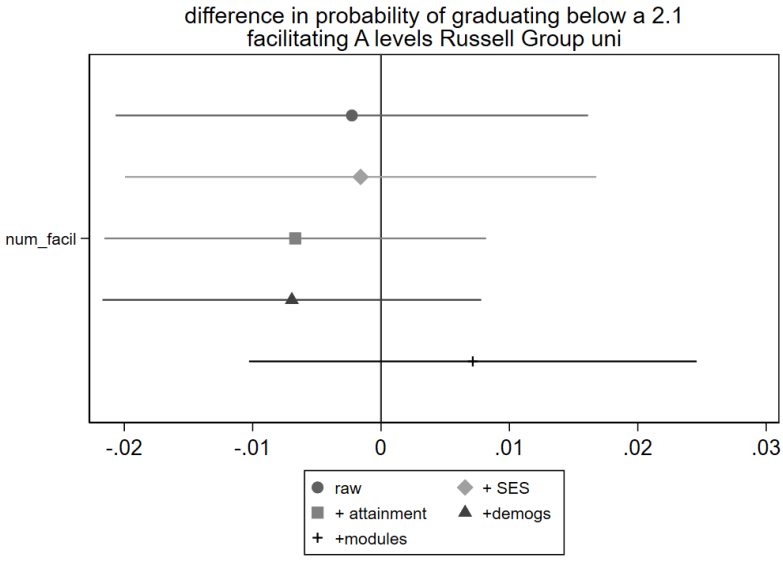


Figure 29: Gap in probability of graduating below a 2.1 by number of facilitating A-levels, Russell Group universities



Less suitable subjects

We can also consider the role of module scores in mediating the relationships with university outcomes for less suitable A-levels. First, we explore this for our outcome of dropping out, in Figures 30 and 31 for a representative post-92 and Russell Group institution respectively. For both university types, the results are fairly inconclusive, and we are able to say very little about the impact of module scores as a mediator of the relationship between possession of less suitable A-levels and dropout.

Figure 30: Gap in probability of dropout by number of less suitable A-levels, post 1992 universities

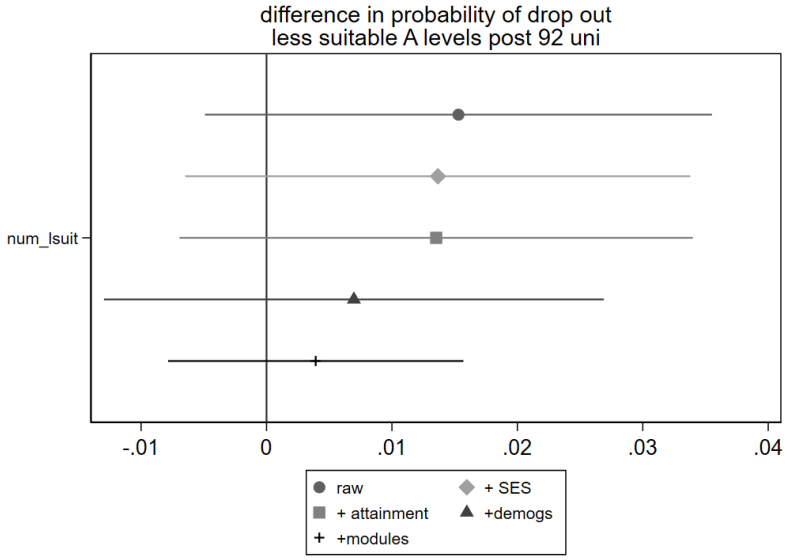
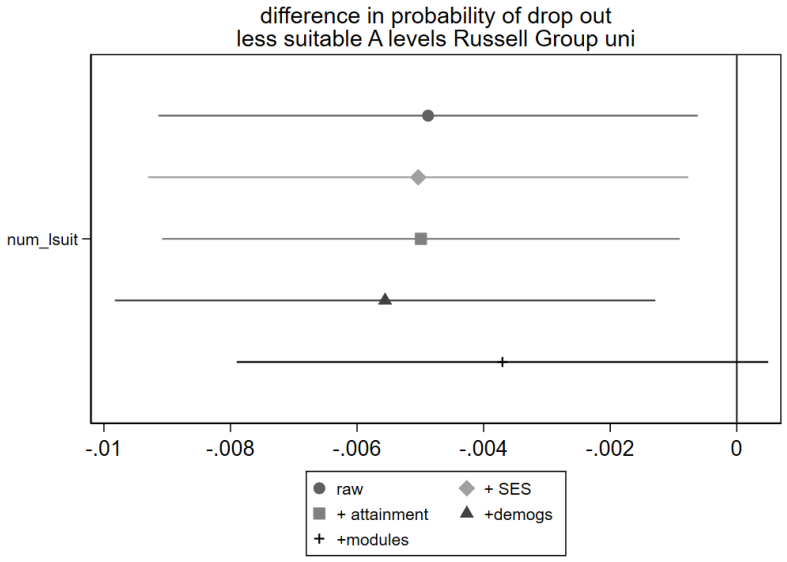


Figure 31: Gap in probability of drop out by number of less suitable A-levels, Russell Group universities



For our outcome of graduating below a 2:1, Figures 32 and 33 show results for our post 1992 and Russell Group universities respectively. Here, for both types of institution, there is a clearer positive relationship between holding a less suitable A-level and graduating below a 2:1. This relationship is fully mediated by module scores across both types of institution. This indicates that the academic performance through university is the mechanism through which holding a less suitable A-level is associated with graduating below a 2:1.

Figure 32: Gap in probability of graduating below a 2.1 by number of less suitable A-levels, post 1992 universities

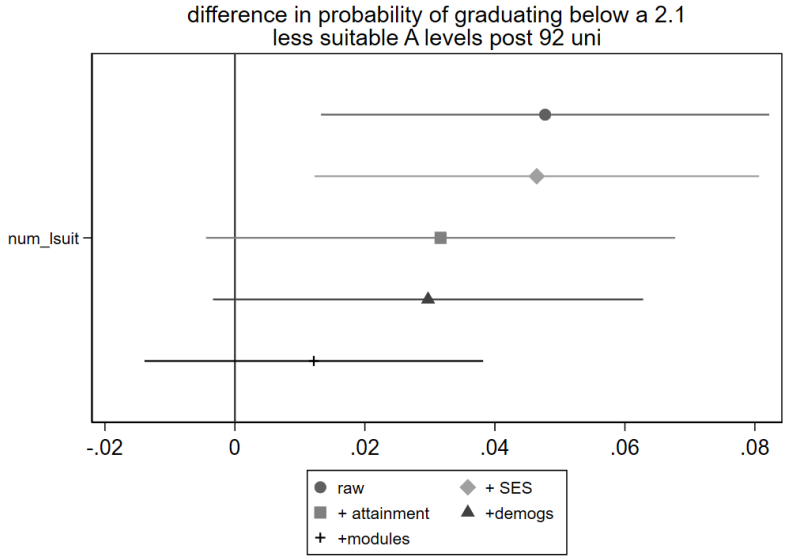
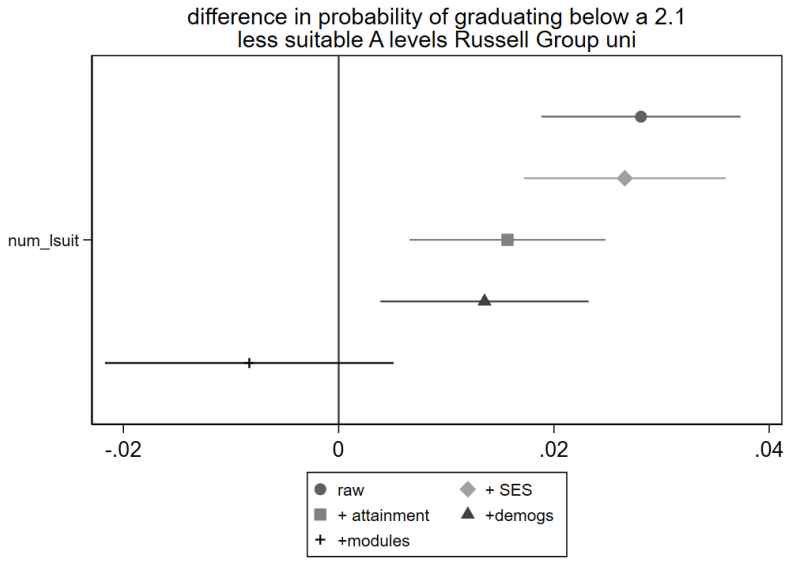


Figure 33: Gap in probability of graduating below a 2.1 by number of less suitable A-levels, Russell Group universities



6 Choice of A-level and BTEC subjects and outcomes for popular degree courses without a pre-requisite in the related subject

6.1 A-level subjects

We now turn to look at subsets of our administrative data: students taking degree courses in the subjects of interest described in section 3.1.4, and how their university outcomes relate to whether they have an entry qualification in the same subject. In Table 6 we look at outcomes for those with an A-level in the related subject, comparing them in these full models with someone who is the same in all measurable respects, doing the same subject at the same university, except they have an A-level in any other subject instead of one in the related subject. None of these related subjects is defined as 'facilitating', and most are classified as 'less suitable' in the taxonomy in Appendix 3 (computing, sociology and psychology are the exceptions, classified as 'useful').

As shown in Table 6 the picture is mixed. For some subjects, having the related A-level is associated with having significantly better outcomes, while for others, there is no significant relationship, particularly where there are relatively few students in the sample and the chances of the outcome are low (for example accounting, media studies and drama). There are no subjects for which having the related A-level is significantly associated with increased chances of adverse outcomes. For computing, sociology, psychology and sports science degrees, students are significantly less likely to drop out (with about 0.7 times the chance of someone without, on average).[41] These are relatively large relationships, consistent with students with the related subject being at an advantage likely because of preparation provided by the subject content of their A-level.[42]

Table 6: Percentage point difference in dropout, repetition and graduating below 2:1 by having the related A-level (compared with not) for sample with at least one A-level, full models

	Accounting	Business	Media	Sociology	Sports Science	Drama	Computing	Law	Psychology
Dropout	-0.009	0.002	-0.003	-0.017***	-0.020***	-0.000	-0.032***	-0.005	-0.017***
	(0.006)	(0.003)	(0.005)	(0.004)	(0.005)	(0.006)	(0.005)	(0.003)	(0.004)
Repetition	-0.021***	-0.002	-0.004	-0.005	-0.013***	-0.005	-0.014***	-0.013***	-0.010***
	(0.004)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
N	13,540	34,015	12,980	17,065	14,680	9,000	19,200	27,505	35,240
Graduat'g below 2:1	-0.015	-0.016***	0.004	-0.018*	-0.037***	-0.019**	-0.024**	-0.020***	-0.045***
	(0.010)	(0.004)	(0.007)	(0.008)	(0.009)	(0.007)	(0.008)	(0.006)	(0.006)
N	11,475	29,690	10,910	13,860	13,215	8,440	15,470	23,185	29,750

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

For repetition, a significant beneficial relationship with having the related A-level is found for accounting and law students, as well as for computing, psychology and sports science students, although for other subjects no significant relationship can be identified. These relationships are of a similar size relative to the modelled probability for those without the related A-level as for dropout,

[41] Gaps of 3.2pp, 1.7pp, 1.7pp and 2.0pp respectively between students with and without the related A-level which corresponds to a multiple of 0.6, 0.8, 0.7, and 0.8 of the modelled probability of someone without the related A-level but who is similar in all other observed respects.

[42] Perhaps also through motivation if they know more about their degree subject through their A-level studies and are less likely to drop out because they find they don't like it once they arrive at university

with the average chance of repetition multiplied by between 0.6 and 0.7. This provides a suggestion that it is the academic preparation rather than any particular familiarity with a subject that is driving the differences we observe: students who repeat the same subject at the same university are likely to be committed to that subject so a decision to repeat is more likely to be a consequence of academic failure than having made the wrong subject choice in the first place.

Computing, sports science and psychology A-level also have significant beneficial relationships with the graduation outcome, as well as for business, law, and drama and a suggestion for sociology. The gap in graduation outcome between those with and without the related A-level across all these subjects are smaller for the graduation outcome: it is perhaps not surprising that the 'effects' of having a related A-level reduce over time at university. Students with the related A-level in psychology are at the largest relative advantage, with such students three quarters as likely to graduate below a 2:1 than those without, all else equal. And of these subjects with significant differences, sociology students have the smallest gap, with sociology A-level holders 0.9 times as likely as non-holders to fail to graduate at 2:1 or above.

These results suggest that choosing a non-facilitating A-level subject related to, but not compulsory for, what they go on to study at university may be beneficial (or at worst neutral) for the students on the courses we have examined. It may be that by choosing one of these subjects at A-level students' eyes are opened to a new discipline with new enthusiasm, which persists through university, as well as providing helpful subject knowledge. On the other hand these observed relationships may be a consequence of unmeasured factors, such as motivation to study a particular subject.

6.2 BTEC subjects

When we examine the relationship between our university outcomes of interest and having a BTEC in the related subject rather than any other BTEC subject,[43] we find a different picture from that for related A-level subjects. In Table 7 we look at the gaps between the modelled outcomes for these students with and without the related subject, for our full models. As we saw in section 4.1, the probabilities of adverse outcomes are worse for these students than students with A-levels, so the small differences in outcome we see in the table are mostly non-significant.

For the dropout and repetition outcomes, there is no evidence that having the related BTEC rather than one in any other subject is related to beneficial outcomes, and there is suggestive evidence that having a related BTEC in health and social care or health studies rather than a BTEC in another subject[44] is associated with a higher likelihood of dropping out of nursing degrees (nearly 1.2 times the probability of someone without the related BTEC, at 11.0% rather than 9.4%).

[43] amongst the sample of students who have either just BTECs or a mixture of BTECs and A-levels
[44] of the same size

Table 7: Percentage point difference in dropout, repetition and graduating below 2:1 by having a BTEC in a related subject (compared with not) for sample all BTECs or BTEC/A-level mixtures, full models

	Business	Sports Science	Nursing[45]	Drama[46]	Law
Dropout	-0.013	0.006	0.016*	0.003	0.021
	(0.007)	(0.007)	(0.008)	(0.014)	(0.013)
Repetition	0.009	0.000	-0.005	0.000	0.010
	(0.005)	(0.005)	(0.007)	(0.009)	(0.012)
N	15,555	17,655	10,835	5,215	5,075
Graduating below 2:1	0.013	-0.008	0.050***	-0.044*	0.049
	(0.011)	(0.010)	(0.015)	(0.019)	(0.026)
N	9,360	10,520	6,180	4,215	2,410

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

For graduation the picture is more mixed. Having a BTEC in Health and Social Care or Health studies is related to higher chances of graduating below a 2:1 for nursing students, all else equal (1.15 times the probability for someone without). However for drama, having a BTEC in acting and related disciplines is advantageous, relative to those with BTECs in different subjects, reducing the chances of graduating below a 2:1 by a multiple of 0.8, taking into account all their other characteristics. It is possible that there is heterogeneity in academic demand of different BTECs, and in the degree to which the subject content aligns with university courses. It may be that for students doing a BTEC in performing arts, the immersion in the subject at level 3 is more closely aligned to the experience (content and assessment) of a drama degree than is the case for a student with a BTEC in Health studies/health and social care on a nursing degree.

[45] Related BTECs Health and Social Care and Health studies

[46] Related BTECs acting, music theatre, speech and drama, dance

7 Conclusions and policy implications

The decisions made by students navigating the complex world of post-16 education in England is an important area of research that is not well understood. In this report, we contribute to the understanding of these choices by considering the relationship between a range of post-16 decisions, including qualification and subject choice, and a range of university outcomes; dropping out, repeating the first year, and graduating below a 2:1. While previous evidence has considered the association between prior achievement and university outcomes (for example Crawford, 2014), few studies have considered the role of qualifications and subject choice at level 3 separately. We are also able to consider the importance of academic performance at university in this process for the first time, using unique individual-level data from separate institutions, including module scores throughout university.

We find significant gaps in university outcomes between those students studying BTECs compared to A-levels at level 3, even when comparing students with similar backgrounds and prior achievement. Those students who study BTEC qualifications are almost twice as likely to drop out of university and repeat the first year, and 1.4 times more likely to graduate below a 2:1, compared to similar students who study A-level qualifications. However, it is very important to note that the overwhelming majority of students entering with BTECs or combinations do not drop out or repeat, and the majority of those graduating do so with at least a 2:1. These are considerable successes for these students, who without the availability of BTECS might not have had the opportunity to attend university at all. So while it is clearly important to address the gaps in outcomes between students with different types of entry qualification that we observe in our modelling, we support the existence of routes into higher education that students from non-traditional backgrounds successfully use.

Taking A-levels rather than BTECs is socially graded, and the patterns in outcomes between those with A-levels compared to BTECs are somewhat amplified across lower and higher social backgrounds, particularly for the graduation outcome. Our analysis taking into account of annual module scores provides suggestive evidence that these gaps in outcomes are driven by lower academic performance throughout university rather than for non-academic reasons, such as students with BTECs simply deciding that university isn't for them.

For those studying A-levels, taking facilitating subjects rather than non-facilitating is associated with fewer adverse outcomes at university, while taking less suitable A-levels is associated with greater adverse outcomes. The findings are more pronounced in institutions where these types of A-levels are rarer – so in newer universities there seems to be a more beneficial relationship of outcomes with having more facilitating A-levels. Our analysis of individual institutions shows similar patterns, with academic performance while at university again playing a key role in driving these trends.

In our analysis of popular degree subjects, we find that having a related A-level subject for the degree course rather than any other A-level is associated with a reduced risk of adverse outcomes at university for several of the degree courses we examine – those studying a range of related A-levels are less likely to drop out, repeat the year, and graduate below a 2:1, relative to those studying a non-related A-level but who have otherwise similar observed characteristics including prior achievement. However, the picture is more mixed for BTEC qualifications – we find some evidence that related BTECs such as health and social care, and health studies, are associated with more adverse outcomes for the related nursing degree, than those studying other BTECs before university.

Our findings have important implications for schools, colleges, and universities. The finding of adverse outcomes associated with those studying BTECs and less suitable A-levels, as well as the role of

academic performance at university in driving these findings, suggests that more should be done to ensure that those studying BTECs and less suitable A-level subjects are appropriately prepared for the challenges of university. This should not be read as a reason to discourage the participation at university of students holding them. We know that a large number of lower income students use the BTEC route as a way into university, and that students with BTEC qualifications have made up more than 20% of young full time first degree UK entrants for the past four years (HESA, 2021), so this route is very important both for individual students aspiring to university and the higher education sector. Instead, our findings should be seen as a possible illustration of the relative failure of the existing system to prepare and support students with non-traditional qualifications for and through their university studies. These findings are consistent with the experiences of students and HE and FE lecturers described in the recent 'Transforming Transitions' project (Banerjee and Myhill, 2019). We support these authors' calls for improved shared working between HEIs and FE colleges in order to smooth transitions of those with non-traditional qualifications, and would extend this to include shared working with schools providing BTECs.

For our findings on popular degree subjects and related qualifications, the Department for Education consultation on the funding of level 3 qualifications (DfE, 2020b) proposes retaining 'large' BTECs relating to 'practical' degree subjects (and not those related to other subjects), and includes as examples both performing arts and sports science in this list. It would seem from our results that although this retention might be associated with good degree class outcomes for drama as an example of performing arts, having a sports related BTEC is no better for outcomes in sports sciences degree than the same size BTEC in another subject. This contrasts with the A-level in the related subject (physical education) which is associated with better outcomes. Investigating the way in which alignment of the content and modes of assessment of BTECs with the related degree course varies by subject would further inform the reform decisions, as well as taking into account results of the most recent cohorts who will have taken reformed BTECs with a higher proportion of external assessment, including written exams.

Key recommendations for policy and practice

Recommendations for schools and colleges:

- Schools and colleges should work to improve IAG strategies to help students better to navigate different qualifications. BTECs provide UCAS tariff points and students may choose them at age 16 as an equivalent to A-levels enabling them to apply for and enter university. But it is important that they are aware that the preparation for university study is different from A-levels (through both content and assessment methods) and that they may find the traditional qualification and subjects route better aligned with expectations and assessment method they will currently encounter at university.

Recommendations for universities:

- Universities should be aware that the qualifications with which students enter may have an effect on their progress. Students with different qualifications will be better or worse prepared for different aspects of university and are likely to need different support, particularly in terms of academic support. Bearing in mind that high proportions of BTEC students are from low SES backgrounds, supporting these students, alongside recruiting them, could be a key part of universities' widening participation agendas.
- Universities should monitor the outcomes of students with different entry qualifications, in particular taking account of differences in performance by assessment type, and consider the alignment of assessment methods with students' previous experience.

- Universities should be aware that even among students with A-levels, those with larger numbers of 'less suitable' subjects (particularly where the A-level subject is not in the same subject as the degree) may struggle more than those with facilitating subjects, and the gap may be greater in universities which have smaller proportions of students with facilitating subjects.

- But where 'less suitable' or other non-facilitating subjects are not required but are in the same subject as the degree course, in many of the degree subjects we study they relate to better outcomes for students. Universities can then identify those without the related subject to target for support.

Recommendations for policy makers:

- Although the vast majority of students in the UK do end up completing their degrees, policy makers should be aware that the proportion of students with BTECs who experience these adverse outcomes, while still low, is higher than for A-level students.

- Since the great majority of students entering university with less traditional academic qualifications achieve success, restricting university entry purely to those with traditional academic qualifications could risk damaging widening participation. A large proportion of low SES students gain entry to university with non-traditional qualifications. For example, in our sample 39.5% of low SES young full time students enter university with BTECs or BTEC/A-level mix compared to just 9.6% of high SES students.

- Policy makers should work with other stakeholders to improve the rates of success of non-traditional versus A-level students at university, for example on ensuring appropriate support at university for those entering with different qualifications, and working with other stakeholders on the alignment of entry qualifications with university courses.

- More research is needed to understand why we see these patterns of lower success among BTEC students, even after accounting for prior GCSE attainment. For example, more work should be commissioned to understand whether methods of assessment are a driver of differences in university success rates with findings fed back to post-16 providers and universities for greater alignment between courses. The cohorts examined here largely predate reformed BTECs. It is as yet unclear how much the increased proportion of external assessment in the new BTECs will address the gap in outcomes we measure.

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Appendices

1 University types – Boliver Clusters
2 Distributions of BTECs and A-level entry by university type and outcomes by degree subject and university type
3 Taxonomy of A-level subjects
4 Technical appendix – data and methods
5 Distributions of facilitating and less suitable A-levels held by degree subject groups and university type among those with at least one A-level, for first years and graduates
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Appendix 1 – University types – Boliver Clusters

Cluster 1 (Oxbridge)	Cluster 3 (New universities and old lower ranked)	Cluster 3 cont'd	Cluster 4 (Bottom ranked)
Cambridge[a]	Abertay Dundee	Newman	Anglia Ruskin
Oxford[a]	Aberystwyth	Northampton	Bishop Grosseteste
	Arts University, Bournemouth	Nottingham Trent	University College, Birmingham
Cluster 2 (Russell Group and other higher ranked)	University of the Arts, London	Northumbria	Bolton
Aberdeen	Aston	Oxford Brookes	Buckinghamshire New
Bath	Bangor	Plymouth	Cumbria
Birmingham[a]	Bath Spa	Portsmouth	East London
Bristol[a]	Bedfordshire	Queen Margaret	Edge Hill
Cardiff[a]	Birmingham City	Robert Gordon	Glyndwr
Dundee	Bournemouth	Roehampton	Leeds Trinity
Durham[a]	Bradford	Salford	Liverpool Hope
UEA	Brighton	Sheffield Hallam	London Metropolitan
Edinburgh[a]	Brunel	Staffordshire	Newport
Exeter[a]	Christ Church, Canterbury	Stirling	St Mark and St John
Glasgow[a]	Cardiff Metropolitan	Sunderland	Southampton Solent
Goldsmiths	Central Lancashire	Swansea	Suffolk
Heriot-Watt	Chester	Teesside	Trinity St David
Imperial College[a]	Chichester	Ulster	Wolverhampton
Kent	City	UWE Bristol	York St John
King's College London[a]	Coventry	West London	
Lancaster	University for the Creative Arts	West of Scotland	
Leeds[a]	De Montfort	Westminster	
Leicester	Derby	Winchester	
Liverpool[a]	Edinburgh Napier	Worcester	
UCL[a]	Essex		
London School of Economics[a]	Falmouth		
Loughborough	Glamorgan		
Manchester[a]	Glasgow Caledonian		
Newcastle[a]	Gloucestershire		
Nottingham[a]	Greenwich		
Queen Mary[a]	Harper Adams		
Queen's Belfast[a]	Hertfordshire		
Reading	Highlands and Islands		
Royal Holloway	Huddersfield		
St Andrews	Hull		
SOAS	Keele		
Sheffield[a]	Kingston		
Southampton[a]	Leeds Becket		
Strathclyde	Lincoln		
Surrey	Liverpool John Moores		
Sussex	London South Bank		
Warwick[a]	Manchester Met		
York[a]	Middlesex		

[a]Russell Group universities

Appendix 2 - Distributions of BTECs and A-level entry by university type, and outcomes by degree subject and university type

Figure 34: Proportions of students with BTECs and A-levels by university type

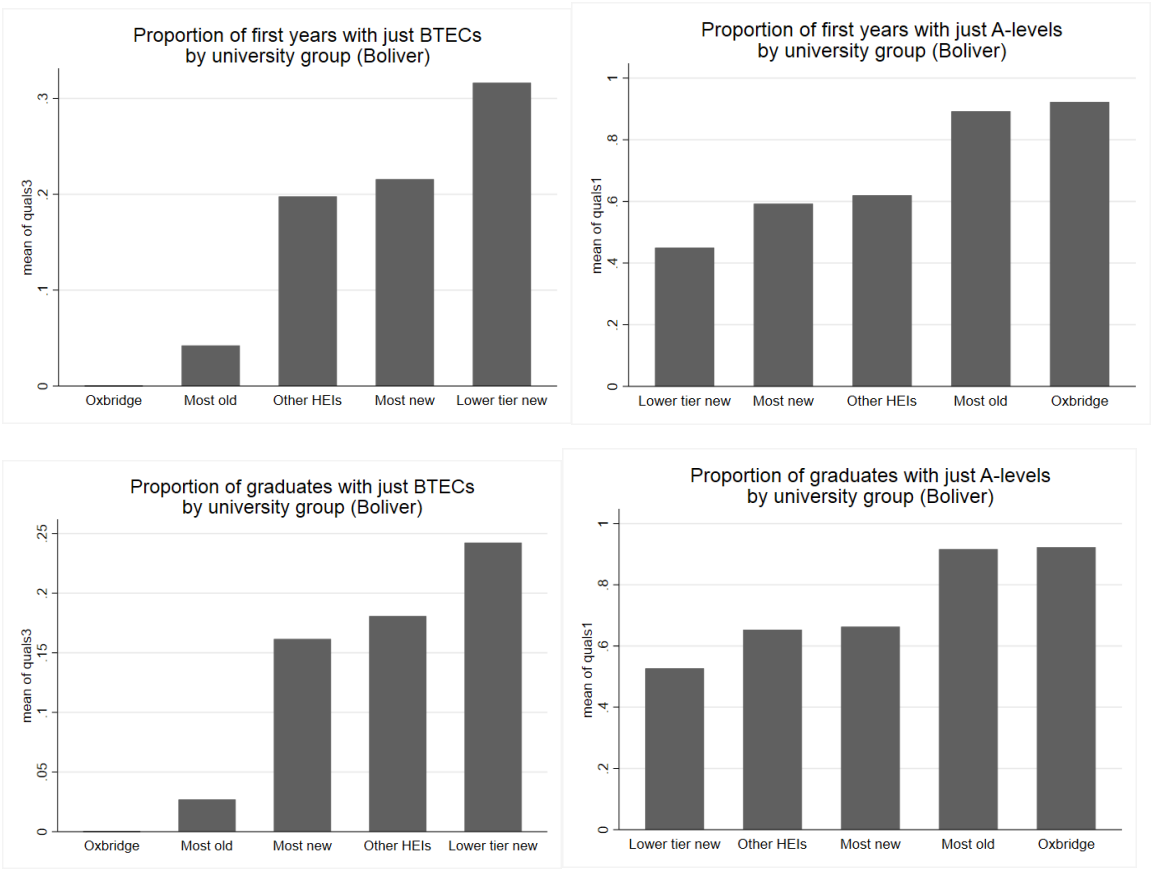


Figure 35: Dropout proportion by degree subject and university type

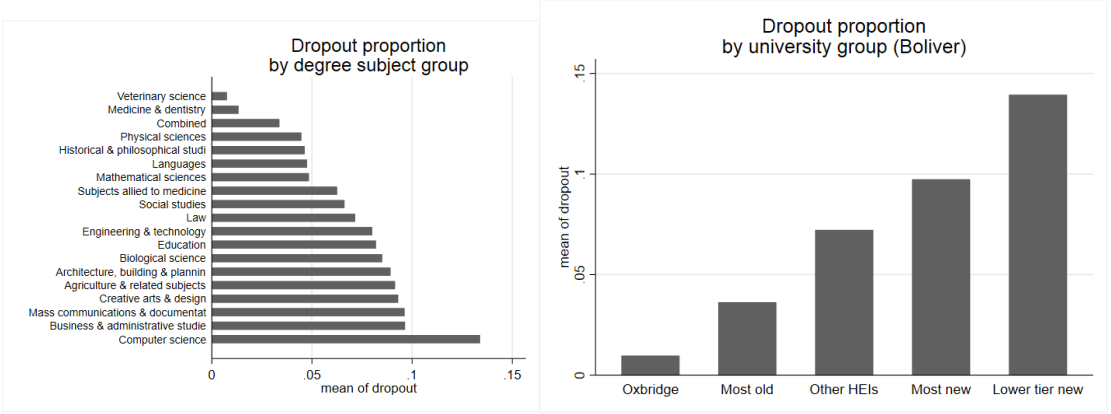


Figure 36: Repeats proportion by degree subject and university type

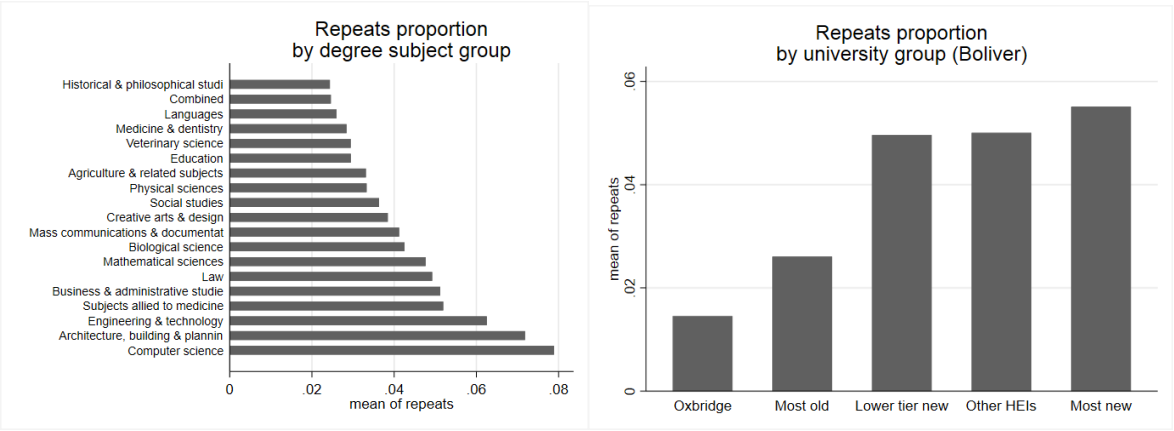
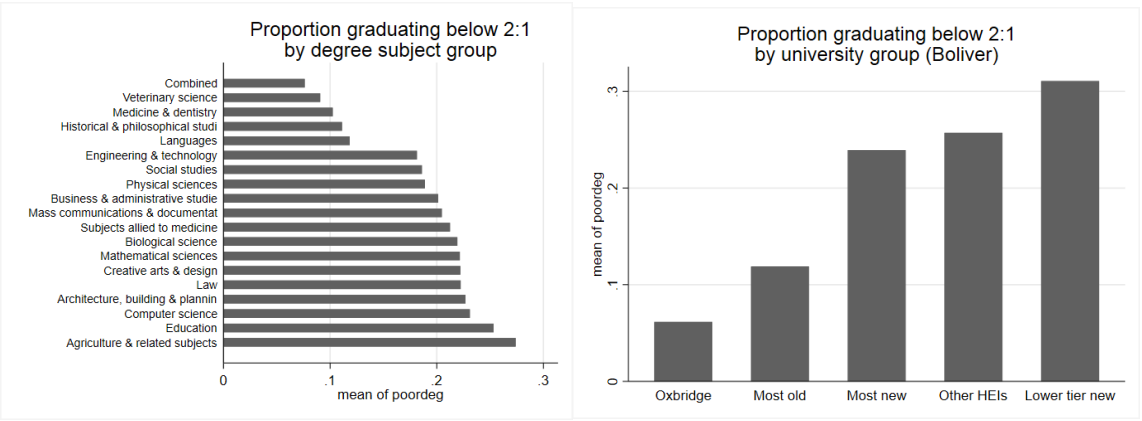


Figure 37: Graduates below 2:1 proportion (among graduating students) by degree subject and university type



Appendix 3 - Taxonomy of A-level subjects

Facilitating	Facilitating cont'd (small entry languages)	Useful	More limited suitability	Less effective preparation[47]
			Combined as 'less suitable' in analysis	
Biology	Biblical Hebrew[48n]	Ancient history	Art and design[49]	Accounting
Chemistry	Arabic	Archaeology[50d]	Business	Anthropology[dn]
Chinese	Bengali	Classical civilisation	DT: product design (3-D design)[51]	Applied art and design (double)*[d]
Classical Greek	Dutch[d]	Classics[d]	DT: prod. design (textiles)[n]	Applied art and design*[d]
English literature	Greek (modern)	Computer science	DT: systems and control technology	Applied business (double)*[d]
French	Gujarati	Economics	Drama & theatre studies	Applied business*[d]
Further mathematics	Japanese	Economics and business[d]	Electronics	Applied ICT (double)*[d]
Geography	Modern Hebrew	English lang'ge & literature	Film studies	Applied ICT*[d]
German	Panjabi	English language	ICT[52d]	Applied science (double)*[d]
History	Persian	Environmental science	Law	Applied science*[d]
Human biology[dn]	Polish	Geology	Media studies	Citizenship studies[d]
Italian	Portuguese	Government and politics	Music technology	Communication and culture[d]
Latin	Turkish	History of art	Physical education	Creative writing[dn]
Mathematics	Urdu	Music	World development[d]	Dance
Physics		Philosophy		DT: food technology[d]
Pure mathematics[d]		Psychology		Engineering*[d]
		Religious studies		Health and social care (double)*[d]
Russian		Sociology		Health and social care*[d]
Spanish		Statistics		Humanities[dn]
Welsh second language[n]		Welsh first language[n]		Leisure studies (double)*[d]
				Leisure studies*[d]
				Media: communication and production*[d]
				Performances studies[d]
		Non-counting		Performing arts*[d]
		Critical thinking[d]		Science in society[dn]
		General studies[d]		Travel and tourism (double)*[d]
				Travel and tourism*[d]

[47] Applied A-levels marked *
[48] No entries in England/combined with other subject in National Pupil Database marked[n]
[49] Includes 6 additional endorsements/pathways
[50] Withdrawn in 2015-18 reforms marked[d]
[51] DT: product design specifications/names changed in reforms
[52] Information and communication technology

Appendix 4 – Technical appendix

Data

Additional details of linked administrative data

We are interested in two outcomes relating to first years at university, and one relating to graduates. We therefore use individual-level administrative data provided by HESA on three cohorts of first years and three cohorts of graduates at UK universities. We focus on students domiciled in England before university and link them to their educational history at school or college in England, both state and private, using school records at age 16 in the NPD, known as Key Stage 4 (KS4), and at age 18 or 19 to either or both of the NPD at Key Stage 5 (KS5), and ILR for those at Further Education college rather than school. We start with the university records from HESA, then link to KS4, KS5 and ILR records from any earlier year, as some students have more than one gap year, or take more than two years in post-16 education.

Qualifications and outcomes differ by university, and it is useful to summarise our findings by university type. Rather than using the somewhat arbitrary grouping of universities according to age or membership organisation, we use the more theoretically rigorous categories developed by Boliver (2015) based on a cluster analysis of five key dimensions of universities: research activity, teaching quality, economic resources, academic selectivity and socio-economic mix of the student body. This gives rise to four distinct clusters which are set out in Appendix 1 above.

Outcomes

Dropout

We follow HESA methodology in defining dropout as those students in our first-year sample who are not found in the HESA data in the following year, but with one notable difference – we include students who have repeated their first year one or more times and then drop out of the first year of the programme[53]. We have data on university attendance for four years, from 14/15 to 17/18, which means that we can check for absence in the following year for members of all three of our cohorts. Because we use several cohorts it is possible for students to be recorded as dropping out twice. We keep the earlier instance in the data as it is closer to the time of study for the entry qualifications we are examining. It is also possible that students return to successful study having dropped out for a year. We can estimate the likelihood of this using our first cohort. Of this cohort some 22% of those dropping out were back at an HEI either two or three years later, although of those around 14% dropped out a second time, during the time we can observe them. Those ending their first degree instance and starting a lower level qualification the following year are recorded as dropping out of their first degree.

Repetition

Students repeating are those recorded as being in the first year of their degree programme in the second year after their entry to their HEI, studying the same main subject (the first subject noted in their HESA record). It therefore excludes people who change subject or HEI, and is a measure of a lack of academic progression. We follow the Hefce experimental statistics note (HEFCE, 2017).

Graduating below a 2:1

For our third outcome, our sample is all graduates with a classified degree. HESA data categorises results in first degrees in UK universities as first class, upper second class (commonly described as 2:1), lower second class (2:2) and third class/pass (pass being a degree without honours). The outcome we examine is whether

[53] We use this approach rather than relying on the 'Reason End' field in the HESA data as that variable is unreliable: it is based on self- reporting of reasons for leaving and in many cases is not captured at all.

a student graduates below a 2:1, rather than with a first class or 2:1 degree. Note we only consider those who graduated for this outcome, so dropouts are excluded – i.e. the outcome is conditional on graduating.

Qualification types

The KS5 Exams dataset provided to us lists all qualifications recorded at level 3 for those at school and sixth form college and most of those at further education (FE) college, including mapping codes allowing matching to subjects, and qualification codes allowing matching to type and level of qualifications.[54]

Of the 743,900 first years, 7,700 appear only in the ILR data, of whom 1,685 students entered university with Access qualifications and 4,670 had other level 3 qualifications. For the 614,580 graduates, 9,310 appear only in the ILR data, of whom 2,360 were Access students and 4,955 had other level 3 qualifications. There are relatively few Access students in the samples as they need to be at least 19 years old to have an Access course funded, so it is an uncommon qualification for young entrants.

Measuring socio-economic status

As noted above, an SES quintile is computed using a variety of measures including individual Free School Meal eligibility and very local neighbourhood measures. These neighbourhood data are based on 2011 census measures, calculated at Output Area level (around 150 households). We also use the Index of Multiple Deprivation (at Lower Super Output Area level of around 700 households for 2015) and a classification of residential neighbourhoods type (ACORN (CACI Ltd, 2021)), derived from information on housing details and socio-economic characteristics at postcode level of around 15 households). These measures are combined in a principal components analysis.

If any of the variables used in constructing the SES quintiles is missing, we use the KS5 pupil level data at age 18 and the ILR data to fill in as many gaps as possible. Almost all the missing data relates to students at private schools at age 16, for whom these variables are not recorded in the pupil level data. These students are assigned to the top SES quintile, following Chowdry et al (2013) (86,085 first years and 74,435 graduates[55]).

[54] The KS5 Exam file also includes discount codes, enabling us to remove double counted qualifications, for example when a student has done a qualification which subsequently forms part of a larger qualification (say an AS level then an A-level in the same subject) or two qualifications of the same subject, type and level (for example qualifications taken through more than one exam board, or taken more than once).

[55] These are a larger proportion of our samples than the overall proportion of 16 year olds at private schools, as our samples are defined by those at HEIs, where students from private schools are over-represented.

Methods

Model equations, demographic characteristics and other controls

Our aim is to model the expected value μ_{ijt} of our three dichotomous outcomes, where the outcome we observe y_{ijt} is assumed to depend on the individual level variables X_{ij}, the cluster level variables C_j (where clustering is at the level of individual university x degree course subject), and a cohort variable T_t to take account of trends over time. u_j is the random effect of cluster j.

$$\mu_{ijt} = \Pr(y_{ijt} = 1|X_{ij}, C_j, T_t, u_j)$$

We model $g(\mu_{ijt}) = \alpha + \beta X_{ij} + \gamma C_j + \tau T_t + u_j$

Where $g(.)$ is a link function which transforms the expected value of the outcome so it can be linearly related to the predictor variables, and in particular constrains it to lie between 0 and 1.

We use the logit function as our link:

$$logit = \log(Odds) = \log\left(\frac{Pr}{1 - Pr}\right)$$

giving

$$logit(\mu_{ijt}) = \alpha + \beta X_{ij} + \gamma C_j + \tau T_t + u_j$$

The standard assumptions of multi-level models, of which this is an example, is that the level two error is a random variable with normal distribution - $u_j \sim N(0, \sigma_{u_j}^2)$ and that the level two error is not correlated with the individual level variables - $E(u_j|X_{ij}, C_j) = 0$. This this is unlikely to be the case – for example the relationship of a particular university course combination with graduating below a 2:1 is likely to be correlated with the GCSE results of the students on the course. Unless this issue is dealt with, the estimates of β will be biased. Using fixed rather than random effects estimators deals with this problem but is not feasible in our case because of the large number of clusters to estimate (for example there are over 5000 course/university combinations for research question 1.1).

The solution is therefore to use a correlated random effects model (Wooldridge, 2010) which includes the cluster level means of the individual level variables $\bar{X}_j$. This then picks up any correlation between the X_{ij}s and the cluster random effect u_j, ensuring the $E(u_j|X_{ij}, C_i) = 0$ assumption is not violated. The coefficients on these cluster level means are not of substantive interest in this study, where we are focusing on the relationship of individuals rather than courses with outcomes. Although it is possible for reasons of efficiency to exclude these cluster level means from models if they are not significant, all levels of a variable need including if any of them is significant. This is the case for our suite of models, so all cluster means are included for all individual level variables.

Taking account of this expands our basic model equation to:

$$logit(\mu_{ijt}) = \alpha + \beta_W X_{ij} + \lambda \bar{X}_j + \gamma C_j + \tau T_t + u_j$$

Where β_W is the within cluster effect (the equivalent of the coefficient given in a fixed effect model) and $\lambda = \beta_B - \beta_W$. β_B is the between cluster effect, which is not the focus of our study, as noted above.

The variables X_{ij}, $\bar{X}_j$ and C_j are added to the models in stages for questions 1.1, 1.2, 1.3, 2.1 and 2.2 as set out in the following table. The measures of qualification type, prior attainment and SES are discussed in the data and methods section. The demographic and university level measures are set out below the model

summary table. Where individual level variables are included in the model, the cluster means for all levels of that variable are also added at the same stage. We also include interaction terms of qualification type with SES quintile to answer our first set of questions, and with university type (Boliver cluster) for our second set.

Table 8: Model summary table for all research questions

Model set	Model 1	Model 2	Model 3	Model 4	Additional models
1.1	Qualification types, cohort	SES quintile	Prior attainment at level 2	Demographics/uni	N/A
1.2	Qualification types, cohort	SES quintile	Prior attainment at level 2	Demographics/uni	Interactions qualification type x SES quintile
1.3	Qualification types, cohort	SES quintile (income)	Prior attainment at level 3	Demographics	Module scores
2.1	Number of facilitating or less suitable A-levels, cohort	SES quintile	Prior attainment at levels 2 and 3	Demographics/uni	Interactions qualification type x university type
2.2	Number of facilitating or less suitable A-levels, cohort	SES quintile (income)	Prior attainment at level 3	Demographics	Module scores
3.1	Full models only run. Whether has related subject A-level, total number A-levels, qualification type, SES quintile, prior attainment at level 2, demographics, uni, cohort.				
3.2	Full models only run. Whether has related subject BTEC, total size of BTEC qualifications, qualification type, SES quintile, prior attainment at level 2, demographics, university, cohort.				

In addition to the measures of SES and prior attainment discussed in section 3, we take account of the following set of characteristics in our models (and we also include the mean proportions of these measures at university x degree subject level, as discussed above).

Table 9: Demographic and university variables

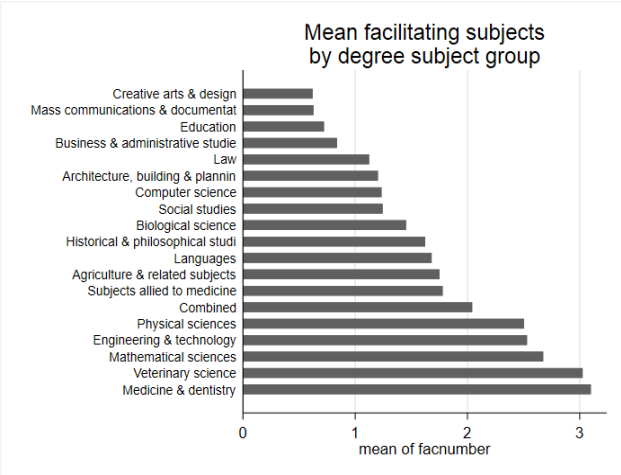
Variable	Categories	Notes
Age group	Less than 18, 18-20 for first year entrants. 18-20, 21-24 for graduating students	From HESA data – computed from age on 31st August of year of entry.
Gender	Female, male	From KS4 pupil level data
Gap year	One or more gap years, no gap year	Computed from age on entry to university and when they completed KS5
Ethnicity	White, Black – Caribbean, Black – African, Other Black Background, Asian – Indian, Asian – Pakistani, Asian – Bangladeshi, Chinese, Other Asian background, Other (including mixed), unknown	As recorded in KS4 pupil level data, with any missings filled in as far as possible from KS5 pupil records, ILR records and HE records, in that order. Students at private school in KS4 and KS5 do not have ethnicity collected, but do in the HESA data.
Disability	No known disability, blind or serious visual impairment, deaf or serious hearing impairment, a physical impairment or mobility issues, mental health condition, a long-standing illness or health condition, two or more conditions, social communication/autistic spectrum disorder, specific learning difficulty, another disability, impairment or medical condition	From HESA data as declared by student
Absence	Persistent absence flag, no flag, flag missing	From KS4 data, absence data includes a flag if a pupil is absent for more than 15% of possible attendance days. Not collected for private schools.
Type of school	Non-selective state, selective state (grammar), private, 6th form college, FE, other/unknown	From KS5 pupil level data (age 18/19), students found only in ILR coded to FE college. Selective state (grammar) schools found by linking to school identifiers.
Parental education	Parent has higher education, parent does not have higher education, parental education unknown	From HESA data
Term time accommodation	Halls (university or private), parental home, own residence, other rented, other/unknown	From HESA data.
Type of university (Boliver cluster)	1 Oxbridge, 2 Most old universities (including all remaining Russell Group), 3 Most new universities, 4 Lower tier new universities, 5 Other HEIs (most of which are specialist institutions)	See list in Appendix 1. University from HESA data, categorisations from Boliver (2015).

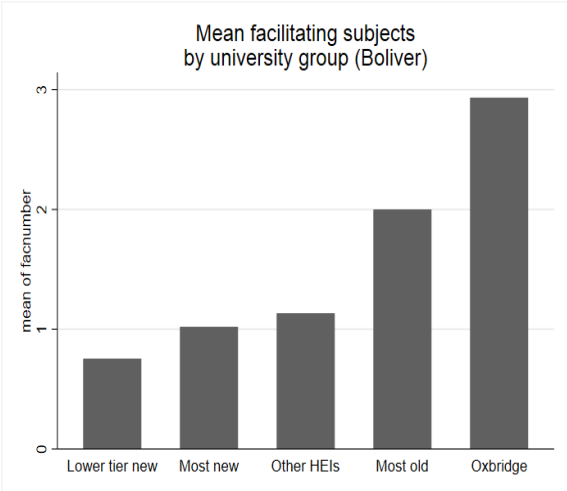
Table 10: Other key demographic characteristics by outcome for those dropping out, repeating, and graduating below 2:1

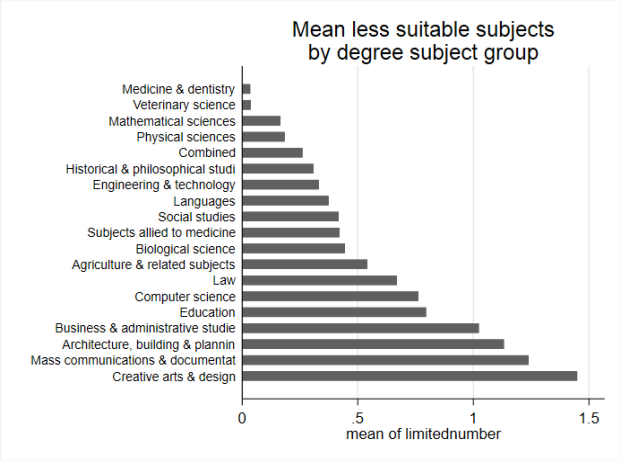
	Dropouts	Repeaters	All first years	Graduates below 2:1	All graduates
N	56,615	32,210	743,900	121,680	614,580
% Female	48.5	43.5	55.6	50.9	56.6
% Non White	28.6	43.4	26.5	34.1	23.5
Total Level 2 points	497	490	534	503	542
Total Level 3 points (robustness only)	773	776	911	750	851
% at non selective state school	38.6	38.5	43.2	40.4	43.3
% at grammar school	3.2	4.3	8.1	4.8	8.3
% at private school	4.8	5.9	10.4	6.8	10.9
% at 6th form college	13.7	13.9	13.2	18.0	17.5
% at further education college	39.5	37.1	25.0	30.0	19.8
% declaring a disability at university	14.8	17.2	13.4	17.8	15.8
% with persistent absence recorded at KS4	5.4	5.4	3.2	4.4	3.8
% in university provided accommodation	46.7	51.9	64.6	12.2	13.0

Appendix 5 – Distributions of facilitating and less suitable A-levels held by degree subject groups and university type among those with at least one A-level, for first years and graduates

Figure 38: Facilitating and less suitable A-levels by degree subject group and university type: first years







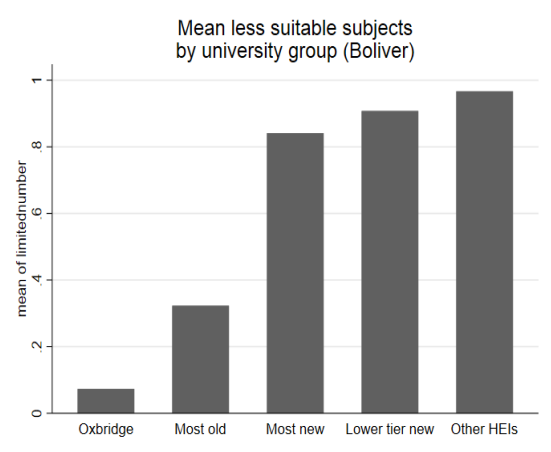
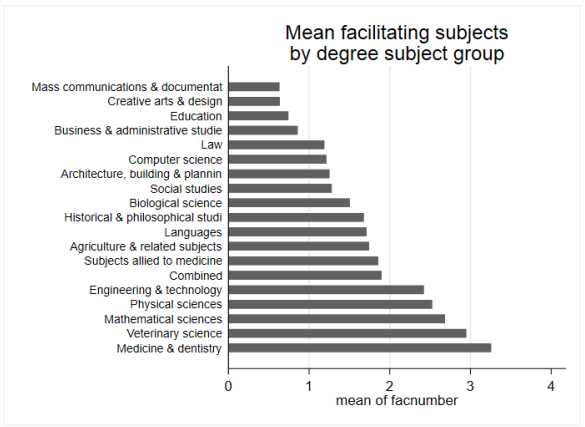
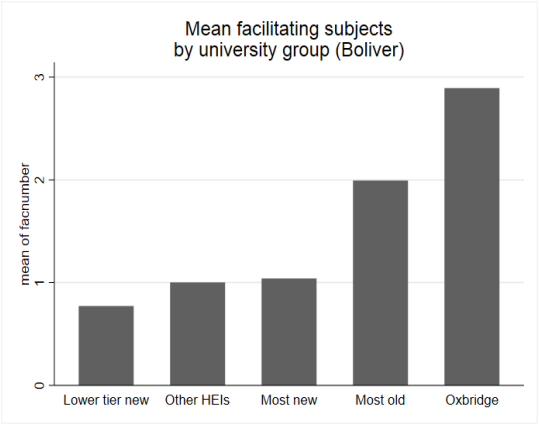
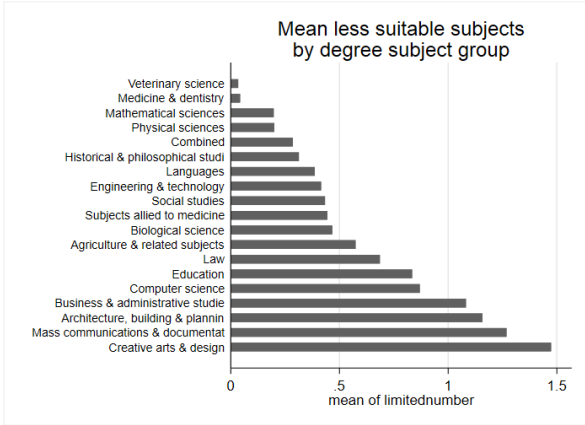
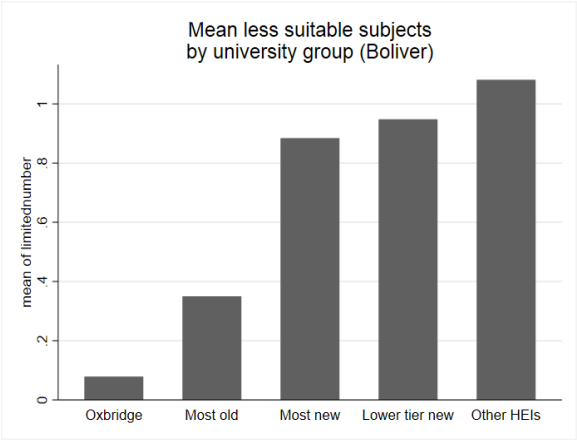


Figure 39: Facilitating and less suitable A-levels by degree subject group and university type: graduates









Appendix 6 - Relationship between qualification types and university outcomes – summary for all qualifications types

Table 11: Gaps in probability of dropout, repetition and graduating below a 2:1 between students with all qualification types, compared with those with A-levels only – full models

	BTEC/A-lev mix	BTEC only	Other academic	Access	Other L3	No formal qualifications	Unknown/level unknown
Dropout	0.017***	0.054***	0.010**	0.038***	0.033***	0.063***	0.110***
SE	(0.001)	(0.001)	(0.004)	(0.005)	(0.001)	(0.009)	(0.012)
Repeats	0.010***	0.025***	0.007**	0.027***	0.014***	0.039***	0.025***
SE	(0.001)	(0.001)	(0.003)	(0.004)	(0.001)	(0.007)	(0.007)
Grad below 2:1	0.034***	0.072***	0.014*	0.027***	0.048***	0.073***	0.046**
SE	(0.002)	(0.002)	(0.005)	(0.007)	(0.002)	(0.013)	(0.013)

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Qualifications other than A-levels and BTECs

Other academic qualifications

In England, these are the International Baccalaureate (IB) and the Cambridge Pre-U set of qualifications which are taken by some pupils in tandem with A-levels. The IB at higher level is a broader qualification than A-levels, taken across six subjects with a compulsory core, for which one grade is given. Previous evidence on university outcomes is limited: we are unaware of any on dropout or repetition and the relationship with degree class is not entirely clear, as work by Green and Vignoles (2012) and Gill (2016) concentrated on equivalence of tariff and was unlinked to prior attainment at level two. Gill suggests that for a given UCAS tariff A-level students do better than otherwise similar IB students, while Green and Vignoles find that controlling for university, subject and demographics (but not prior attainment at either level 2 or 3) the converse is true, which is effectively a selection effect.

The Cambridge Pre-U was introduced by Cambridge Assessment International Education in 2008 designed to be a rigorous, linear 16-19 alternative to A-levels. The uptake among schools was not high and in 2019 it was announced that this suite of qualifications is not sustainable and will be withdrawn with the last examination in 2023 (Cambridge Assessment International Education, 2019). Previous work by Gill and Vidal Rodeiro (2014) suggests that students entering university with Pre-U qualifications are not significantly likely to get a higher class of degree than those with A-levels, although the analysis depends on the correct alignment of UCAS tariff for the two sorts of qualifications, as again level 2 prior attainment is not linked. We are unaware of any studies of dropout and repetition among students entering with Pre-U qualifications.

Other level 3 qualifications

As noted in the Government's recent consultation on post-16 qualifications at level 3 and below in England, there is a very 'complex landscape' (p7) of level 3 qualifications available to learners (DfE, 2020a). As at May 2021 there are nearly 4,600 level 3 qualifications available, of which A and AS levels, BTECs, IB and Pre-U account for some 750 (counting different providers separately). This leaves over 3,800 other level 3 qualifications from over 200 providers available to students. The largest of these providers is the City and Guilds of London Institute with over 400 qualifications, but there are many providers of only a handful of qualifications. This landscape is the subject of consultation over reform at the time of writing as noted for BTECs (DfE, 2020a 2020b). These qualifications are largely technical in nature, designed primarily as

preparation for work rather than HE study, but a significant number of students enter university with these qualifications (in our data some 6% enter with combinations of other level 3 qualifications or a mixture of these with BTECs and A-levels).

Access to Higher Education

These are qualifications funded for those aged 19 and over, designed to prepare those without traditional qualifications at level 3 to enter higher education, and available in a range of subjects and from a variety of providers. There are thus relatively few in our sample of young entrants.

Appendix 7 - Modelling results for module scores data – qualification type

Table 12; Qualification type and module scores: BTEC only versus A-levels, full regression results

Probability of dropping out					Probability of graduating below a 2.1			
uni	variable	full model	Including modules		uni	variable	full model	Including modules
post 1992					post 1992			
6	BTEC only	**0.1145**	0.0223		6	BTEC only	**0.1502**	-0.0434
6		**(0.0316)**	(0.0306)		6		**(0.0409)**	(0.0323)
6	N	2550	1281		6	N	2550	1281
5	BTEC only	**0.147**	0.005		5	BTEC only	**0.139**	-0.014
5		**(0.021)**	(0.01)		5		**(0.042)**	(0.039)
5	N	7732	7732		5	N	1448	1448
Russell Group					Russell Group			
1	BTEC only	**0.1373**	0.0053		1	BTEC only	**0.3288**	**0.2484**
1		**(0.0471)**	(0.0131)		1		**(0.0651)**	**(0.051)**
1	N	8511	4404		1	N	4011	3658

Notes: full model includes controls for all other entry qualification types, parental income, level 3 attainment entry scores, demographics, degree subject (JACS) dummies, year of entry dummies. Standard errors are clustered by year-subject.

Appendix 8 – Modelling results for module scores data –facilitating and less suitable A-levels

Table 13: Facilitating A-levels and module scores: full regression results

Probability of dropping out					Probability of graduating below a 2.1			
uni	variable	Full model	Including modules		uni	variable	Full model	Including modules
Post 1992					Post 1992			
7	num_facil	-0.0143	0		7	num_facil	**-0.0457**	-0.0036
7		(0.0082)	(0.004)		7		**(0.0153)**	(0.0133)
7	N	1934	1613		7	N	1570	1551
6	num_facil	**-0.011**	0.0023		6	num_facil	**-0.031**	0.0043
6		**(0.0047)**	(0.0054)		6		**(0.0076)**	(0.0086)
6	N	2151	1021		6	N	1937	991
5	num_facil	**-0.017**	-0.006		5	num_facil	**-0.068**	**-0.029**
5		**(0.005)**	(0.004)		5		**(0.013)**	**(0.012)**
5	N	5419	5419		5	N	**1183**	**1182**
Russell Group					Russell Group			
2	num_facil	**-0.0044**	0.0015		2	num_facil	-0.0041	0.0091
2		**(0.0016)**	(0.0006)		2		(0.0024)	(0.0022)
2	N	10471	3849		2	N	10225	3848
3	num_facil	-0.0023	-0.0035		3	num_facil	-0.0018	0.0054
3		(0.0013)	(0.0011)		3		(0.0083)	(0.0058)
3	N	630	597		3	N	603	587
4	num_facil	0.0007	0.0014		4	num_facil	-0.0173	0.0071
4		(0.0013)	(0.0011)		4		(0.0082)	(0.0085)
4	N	7257	5210		4	N	7133	5165
1	num_facil	**-0.01**	-0.0005		1	num_facil	0.0004	0.0035
1		**(0.0043)**	(0.0009)		1		(0.0061)	(0.0054)
1	N	5953	3015		1	N	2652	2463

Notes: full model includes controls for number of A-levels on entry, parental income,
level 3 attainment entry scores, demographics, degree subject (JACS) dummies, year of entry dummies.
Standard errors are clustered by year-subject.

Table 14: Less suitable A-levels and module scores: full regression results

Probability of dropping out					Probability of graduating below a 2.1			
uni	variable	Full model	Including modules		uni	variable	Full model	Including modules
Post 1992					Post 1992			
7	num_lsuit	0.0025	0.0039		7	num_lsuit	**0.0303**	0.0159
7		(0.0099)	(0.0057)		7		**(0.0144)**	(0.0117)
7	N	1934	1613		7	N	1570	1581
6	num_lsuit	0.0021	-0.0023		6	num_lsuit	0.0078	0.0087
6		(0.0051)	(0.0038)		6		(0.0114)	(0.0097)
6	N	2151	1021		6	N	1937	1023
5	num_lsuit	**0.013**	0.005		5	num_lsuit	**0.039**	0.017
5		**(0.005)**	(0.004)		5		**(0.014)**	(0.013)
5	N	5419	5419		5	N	**1183**	1182
Russell Group					*Russell Group*			
2	num_lsuit	**0.008**	-0.0003		2	num_lsuit	**0.0102**	-0.0073
2		**(0.0032)**	(0.002)		2		**(0.0044)**	(0.0063)
2	N	10471	3849		2	N	10225	3864
3	num_lsuit	0.0124	0.0168		3	num_lsuit	0.0147	0.0206
3		(0.0068)	(0.0095)		3		(0.01)	(0.0177)
3	N	630	597		3	N	603	587
4	num_lsuit	-0.0039	-0.0037		4	num_lsuit	**0.0283**	0.0023
4		(0.0021)	(0.0021)		4		**(0.0139)**	(0.0102)
4	N	7257	5210		4	N	7133	5185
1	num_lsuit	0.0218	0.0023		1	num_lsuit	0.0029	-0.0049
1		(0.0149)	(0.0021)		1		(0.0176)	(0.0131)
1	N	5953	3015		1	N	2652	2463

Notes: full model includes controls for number of A-levels on entry, parental income,
level 3 attainment entry scores, demographics, degree subject (JACS) dummies, year of entry dummies.
Standard errors are clustered by year-subject.

Appendix 9 - Maths A-level and Extended Project Qualifications (EPQ)

Maths is the most popular A-level among both first years and graduates in our samples of students with at least one A-level (held by 30% of both first years and graduates), but the proportions of students with it vary considerably by type of university, as well as by degree subject.

Figure 40: First years proportion with A-level maths by degree subject and university type

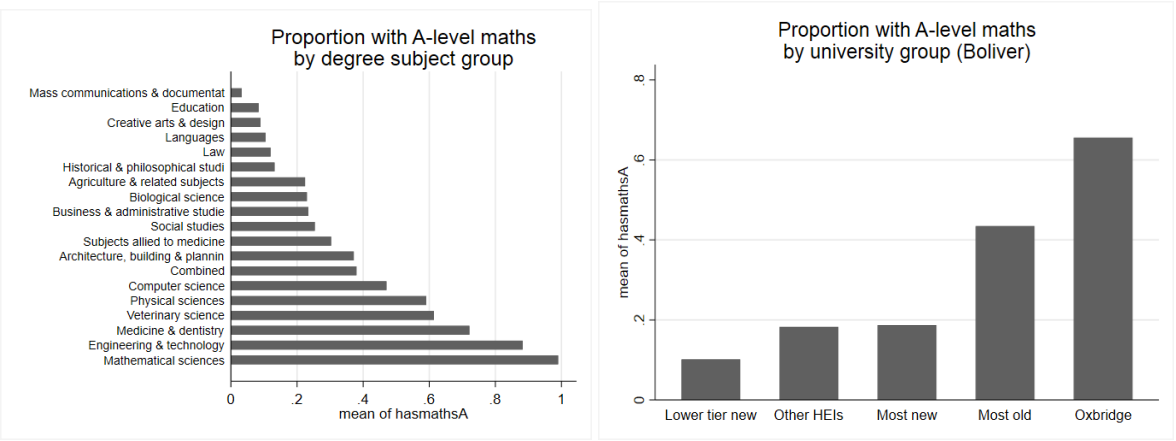


Figure 41: Graduates proportion with A-level maths by degree subject and university type

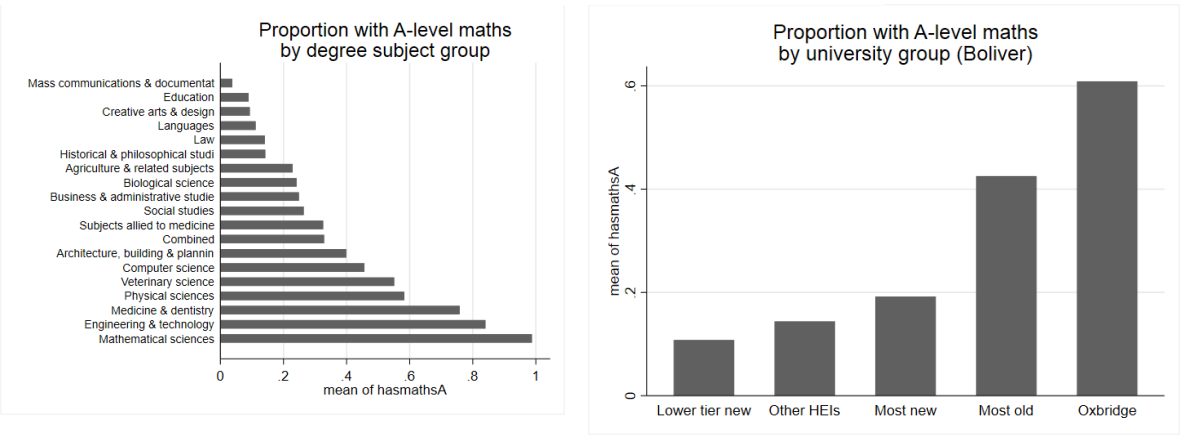


Table 15: Percentage with outcome for entrants and graduates with at least one A-level by whether EPQs and Maths A-level held

	Extended Project Qualification		Maths A-level	
	Does not hold	Holds	Does not hold	Holds
Dropout %	5.5	3.0	5.9	3.3
Repeats %	3.3	1.8	3.2	2.8
Graduates below 2:1 %	16.9	11.0	16.9	14.2

In Table 16 we show the results of the full models (taking into account level 2 achievement and the full range of demographic characteristics and accounting for all contextual effects) for all three of our outcomes, for the sample with at least one A-level.

Having A-level maths (rather than any other A-level) is associated with being less likely to drop out by 1.0pp, on average across all degree/university combinations. This is a small relationship compared with the

qualification type ones we examine above, but somewhat bigger than that for any one facilitating subject we saw in the main analysis (0.6pp), suggesting that having maths A-level is even more strongly related to reducing the chance of dropout than having any facilitating subject, compared with any other. It is even more strongly related to a reduction in repetition at 0.7pp than having any facilitating subject. When students reach graduation there remains no significant reduction in chances of graduating below a 2:1 associated with having A-level maths, on average.

EPQs are held by 15% of our first year sample of students with at least one A-level, and 13% of graduating students. Having an EPQ is significantly related to all three outcomes as shown in the table below, with holding it related to significantly better outcomes, particularly for graduation, where the chances of graduating below a 2:1 are reduced by 2.1pp. Our modelling does not allow us to distinguish between the possible reasons for this association: perhaps the skills of independent study and research learnt in the EPQ are persistently helpful through a degree course, or those who chose to do an EQP are highly motivated students whose motivation continues to be beneficial at university.

Table 16: Percentage point difference between having or not having maths A-level and (separately) EPQ for all those with at least one A-level, all outcomes, full model

	Dropout	Repetition	Graduate below 2:1
Has A-level maths	-0.010***	-0.007***	-0.001
	(0.001)	(0.001)	(0.002)
Has EQP	-0.013***	-0.009***	-0.021***
	(0.001)	(0.001)	(0.001)
Observations	588,740	588,740	508,090

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Appendix 10 – Data and findings for mature entrants

Individual level data for the same university cohorts as the linked data was provided for English domiciled mature students by HESA, aged 21 or over on entry, including demographic data. Only full time students are included in this analysis for the same reason as the linked data analysis. The same demographic variables are used as for the linked data, but all taken from HESA, rather than some coming from the age 16 KS4 records. Age groups are summarised as 21-24, 25-29, 30+. Absence from school is not recorded, and only previous educational establishment rather than school or college type is available, which may be a post 18+ establishment, including HEIs.

Prior attainment measure

The mature students' data is unlinked to school records, as for all but the youngest mature students their school data was not collected through the NPD. UCAS tariff points from level 3 qualifications were provided in the HESA data. In addition, individual level three qualifications (types of qualification, subject and grades) were provided as a separate qualifications file, linkable to the individual level records. From these, UCAS tariffs are calculated for A-levels and BTECs and some missing tariff points calculated. For students doing A-levels, BTECs and a mixture, this means that over 99% of students have a record of tariff points. For other level 3 qualifications, three quarters have no, or only partial, tariff points recorded, as for much of this period most fell outside the UCAS tariff. This, together with the fact that until the 2017 admissions cycle Access awards did not attract UCAS points, and those entering with level 4 or below level 3 qualifications (including level 1, level 2, unknown or no formal qualifications) have no level 3 qualifications recorded in the data, means that overall only 34% of first years and 38% of graduates have tariff points. Quintiles are constructed from capped tariff points (capped at the equivalent of three A* at A-level) and those with missing points are coded to a separate category.

Social background measure

Because the KS4 measures of social background are not available for this data, three class SEC is used (professional/managerial, intermediate and routine, plus long term unemployed), coded from the eight class variable provided by HESA. For mature students this variable is derived from their self-classification (rather than their parents') provided to UCAS. A substantial proportion (over 30% of both first years and graduates) is missing, and coded to a separate category.

Descriptive statistics

Table 17 sets out descriptive statistics for the full sample of first years and graduating mature students.

Mature students are, on average, nearly twice as likely as young entrants to drop out (15.0% compared with 7.6%) but somewhat less likely to repeat a year (3.1% compared with 4.3%). They are also just less than one and half times more likely to graduate below a 2:1 (28.2%) compared with young entrants (19.8%). The patterns of outcome by qualification type are broadly similar to the linked data. Mature students entering with A-levels have slightly lower prior attainment as measured by UCAS tariff points than those with BTECs, in contrast to what is seen for KS4 prior attainment for young entrants. This may partly be a selection effect of those who enter university as mature students and partly an artefact of the lack of comparability of BTEC and A-level points in the UCAS tariff that has been documented (Ofqual, 2018).

Mature students entering with BTECs are less likely to be from the professional/managerial SEC class than those with A-levels, more likely to be non-White and more likely to be male.

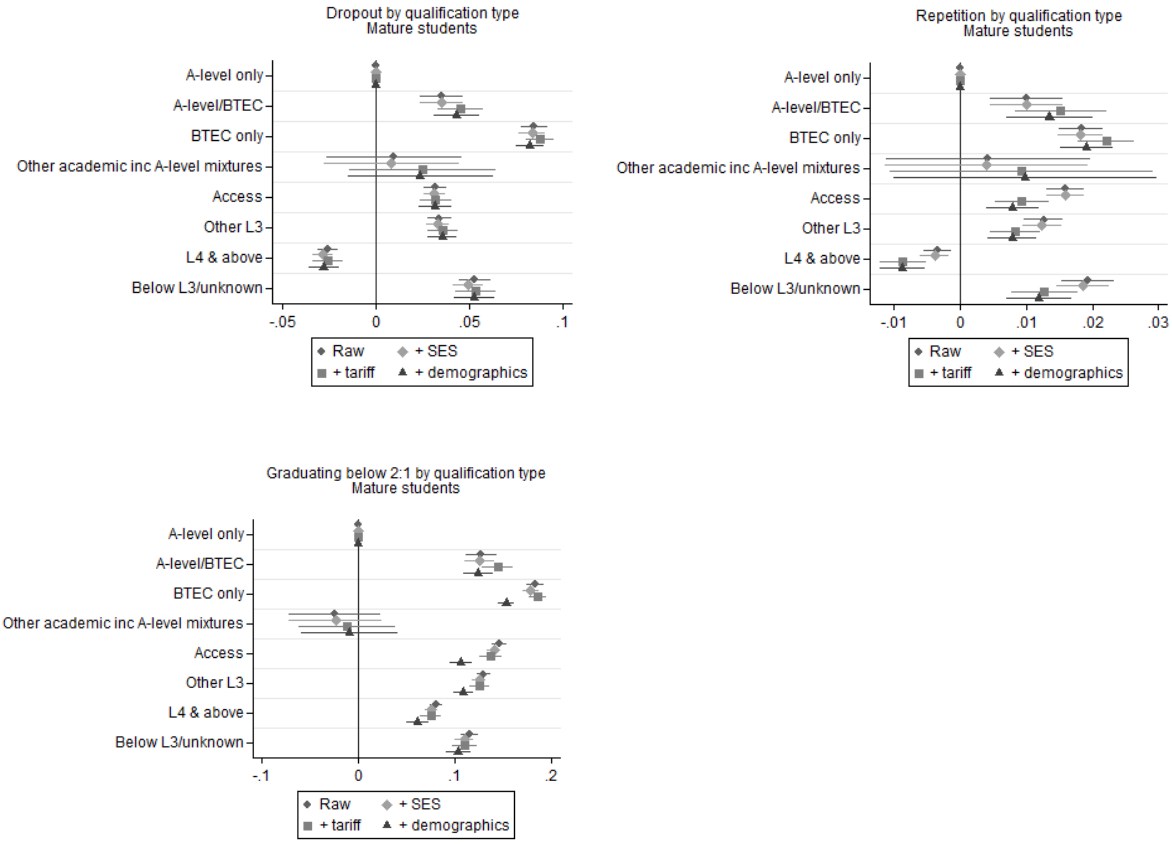
Table 17: Descriptive statistics for English domiciled full time mature entrants to UK universities

	All	A-level only	Mixed A-level and BTECs	BTECs only	Other academic	L4 plus	Access	Other L3 including other mixtures	Below L3/ Unknown/ no formal
First years									
N	192,585	28,552	4,684	21,535	359	42,051	27,048	55,353	13,003
Dropout %	15.0	13.8	17.1	22.9	15.6	15.2	17.2	9.5	22.1
Repeats %	3.1	2.6	3.2	4.1	3.3	3.8	3.6	1.9	5.0
Tariff points (Old UCAS)	292	299	346	301	418	-	-	-	-
Prof/mgr %	26.9	38.3	31.0	24.4	52.0	17.5	21.8	31.2	28.9
Non White %	34.0	26.6	33.0	40.3	28.2	29.5	37.6	36.4	38.3
Female %	60.7	53.3	46.5	47.0	53.6	72.6	63.9	61.7	56.2
Graduates									
N	165,576	29,044	3,377	15,967	316	29,015	26,752	48,271	12,834
Graduating below 2:1 %	28.2	17.6	30.3	36.7	15.8	30.4	31.3	28.2	30.1
Tariff points (Old UCAS)	280	281	350	292	398	-	-	-	-
Prof/mgr %	28.6	38.6	31.8	26.5	49.5	20	23.4	31.2	27.4
Non White %	30.0	23.0	26.3	33.2	30.7	29.6	33.2	31.6	31.3
Female %	62.1	54.9	48.4	48.3	53.8	73.6	66.2	63.8	58.7

Relationship between qualification type and university outcomes

A series of graphs for dropout, repetition and graduating below a 2:1 is given below for mature students by qualification type, with bars showing 95% confidence intervals. The raw gaps by qualification type are barely closed by adding SEC classification, capped tariff points quintile and demographics into the models. The large reduction in gap accounted for when we include detailed attainment at age 16 is not seen when we use quintiles based on the UCAS tariff, across all three outcomes. This is true for those with BTECs and an A-level/BTEC mixture, where we have full records of UCAS tariff, as well as for those qualification types where much or all of the tariff data is missing.

Figure 42: Gaps in outcome by qualification type for mature students



Having level 3 qualifications other than A-levels is related to persistently worse outcomes for mature students, with the exception of no difference for the few students entering with 'other academic' level 3 qualifications. Entering with 'level 4 qualifications plus', i.e. having at least a certificate in higher education, is associated with reduced chances of dropping out and repeating, but still higher chances of graduating below a 2:1 than those with A-levels, but with the caveat that there is no prior attainment information for level 3 for these students.

We can compare the gaps in our full models with those we find for young entrants, using two sets of results: their results taking into account their attainment at age 16 (our main specification), and also using the same measure of prior attainment (level 3 tariff quintiles) that we are able to use for

mature students (noted for robustness in the main report). All figures are significant with a p-value <0.001

Table 18: Comparison of modelled gaps in outcome by qualification type between young and mature students

Gap between A-level and BTEC students – full models	Mature students	Young entrants (using age 16 results to measure attainment)	Young entrants robustness (using level 3 tariff quintiles)
Dropout	8.2pp	5.4pp	7.4pp
Repetition	1.9pp	2.5pp	4.2pp
Graduating below 2:1	15.3pp	7.2pp	15.4pp

The gap in dropout for mature students between BTEC and A-level entrants is somewhat larger than for young entrants, although comparing the two models using tariff quintiles to control for prior attainment, the results are quite close. The same is true for graduating below a 2:1. In both cases the raw chance of the outcome is higher for mature students than young entrants, so the 'gap' is a smaller multiple of the chances of outcome.

The gap in chances of repetition between those with A-levels and BTECs is smaller for mature students than young entrants, but so is the raw chance of repeating. For young entrants the chance of repetition for those with BTECs is 1.7 times that for A-levels, whereas for mature entrants the chance is nearer one and a half times.

Given the caveat that prior attainment is not as well-controlled for in these models as in the main linked data analysis, we can say that mature students entering with A-levels do seem to be at an advantage compared with those with BTECs for all three outcomes. Our analysis is likely to over-estimate these gaps given what we observe when we account for prior attainment in two different ways in the linked data, with a particularly large difference using the two methods for the graduation outcome. But it is unlikely that these gaps would disappear for mature students for the dropout and graduation outcomes, where significant differences would remain if the gaps were reduced by the same sorts of amounts that we see between the two young entrants' models.

Relationship between preferred and non-preferred A-levels and university outcomes

We repeat the analysis for facilitating and less suitable A-levels using the same methodology as for the linked data, with the same modifications to measures of prior attainment and social background as set out above. Relatively few mature students enter with A-levels, so although we see relationships with the sorts of directions and orders of magnitude in the data that we would expect given what we have seen for young entrants, most results are not significant. The exception is that we find an increased chance of 1.0pp*** of graduating below a 2:1 per less suitable A-level (entered as a continuous variable), slightly larger than the estimate of 0.7pp*** from the linked model.

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