Accessing the top. High ranked universities and students' performance.

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Preliminary work
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This version: November 2019

Abstract

Accessing to élite universities is perceived as a strong career enhancer. Despite that, studies on returns to élite universities that take into account for selection fail to find a clear relation with career outcomes (Dale and Krueger, 2002, 2014), or find it only for some population groups (Zimmerman, 2014, 2019). How people perform in those universities may in part explain the limited impact. To study if that is the case, this paper exploits a policy variation in England that allowed universities, and in particular higher ranked ones, to expand their student numbers. Results indicate that, for people who attended élite universities as a result of the reform, the probability of dropping out increases by around 7 percentage points, while the probability of obtaining the best final mark, conditional on graduating, decreases by around 28 percentage points. A few mechanisms that can explain the results are discussed.

1 Introduction

Who wouldn't want to see their children go to an élite university? High ranked, selective institutions are generally recognised to be a great career fostering, network buinding, knowledge enhancing tool. Recent scandals in the US - which put under the spotlight a network of bribery aimed at getting access to US élite universities[1] - showed that for some parents at least, going to élite institutions is an almost 'no matter how much' situation.

Whether accessing different universities has a real impact on people's outcomes is even more relevant taking into account the large proportion of public spending that

*Centre for Economic Performance (LSE). Data have been used under the data request DR170602.01.

[1] *The Guardian*, 13 Mar 2019, 'US college admissions scandal: how did the scheme work and who was charged?'.

is devoted to higher education[2]. According to the 2018 Annual Report on Education Spending in England (Belfield et al., 2018) the cost for funding each cohort students in higher education, in England, is £17 billion and, even though in the long run - given the recent changes in the university fee system - the cost will be split between taxpayers and students, it is currently almost entirely funded through government finances. The increased role of fees in the financing may provide a stronger incentive for universities in increasing their student numbers. A large and sudden expansion may rise concerns on the possibility of ensuring high quality of the education provided, although this may matter just in the short run, as in the long run universities can adapt by increasing the number of lecturers, for example.

The US college admissions scandal points also to the fact that élite institutions could have a role in spreading income inequality if their admission system is not fully based on students' merit and potential. To an extreme, if only students from a wealthy and well connected background are granted access to élite university, these institutions can become a mechanism to 'protect' and strengthen inequalities. Similarly, this could happen if students with different socio-economic backgrounds end up performing very differently in academic terms, and later on in labour market outcomes. Specular to this, characterising students from different economic background only on the basis of academic performance may be somehow misleading, as people with higher financial constraints can be subject limits to their capacity to get proper training, as they might need to work while studying, or they may have lower access to private tutoring. In this respect, the English university system, in contrast with the US one, shuts down one heterogeneity in the cost of universities, as it imposes the same fee cap on all publicly funded universities[3], no matter the quality or the rank, so all students face the same fees for a Bachelor degree[4].

A number of papers support the idea that élite institutions bring higher wages. These papers rely mainly on selection on observables techniques for identification (Black and Smith, 2004, 2006, Brewer et al., 1999, Dillon and Smith, 2017). The choice of going to a specific university is not quite a random one, even conditioning on a broad range of observables. For this, it is important to take into account issues of selection. Papers that take into account selection find more mixed results. Dale and Krueger (2002, 2014) find no average effect of enrolling to a higher end institution, although some impact is there for lower-income minorities. Hoekstra (2009), exploiting a regression discontinuity design, finds a substantial return to college rank for white men, while no return appears to be there for other population groups. Similar results are found in slightly different contexts (Zimmerman, 2014, 2019). Other works using other strategies for identification

[2]It represents on average 1 percent of total GDP in OECD countries, which is approximately one fourth of the total public spending on education in those countries according to the OECD Public spending on education indicator (2019)

[3]Which are virtually the entirety of English universities

[4]Of course all other costs may differ, for example depending on the location of the university

also find limited evidence on the impact of university rank on wages (Lindahl and Regnér, 2005, Long, 2008)[5]. This literature on élite colleges has a close relation with the one on élite schools. Even for lower levels of schooling results are overall mixed. Using discontinuities in the students' admission procedure, Abdulkadirolu et al. (2014) and related later work (Abdulkadiroglu et al., 2017) find little causal effect of more selective schools on students' test scores and later achievement.

The fact that positive effects of élite institutions are either limited in magnitude or limited to a sub-group of the population - once selection is considered - is a bit puzzling if compared with evidence on the weight that people put on higher ranked schools and the willingness to pay for school rank and quality. For instance, literature shows that house prices tend to increase in the proximity of high ranked schools, suggesting a high willingness to pay for school rank and quality (Black, 1999, Fack and Grenet, 2010, Gibbons and Machin, 2003, 2006, Gibbons et al., 2013).

This work studies whether attending élite universities for students at the margin of universities acceptance rules lead to any difference in their academic performances. In other words, do students who access élite universities due to an exogenous shock to the probability of entrance end up having a poorer academic performance? This is important, as life events like dropout from university, change of institution or subject, or lower final grades can translate into labour market costs, and could give an explanation for the limited impact of high ranked universities found in the literature. A recent paper (MacLeod et al., 2017) shows that once a new signal tool as a final exam is in place, the returns to university reputation are reduced. Moreover, academic dropouts can be an undesirable output also from the university point of view, as they may translate into reputational or financial loss, and in a setting where the university financing is in total or in part public, this may translate into public spending inefficiencies.

The focus is on the English educational system. This has a few advantages. First of all, the provision of a large administrative dataset covering the entire educational path of students. This allows to fully control for the performance in lower levels of education, to track students into higher education institutions, and to also control for a series of demographic and background characteristics. In second instance, the English higher education system is one of the most prominent university systems in the world, with a number of institutions consistently ranking among world top rankings in various fields. Nevertheless, the quality of English universities is various, as it is the case in many countries, allowing for vast heterogeneities across the system. Another feature that characterises the English system is that it is almost entirely publicly funded[6],

[5]Hoxby (2009) and Hershbein (2013) provide a recent overview of works on the labour market effects of the characteristics of the higher education institutions.

[6]There are only five universities that are completely private and which are only marginal in the English higher education panorama (University of Buckingham, Regent's University London, The University of Law, BPP University and Arden University). These universities are not included in the administrative data. Results are though not likely to be affected much by this exclusion given the marginal role that those institutions have in the English setting.

with funding depending largely on the quantity of students enrolled. Recent reforms have increased the weight of tuition fees in the university funding, nevertheless, the system remains largely publicly regulated and the government still subsidises tuition fees and scholarships. So the English system has features that differ substantially from the US setting and from other countries, as Chile, that have largely been the focus of previous literature. Thirdly, the English system has been affected by a few reforms in recent years. Interestingly for this work, in 2012/13 and in 2013/14 two reforms affected the regulation of students control numbers - SCN henceforth. These reforms created exogenous discontinuities in the capacity of universities to enrol students with a given high school performance. As addressed later in this paper, this affected the probability of students with certain entry grades to access better universities, by giving to higher ranked universities a higher incentive to expand their numbers.

SCN were caps set by the central government to the number of students that each university could enrol in a given year. The caps applied to all home students, who are defined at the time of the writing as both UK nationals and EU nationals. Universities were subject to fines in case the number of home students enrolled diverged from the cap. In the academic year 2012/13[7], mostly unanticipated, a reform lifted the SCN caps allowing universities to exclude from the SCN students with a high school performance higher than a given threshold. This way universities had the possibility of enrolling their preferred number of students from the pool of high performing students, while students with lower grades remained subject to SCN. In 2013/14 the government decided to lower again the threshold for exclusion from the SCN accounting system[8] The students who are excluded from SCN in 2012/13 and 2013/14 are relatively high achievers and they were over-represented in high ranked institutions even before the reforms. In most of this work high ranked institutions coincide with the Russell group universities[9], though alternative measures will be used in this work, as university rankings. Students with more than the 2013/14 threshold were 70% of the students in the Russell group institutions already before the reforms, while they represented only 11.4% of students in other universities.

So, after the reform, universities are given the possibility to expand by attracting high performing students. As Russell group universities were already attracting high

[7]Academic year 2012/13 is also the year when university fees were increased, as will be discussed in Section 2. While the increase in fees was announced in 2010, and therefore largely anticipated, the lift to the SCN cap was not announced in 2010.

[8]High school in England - referred to as Key Stage 5 of the English education system - coincides with different types of post secondary education that usually last for two years, between the age of 16 and the age of 18, and that require to pass a final exam to be granted the corresponding qualification. The most common qualifications among students who go to university later on are the A-levels. Although A-levels do not represent the universe of students' choices at the age of 16, A-levels takers represent the majority of students at university, so in this work the focus will be on A-level takers. At the A-levels a student can choose the number and the subject of the exams. Exams are marked on a scale E (lowest) to A*. Usually, to go to university later on, students take 3 exams on 3 different subjects. The thresholds were set in 2012/13 to a final mark of AAB and ABB in 2013/14 to ABB.

[9]Russell group universities are 24 UK institutions generally at the top of national and international rankings. 20 of the 24 Russell group universities are located in England.

performing students more, one may expect that they also have the highest potential and incentive to expand[10]. If that is true, the probability of SCN excluded students enrolling in a higher ranked institution would be higher after the two reforms[11], which is what this empirical analysis finds and which constitutes the first stage of the instrumental variable model presented in this paper.

This empirical analysis shows that students that go to Russell group universities because of the changes induced by the reforms have an approximately 7 percentage points higher probability of dropping out within the first year, and an approximately 28 percent lower probability of finishing with a very high final mark. Results show some heterogeneity with respect to demographic and background characteristics.

To summarise, this paper exploits the two SCN caps reforms as exogenous shocks to the probability of going to a Russell group university to analyse how going to an élite institution for students at the margin of the reforms has an impact on their academic performance. It uses administrative data on the universe of English students throughout their whole academic career. It finds that students who enrolled to Russell group universities as a consequence of the SCN reforms have a higher probability of dropping out from university or of changing institution or subject. For students who do not drop out, the probability of finishing the bachelor with a high final grade substantially decreases.

This work contributes to the literature in several ways. First, it pins down a mechanism that could mitigate the positive impact of élite universities. I find that students who go to a certain type of universities because of the exogenous policy changes described have poorer academic performance. Although the data does not allow to directly test whether this translates into lower wages for the same students, it provides some evidence for a potential explanatory channel. For instance, in a human capital framework, dropouts represent an interruption or a slow down in the accumulation of human capital, which can translate into a lower return compared to a counterfactual completion of the university path. Thinking to education as a signal for productivity, dropouts can be detrimental in terms of future earnings as they translate into no or delayed qualification, and could potentially have some stigma cost attached. Thinking to final marks, a lower qualification may to the one hand suggest that the human capital cumulated can be of lower quality, on the other hand, in a signalling framework, it may signal a lower level of productivity. The question remains open in terms of whether going to an élite institution even though performing worse may still translate into some labour

[10]Even if expansion may be prevented in the short run by physical constraints - as, for instance, classrooms availability, teachers availability and so on, students excluded from SCN became in any case 'cost free' in terms of SCN, namely universities can enrol them without reducing their SCN availability. Moreover, even though Russell group universities were already enrolling many 'excluded' students - i.e. students above AAB and ABB thresholds - they were not enrolling them all, so they still may have margins to increase their student numbers by attracting more students from those groups.

[11]Other proxies for university rank can be used as international and national rankings, and Russell group universities may not be the only way of representing an élite institution. Some robustness checks will be provided in this respect.

market premium. Little evidence is there in this respect, two exceptions are Feng and Graetz (2017) and Naylor et al. (2016) that both show that returns for higher degree class are quite high. The lower probability of getting a high degree may then be costly in terms of labour market outcomes, but whether this overcomes the potential gain from attending a higher ranked institution is an open question. Thinking to education as a signalling device, in a context where the participation to higher education institutions increases, the capacity of the sole qualification of being a signal of higher productivity in the labour market may be diluted, and this may translate into a larger weight placed on different aspects of the university career, as the final degree, for example. In line with this idea, MacLeod et al. (2017) show that returns to university reputation are diluted after the introduction of standardised final tests in Colombia, though they find that returns reputation do not completely disappear.

The second contribution is to use a very broad administrative dataset that links extremely detailed information on the performance throughout lower levels of education (National Pupil Database) to information on university attendance and performance (Higher Education Statistics Agency). The dataset covers 9 cohorts of students, from students entering at university in the academic year 2006/07 until students entering in 2014/15, providing detailed information on exams performance, university and subject attended and final degree obtained. The dataset has the advantage of being linked to the School Census, that contains detailed demographic information as well as detailed information on students' location. This allows to control for a broad set of student level characteristics, and to test for a broad set of heterogeneities of the effects, as well as to try to define who are the people most affected by the policy change. Moreover, the policy reforms that exploited for identification allow to study the English university system as a whole and not to focus on a single institution or on a subgroup of institutions.

Third this work is the first, to my knowledge, to analyse the impact of SCN relaxation measures on the English university system. This is an important reform, as it relaxes legal constraints on university expansion without introducing new institutions or converting to university status institutions of a different nature[12]. Due to the nature of the reforms, high ranked universities are, at the same time, the institutions with more 'freedom' to expand - as they were already disproportionally attracting high performing students - and the ones that need to increase the pool of relatively low performers if they want to expand.

An important aspect of the study is to understand why people who enrol to higher ranked institutions due to the reform tend to have poorer academic performance. One could think to few candidate explanations. This paper will also try to address what are the most likely candidates to explain the findings. Though the power to run precise tests to disentangle between different mechanisms is limited, this paper tries

[12] As, for instance with the Further and Higher Education Act of 1992, which abolished the distinction between universities and polytechnics in the UK.

to provide suggestive evidence in favour or against them. The most straightforward mechanism could be that the reforms induce an increased probability of overmatching for students[13], and that students at the margin are simply struggling to cope with the increased difficulty of their coursework. The second candidate explanation is related to the peer effects and students' ranking literature. Overall, students who go to higher ranked universities due to the reforms, are both more likely to have better quality peers, but also to be at the bottom of the distribution of students within the same institution, the two could potentially drive the results to different directions. For instance, the literature has pointed out that peer effects may be highly non-linear and heterogeneous (Sacerdote, 2001), and there is mixed evidence on whether lower ability students benefit more from peers that are less or more homogenous to them (Booij et al., 2016, Carrell et al., 2013). Tincani (2017) shows that peer effects on test scores are partly related to rank concerns. Murphy and Weinhardt (2018) find, using English administrative data, strong and long-lasting effects of ordinal ranking during primary school on later achievement. The third candidate explanation is that universities that are more affected by the reforms are also the ones who increased their student numbers more. This may have induced a relatively scarcer provision of resources per students, at least in the short run, which could have an differential impact on students at different performance levels.

In the remainder of the paper, Section 2 gives some information on the institutional background, Section 3 describes the dataset. Section 4 discusses the empirical analysis and Section 5 shows the results. Section 6 discusses the potential mechanisms explaining the results. Section 7 concludes.

2 Institutional setting

Major changes have affected the English university system in the last decades. Murphy et al. (2018) provides an accurate description of the reforms that affected the system since the 1990s.

This work focuses on two reforms of the changes of the number of students that universities can enrol. English universities are prevalently publicly funded and caps to the enrolment of students were introduced in 1994 to guarantee the financial sustainability of university funding. This direct control of the government on student numbers lasted for almost 20 years, until the academic year 2012/13 when the caps started to be relaxed. From that year, universities are free to enrol their preferred number of students with a final mark of AAB or more in their A levels[14]. The following year, also students with

[13] Dillon and Smith (2018, 2017) are recent references for the literature on the impact of academic mis-matching

[14] A levels are the prevalent high-school level path for people enrolling at university. A levels are exams on different subjects, and the final possible mark in each exam can go from a minimum of E to a maximum of A*. For example, AAB corresponds to three A levels with A, A, and B as final marks, respectively. More detail on

ABB, so a slightly lower mark, were excluded from the government's direct control. Students' control numbers were eventually removed in 2015/16[15].

The students' control numbers changes are strictly related to a major change in the university financing system occurred in 2012/13. The central government finances universities and since 1998 sets fee caps tuition universities can charge to the students. Table 1 summarizes the history of fee cap changes in England. The most recent one was decided at the end of 2010. Following Browne (2010), the government set the cap to £9,000 per year[16], a level that was three times higher than the existing one and that made English universities jump up in the ranking of most expensive university systems in the world[17]. This changes have affected the financial costs for students', but they have also changed the structure of the university funding[18], which is now way more directly linked to the number of students enrolled. This was meant to guarantee the financial sustainability of the Higher Education system, relaxing at the same time the need for SCN. General press[19] has debated on how the combination of these policies may have induced universities to compete to attract more students. Some descriptive results (Murphy et al., 2018) confirm this idea, documenting that Russell Group universities apparently lowered their entry standards to expand, this reflecting in a fall of the average high school level performance of the students enrolled.

To understand who are excluded from the SCN reforms, some more words on the English primary and secondary education system are required. The system can be framed in two main parts. Until the age of 16, students go through 4 stages of education (Key Stages), each of them ending with a national level exam, along with teacher assessments[20]. Standardized tests at the national level cover Maths, English and Science for KS 1 to 3. Key Stage 4 follows a different mechanism. Besides core exams, and depending on the subjects offered by the school, students choose among a variety of subjects. Final examinations - General Certificates of Secondary Education, GCSEs - occur at the end of Year 11. All students usually sit for English, Maths and at least one Science GCSE[21] but they then can choose the number and the subject of the other exams.

The second branch of the English education system starts after GCSEs. The choice

this will follow in this Section.

[15]This last change will not be part of this analysis, due to data availability.

[16]The reform was approved on 9 December 2010 to be effective from the academic year 2012/13.

[17]According to OECD (2013), after the increase in fees, United Kingdom results as the third most expensive higher education system in the world.

[18]Murphy et al. (2018) describes more in detail the impact of the change in funding.

[19]The Guardian, 17 August 2018, *Prestigious universities edge out rivals in UK battle for students*; The Economist, 23 February 2017, *Growing competition between universities is changing student life.*

[20]The National level standardized tests have been subject to changes over time. For instance, no more standardized tests are to be taken by students in Key Stage 1 from 2003 onwards, and from 2008 onwards standardized tests have been eliminated for Key Stage 3 as well. Table 2 summarizes the compulsory education system in England.

[21]Double Science GCSE and Triple Science GCSE are also offered. These are exams that combine Chemistry, Biology and Physics in order to account for two and three GCSEs, respectively. Work by De Philippis (2017) uses the same data to study how changes in the offer of science subjects at the KS4 level affects the enrolment in STEM majors at university.

is essentially threefold. Pupils can go directly on the job market, pick a vocational education track, or an academic path. While vocational education in England is quite heterogeneous, both in terms of programs and in their length, the academic track usually corresponds to A levels, that last in general 2 years. At the A level stage, students can choose among a broad set of courses, each ending with a final exam at the end of the second year, with an intermediate exam (AS-levels) at the end of the first year. In general, students are free to choose as many A/AS levels as they would like, but usually students going to university take 4 AS-levels in the first year and they carry on 3 A levels at the end of the second year. Final marks correspond to the combination of marks obtained for each A level exam[22]. Figure 1 describes the changes over time of the distribution of the choice among different post-GCSE paths for all students sitting for GCSE exams in a given year, while Figure 2 draws the same picture conditional on them being observed at university. Both vocational and academic tracks entitle students to apply to higher education, even though it is clear by comparing Figure 1 and Figure 2 that A level students are over-represented at university[23].

Despite the increase in fees, the application and enrolment rate seems not to have deeply changed, although empirical analysis does not depict a clear picture. UCAS (2013), Wyness (2015), and Azmat and Simion (2017) document that, after a temporary drop, both applications and enrolment have continued to increase, following pre-reform trends. Recent evidence by Sá (2014) is contrasting this, suggesting that there has been a drop in both applications and attendance. This discrepancy may arise from the aggregate nature of data used by the latter work, that does not allow for a full distinction among cohorts in the pool of each year entrants.

Descriptive evidence from the individual-level dataset[24] confirms previous figures. These data allow to track students and to distinguish between those who go to university straight after high school and those who delay the entrance by one year, phenomenon that accounts, in general, for almost one third of the total enrolment. Figure 3 shows that the drop in enrolment observed between academic year 2011/12 and 2012/13[25] derives mostly from an anticipation effect. A greater proportion of students from 2009 cohort, in fact, enrolled straight after high-school with respect to other cohorts. The rationality of this relies on the fact that this cohort had full information on the increase in tuition fees and knew that, avoiding the gap year, they would have paid the lower fee for all years of the bachelor, saving almost £18,000 for a three-year program. Even if

[22]Marks are given on a A*-E scale. A* was introduced in 2010 to create further variability in marking and with the aim of allowing outstanding students to signal themselves. Measures for KS5 grades constructed for this work take the change into account.

[23]Restricting to students who go to university 3 years after their GCSE - on average when they are 18-19 years old - the A level prevalence is even more striking (Figure A.1 in the Appendix A).

[24]The dataset will be fully illustrated in Section 3.

[25]The reform fully affected students finishing compulsory school from 2009/2010 onwards. Students finishing KS4 in year 2008/2009 were aware of the increase since their last year of high school, so they could anticipate it not taking one gap year. The increase in fees did not apply to students already at university at the time it came into force.

descriptive statistics showthat the change the number of students going to university at the 'right time' - i.e. 3 years after GCSE exams, when they are 18-19 years old - is likely to be quite small or even negligible, there might be still concern on the fact that the change in students' numbers may capture part of the fee change. The identification strategy is though reinforced by the fact that the year after the fee increase, the students' control numbers are further modified. After a brief description of the dataset, Section 4 further illustrates this point.

3 Data

This work uses administrative data from the universe of English schools. The National Pupil Database (NPD) contains information on all students at all stages of education in England, with full records of their test performance. This dataset can be linked on the one side to the Census of schools, which contains several demographic information as gender, residential location, mother tongue, free school meal eligibility (FSM), and special education needs (SEN). On the other side, NPD data is linked to data on university students from the Higher Education Statistics Agency (HESA) containing information on the university and subject attended in in each year, final degree obtained, fees financing, as well as some additional background information such as parents' socio-economic status.

The main analysis focuses on students who enrol at a university bachelor programme between 2006/07 and 2014/15. As the reforms used for identification took place towards the end of the data series, only students who enrol at university straight after KS5 are kept in the dataset, as keeping all university students would induce some mechanical attrition to the dataset. The data structure[26] allows to construct measures of KS5 performance for A level takers, so the will keep information on people who have done an A level career at KS5[27]. As shown in Figure 2, A level students are likely to be highly representative of students at university, and there seem to be no particular change in the proportion of A level versus other KS5 path students in correspondence of the reforms studied here. As it is important in this context to use information on academic performance before university, the focus is on students that have studied in England at the KS4 and KS5 level. This way all foreign students coming to English universities are excluded, unless they studied in England also for A levels and GCSEs. Among those, non EU students are not affected by the SCN reform, so they would not be affected by the reforms anyway.

The focus is on bachelor programmes lasting 3 years[28]. Universities that offer only

[26]This could be extended to other KS5 paths in the future.

[27]For part of the year considered there exists an indicator for the path attended at KS5, as this does not cover the entire time span though, a more homogeneous indicator is constructed to keep information for people who passed at least one A level in the data series observed

[28]Longer bachelor programmes are excluded as they would mechanically prevent to study the impact on final

master or PhD programmes are excluded, as well as specialised universities - in arts or music for example - as their selection process is likely to be driven by completely different considerations with respect to all other universities. Very small universities are also excluded[29].

NPD data is available for all students in English schools sitting for national exams, so, information on performance is available also for students at private school for KS4 and KS5 exams. Census data is instead available only for students from state-maintained schools, so in models where census demographics are included, private school students get necessarily dropped. As shown in Figure 4, the percentage of private school students is rising both at the KS4 level and at the KS5, even though remaining overall relatively low in both cases, between 6.5 and 7.5 percent of all students at KS4, and between 4.5 and 5.5 percent of all students at KS5. Conditioning on students who go at university when they are 18-19 years old the figure changes quite a bit - Figure 5 illustrates the percentage of students at university who have attended either KS4 or KS5 exams in a private school. Private school students are clearly over-represented, in particular among Russell group universities where the percentage of private students is around 28 percent. For all university groups, the percentage of private school students enrolled has been decreasing in the period when the reforms took place. Given the relevance of this category, and the fact that excluding those students would overly affect higher ranked institutions, some of the results discussed in Section 5 retain private school students.

Table 3 describes the sample. Of course people deciding to go at university, that is the focus of this work, are a selected group of the NPD population. Table A.1 in the Appendix shows descriptive statistics for students excluded from this analysis, so for students not going at university straight after the end of high school. The comparison of Table 3 and Table A.1 is informative on the differences between students who select into university. Students observed at university tend to be higher performers from quite early stages of their academic career, they are more likely to be women and more likely to be from ethnic minorities or to be non native English speakers[30]. The incidence of free school meal eligible students and of students with special education needs is less prominent among those going at university and they tend to come from areas that are less deprived, and where house prices are higher.

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marks for late cohorts.

[29]Universities that enrol on average less than 200 students per year. They account for less than 1 percent of the dataset.

[30]This is potentially picking up the fact that at university there is a higher prevalence of foreign born. Information on nationality is though available only from the HESA dataset, so the direct comparison in this respect is not possible.

4 Empirical analysis

This work estimates the impact of the rank of higher education institutions on students' performance. What one would like to estimate is essentially the following:

$$Y_{icu} = \beta R_{icu} + \gamma X_{ic} + \theta_c + \theta_s + \epsilon_{icu} \tag{1}$$

where Y_{icu} is a measure of the performance of student i of cohort c, enrolled at university u. R_{icu} is a measure of the rank of institutions of the university u attended by student i, X_{ic} is a broad set of individual level controls. θ_c are GCSE-cohort fixed effects, and θ_s are GCSE school fixed effects. ϵ_{icu} is an idiosyncratic error term. Given the data structure - described in Section 3 - GCSE-cohorts and the academic year when enrolling convey the same information. The full set of controls included are measures of A level performance, KS4 (GCSE) performance, free school meal eligibility and special education needs in KS4, A level performance, parental socio economic status, gender, ethnicity, mother tongue, IDACI, and house prices in the area where living at the end of KS4[31].

In the main analysis focuses on a quite simple measure of university ranking that is an indicator of whether the university belongs to the Russell group[32], alternative results with be presented with different ranking measures[33]. Russell group universities are in general strongly committed to research, have a reputation of being high quality institutions, and they represent the majority of top ranked institutions both at the national level, and leading institutions also at the international level. Russell group universities would be the core of the analysis, nevertheless, I will use annual university rankings[34] as an additional ranking measure in some specifications.

Of course choosing one university over another is not a random choice for students, nor it is for universities to admit one student or another in their pool. Even though the dataset allows to control for a vast variety of dimensions and of fixed effects, this does not rule out the endogeneity of the university choice, which can not be taken 'as good as random'. Table 4 describes the differences in students distribution between Russell group and non Russell group institutions. Students in Russell group tend to have better GCSE records, they are slightly less likely to be women, to be of ethnic minorities and not to speak English as a principal language at home. Students at

[31] Area level controls are defined at the Lower Super Output Area level. IDACI is the Income Deprivation Affecting Children Index *Source:* Census of schools. House prices come from the HM Land Registry Data.

[32] Russell group universities based in England are: University of Birmingham, University of Bristol, University of Cambridge, Durham University, University of Exeter, Imperial College London, King's College London, University of Leeds, University of Liverpool, London School of Economics, University of Manchester, Newcastle University, University of Nottingham, University of Oxford, Queen Mary University of London, University of Sheffield, University of Southampton, University College London, University of Warwick, and University of York.

[33] Time varying, subject specific ranking scores from *The Complete University Guide*.

[34] Source: The Complete University Guide

Russell group universities are almost half as likely as students in other institutions to have been free school meal eligible during school, and they tend to be less likely to have had Special Education Needs at school. They are from higher socio economic status and they come from less deprived areas and with higher house prices, on average. As expected, students are clearly selected into different types of universities.

To correct for selection, as anticipated in Section 1, this work uses two reforms of the English university system [35]. These reforms essentially relaxed the existing centralised students' control numbers (SCN) that set the number of students that one university can enrol every academic year[36] by first excluding students scoring AAB or more at A levels from the SCN in the academic year 2012/13 and then excluding also ABB students the year after. These students were already over-represented in Russell group universities when SCN were equally binding for all universities and all students, as Table 5 shows. The idea is that the reforms have lowered the strings attached to enrolling the students excluded from the SCN, and that Russell group universities are less bounded by SCN after the reforms take place as they were already disproportionally attracting these students before the reforms. Following this idea, the interactions between the A level marks above the thresholds and the years when the reforms took place are used as Instrumental Variables for the rank of the institution, i.e. the Russell group indicator in this context.

The NPD data contains final marks for every A level exam[37], which allows to precisely construct the instruments. Figures A.2 and A.3 in the Appendix illustrate the AAB and ABB equivalences for A levels for the two years when the reforms took place[38]. Table 6 shows differences in control variables among different A level groups.

One concern on using the two reforms as an exogenous variation is that also the incentive to get a specific mark for A level students can have changed, if this allows them to reach better universities. An argument on why this may be of limited impact is that the final mark for an A level exam depends heavily on marks at the previous stage -AS levels - that occurs usually one year before. This in a way limits the capacity of adapting to the SCN reform from the students' perspective, at least in the short run. Figure 6 illustrates that there has been no essential change in the distribution of the A level marks over time. Figure 6 refers to students in my sample, so students going to university straight after high school, Figure A.4 in the Appendix draws the same distribution for the whole GCSE cohort, showing that they remain essentially

[35] The two reforms are discussed from an institutional point of view in Section 2.

[36] Caps applied to home students. Fines were provided for university over- or under-enrolling. Numbers were set at the institution level by the governments, while the internal allocation to different subjects was left to the choice of the single university.

[37] It also contains data on intermediate AS-level results that usually take place one year before A levels. The typical university student from an A level path takes 4 AS levels in the first year and 3 A levels in the second year. Students can take of course more than 3 A levels, for the purpose of the exemption from the SCN the 3 best A levels will be accounted for.

[38] As many universities do not take into account results for the General Studies A level, I exclude this from the A level final marks.

unchanged.

To summarise this paper uses exogenous variation in the probability of accessing a higher ranked institution as an instrumental variable for the university rank of the university where a student is observed. So Equation 1 is estimated using Instrumental Variables in a setting where the first stage is the following

$$R_{icu} = \gamma_1 \sum Alev_{ic} * \kappa_c + \delta X_{icu} + \theta_c + \theta_s + \eta_{icu} \tag{2}$$

so the excluded instrument is a set of interaction terms between A level groups and the time of the reforms. The idea is that even though in general students with higher A level performance have higher chances of enrolling into a Russell group university, the AAB and ABB thresholds start making a difference only when the SCN reforms took place. Figure 7 shows a graphical representation of the direction in which the first stage acts, increasing the probability of going to a Russell group institution for students close to the thresholds defined by the reforms.

4.1 First Stage

Besides the existence of a first stage, the assumptions for the instrumental variable validity are that the IVs are as good as random and that they are exogenous to the model. Given the mostly unanticipated nature of the reforms and having observed no particular change in A level grades over time close to the thresholds, it can be fair to assume that these conditions hold in this context. In this context, the IV is clearly not likely to have an homogeneous impact on all students. For this reason, it is important to stress that the interpretation of this IV strategy has to be read in a Local Average Treatment Effect context. What it is being evaluated is not the average effect of going to an élite university for all students, but for students who were at the margin of the SCN reforms. As the IVs in this case clearly do not have a homogeneous impact, monotonicity has also to hold. In this context it translates into the fact that there are no students who would have gone to a higher ranked institution in absence of the reform and had not gone in presence of the reform. Given the policy setting if can be fair to assume, also in this case, that the assumption holds.

As previously mentioned, the students excluded from SCN by the reforms are quite good performers, who were already more likely to end up in higher ranked institutions. From the universities point of view, this means that, if a university wants to expand its number of students, it can do so by enrolling more students outside SCN thresholds. In principle, the potential to expand is then higher for universities that were already attracting good students to start with. Figure 8 appears to confirm this intuition, as it shows that the average number of entrants per university has increased after the reforms for Russell group universities, while the same seems not to be true for other

institutions.

The fact that non Russell universities have expanded less does not necessarily mean that they did not change their pool of students to any extent. Figure 9[39] shows the shift in the A level performance distributions of students enrolled in Russell and other universities before and after the SCN reforms. Looking at Panel A it is clear that Russell group universities expanded by accepting more students at the thresholds of the SCN reforms, while for other universities, the number of students just below the thresholds increased.

Table 7 reports the first stage estimated coefficients for the excluded instruments, estimated on the whole sample. As it will be the case for all the main models presented in this paper, standard errors are obtained accounting for clusters at the university-subject level. The reason for this is that applications are made at this level and the realised student-university match, which determines the rank of the university where the student is observed, also happens at this level. Robustness checks are included for the main models using different clustering levels. Comparing the different columns, it appears that the inclusion of additional controls, as well as the exclusion of private school students, does not alter the first stage coefficients by much. Also the F tests for the excluded instruments are not too different across specifications. Figure 10 shows a graphical visualisation of the first stage coefficients for the preferred specification - corresponding to Column (4) of Table 7.

As anticipated, the Instrumental Variable estimates presented in this paper have to be interpreted in a LATE framework, so the causal effect identified refers to the effect for compliers. Having a multivariate and multi-instrument setting, identifying the compliers is not necessarily straightforward. A useful exercise is though to investigate heterogeneities of the First Stage with respect to individual level characteristics. For simplicity the results of this exercise are presented in Figure 11. Overall there do not seem to be strong heterogeneities with respect to demographics and census information. Women seem to be less likely to go to Russell group universities due to the reforms, though the standard errors are quite large. One dimension represent a substantial exception, students who were performing marginally better at GCSEs are substantially more likely to go to Russell group universities due to the reform, even conditioning on A level performance.

[39]UCAS points translate A levels combinations into numbers. 140 = $A*$, 120 = A, 100 = B and so on. An AAB corresponds for instance to 340 UCAS points, while an ABB to a 320 UCAS points. UCAS points are calculated considering all A level passed - besides General Course - and not only the best 3 as it is the case for the SCN thresholds.

5 Results

5.1 Dropout

The main analysis presented in this paper focuses on estimating the probability of dropout for students who go to Russell group institutions due to the SCN reforms. Not all students are likely to be equally affected by the reforms, as Section 4.1 discusses. In particular, both students with very good A levels and students with very bad A levels are not much likely to see a change in their probability of going to a higher ranked institution. For this, the baseline specification reduces the sample to students within a certain distance in terms of A level UCAS points to the thresholds defined by the two reforms. For instance, only students in the range of 200 to 400 A level UCAS points will be retained in the main analysis - AAB and ABB correspond to 340 and 320 UCAS points, respectively. Robustness checks will be provided restricting and expanding the sample.

The definition of dropping out in this context is quite broad, so not only complete drop outs from university are taken into account, but also changes of university and changes in major. The idea to use this broader definition is that also changes in university and subject may induce disruptions that could be costly in the labour market[40].

Table 8 shows in the upper panel the Instrumental Variable results for students within 200 and 400 UCAS A level points[41]. The lower panel shows OLS results for comparison. Looking at the OLS results, average dropouts are lower in the Russell group universities[42]. This is not surprising as, at least from an anecdotical point of view, dropouts are in general a non-desirable outcome also from the university perspective, and in general it is likely that a tighter selection process allows higher ranked institutions to recruit students that are less likely to dropout. This already suggests that OLS results are likely to be biased, so the focus will be on the Instrumental Variable results.

Column (1) shows results for the most basic models that include cohort fixed effects, controls for A level marks, and KS4 school fixed effects. This model does not exclude in principle students from private schools. For the students at the margin of going to Russell group universities, the probability of dropping out increases by 9.5 percentage points. Column (2) includes additional controls for GCSE performance. The probability of dropping out in this case is slightly lower (9.2 percentage points). Column (3) re runs the same model excluding private school students, the probability is reduced in this case to 6.8 percentage points. Column (4) includes demographic, backround, and

[40] Further development of this work will consider also other specifications for the dropout
[41] First stage coefficients for the excluded instruments are reported in Table A.2 in the Appendix.
[42] All models are estimated as Linear Probability Models.

area level controls. The impact of going to a Russell group university for students at the margin of the reforms is approximately a 7 percentage points increase in dropouts.

The change in the university fee caps that occurred in 2012/13 may raise concerns on the validity of the exclusion restriction. In this respect, the structure of the SCN reforms is helpful as it provides additional variation in the year after the fee reform. The fee cap reform was announced in 2010, so almost 2 academic years before it entered into place. For this reason, students finishing high school at the end of 2010/11 could anticipate the reform by not taking one gap year, which is relatively common among English students, and enrolling to university straight away. Figure 3 shows that this actually is likely to have happened, as the proportion of students enrolling to university straight after high school on the year before the fee cap reform increased substantially. As this may have some impacts on the results, the upper panel of Table A.3 in the Appendix shows estimates obtained excluding students from that cohort. Coefficients are slightly bigger than for the main specification, though similar to the ones in Table 8. The bottom panel of Table A.3 also excludes students entering in the first year of the fee reform, 2012/13, results are even stronger than it is in our main specifications.

Other robustness checks are shown in the Appendix. Table A.4 for instance runs the models on different sub-samples. Panel A keeps information for all the students in the sample described in Section 3, results are mitigated when all students are considered, and going to Russell group university after the reforms were introduced relates to an approximately 4.4 percentage points increase in the probability of dropping out, in the preferred specification (Column 4). Panels B to E subsequently exclude low A level and high A level students from the analysis, with the rationale that very low and very high performers are less likely to be affected by the reforms. Results are overall closely comparable to the ones of Table 8. Table A.5 show the results obtained by using different cluster structures as clusters at the university level (Panel A), at the university-A level points level (Panel B), and at the GCSE school level (Panel C). The significance of the results does not change dramatically due to the different cluster structures imposed.

Being a Russell group institution is not the only possible measure for being a high ranked institution. Table 9 uses the Overall Score, which is used to construct the yearly university rankings at the subject level[43]. The Overall Score goes on a 0-100 scale, with 100 being the highest score. The final results are smaller, though closely comparable to the ones of Table 8. In fact, on average, Russell group universities have a ranking score that is 8.7 points higher than the other institutions, 92.3 and 83.7 respectively, so multiplying this average difference by the estimated coefficient gives an effect of approximately 6.3 percentage points increase in dropout in the preferred specification (Column 4).

[43]The score is based on different measures that includes the rank of the research and of the teaching, among others. For a complete description please refer to the data source: The Complete University Guide.

One interesting point to investigate is whether the results are driven by one or a few universities in particular. To address this, Figure 12 plots the coefficients and standard errors obtained by leaving out one university at the time. Universities in the sample are 101, so this translate in 101 different estimates. With a few exceptions, estimates concentrate around the overall estimates presented in Column (4) of Table 8. Coefficients range from approximatively 6 percentage points to 8.5 percentage points. Figure 13 relates the coefficients estimates with this method with the overall change in dropout rates before and after the reforms for the university left out. The relation seems quite flat.

5.2 First degree

The probability of dropping out from university is not the only outcome that one may be interested in. Studies on returns to final bachelor degrees (Feng and Graetz, 2017, Naylor et al., 2016) find that higher degrees have substantial returns, even within high ranked institutions. In this part of the paper the focus is on studying the impact of going to an élite institution on the probability of finishing the Bachelor with a First degree, which is the maximum final mark in the English Higher Education system.

Table 10 shows results for the probability of obtaining a First degree at the end of the Bachelor. The models presented are conditional on enrolling in a 3-year programme - due to data limitations - and on not dropping out. When running OLS models (bottom panel), the probability of getting a First degree is around 7 percentage points lower for students in Russell group universities. This is in line with the idea that Russell group universities are in general more selective and less generous in terms of marking. This does though reflect the selection, so also in this case one wants to focus on instrumental variable results that take into account for selection and focus on students at the margin of going to a higher ranked institution. When the model is estimated with instrumental variables (top panel), going to a Russell group university is estimated to reduce the probability of finishing with a first of around 28 percentage points, though the first stage is not so strong in this context. Also in this case results are then replicated using the overall ranking score[44]. In this case, results are on average lower with this measure of ranking, and the first stage is marginally stronger in this specification.

A lower probability of getting an high final mark does not necessarily translate to poorer labour market outcomes, for instance the returns to going to a higher ranked institution may offset the loss from finishing with a lower mark. At the time of writing is not possible to directly test which is the impact on labour market outcomes, but still more work can be done to address this point, and will be the focus of further extensions of this paper.

[44]Data source: The Complete University Guide.

6 Potential mechanisms

Overall this paper finds that students who were pushed to higher ranked universities in reaction to reforms that were in the direction of allowing university expansion are more likely to have a poorer academic performance. For instance they tend to dropout more often from the university where initially enrolled, and they tend to have lower final marks. An important aspect is to understand why this is the case, and this Section will attempt to address this. It would be in general difficult to disentangle different mechanisms in a causal-like way, though some suggestive evidence in favour or against them can be provided[45].

A few candidate explanations can be thought. Perhaps the most straightforward one is that students that are pushed to higher ranked institutions by the reform may struggle to catch up with the level of the courses in top institutions. These students tend to be low performers with respect to the average pool of students of top institutions, and it may simply be that the effort level required is too big for them. In this direction it has first to be noticed that students at the margin of the reforms are quite good performers. Looking at the heterogeneities of the First Stage models - Figure 11 - the clearest signal from this analysis is that students who are more likely to be affected by the reforms studied here tend to be higher performers, even controlling for A level results.

This mechanism builds on the literature on students' mismatching[46] and on the idea that there does not necessarily exist an institution that is absolutely the best choice for everybody, but that the utility comes from the match between students' ability and university selectivity. One thing that signal that this may not be the full explanation relates to the fact that students may tend to choose relatively less effort intense programmes within more difficult institutions. This can happen for a few reasons. On the university side, less demanding programmes may be cheaper and could be the first to try to expand by attracting more students - and the less concerned about having to enroll lower performers perhaps. On the students' side, this may be related to the application mechanism. In England students apply to university in a centralised way and can name in the application up to 5 university-subject choices. Students may act strategically by naming less demanding subjects in more selective institutions. The reforms are not likely to have been anticipated by students, so it can be reasonable to think that students' behaviour does not change. Due the reforms high ranked universities can expand more than others, and this may translate to higher chances for those students to enter in the higher ranked institution to a relatively less demanding programme.

[45] This section is very preliminary and more work will be done to expand the discussion in the next future.
[46] Dillon and Smith (2018, 2017) are recent references for the literature on the impact of academic mis-matching

Table 12 shows some suggestive evidence in this direction. This Table runs a modification of Equation 2 where the dependent variable is a proxy for the selectivity of the subject within an institution at some initial point, and where interactions between the excluded instruments and a Russell group university indicator are included.The dependent variable is the within institution ranking of subjects based on UCAS points for the average student enrolled in the subject-university pair in the academic year 2007/08, or for the least student in an alternative specification. Results show that after the reform, students who were outside SCN tend to choose lower ranked subjects within Russell group institutions. If lower ranked subjects tend also to be less demanding, then this should mitigate the impact on performance, so the results presented in the previous Section could represent actually a lower bound.

The second potential mechanism relates to peer effects and ranking literature. Students who go to higher ranked universities due to the reforms, are both more likely to have better quality peers, and to be at the bottom of the distribution of students within the same institution. The two can have different impacts. Literature has pointed out that peer effects may be highly non-linear and heterogeneous (Sacerdote, 2001), and there is mixed evidence on whether lower ability students benefit more from peers that are homogenous to them (Booij et al., 2016, Carrell et al., 2013). To test whether the quality of peers and the relative position of the student could partly explain the results controls for peers' quality and for relative ranking are added to the baseline model. As of course those are not pre-determined variable and given the presence of multiple instruments they can also be treated as endogenous in this context. Table 13 shows the results. Results do not change too much when the relative quality of the student is considered (Column 2). First stage becomes instead quite weak once peers' quality is taken into account.

The third mechanism is relate to the scarcity of resources. Universities that have expanded due to the reforms are also may have not been able to adjust their level of resources per students, at least in the short run. This could have an impact on students, in particular on those who may start off from weaker academic performance levels. Also in this case, to test whether the resources constraints play a role in explaining the results, some controls for teaching staff presence are added. Table 14 shows the results. The coefficient does decrease once teaching staff measures are included in the model.

Of course these results are far from being conclusive and more work will be done in this direction.

7 Discussion

This paper uses two reforms of the students' cap numbers - relaxing the limits to expand the numbers of students enrolled in each university - to identify the impact of

high ranked élite institutions on students' academic performance.

In this work academic performance is measured by dropouts from university and by the achievement of a high degree at the end of the bachelor. The results for the two outcomes point in the same direction, suggesting that students who were at the margin of being affected by the reforms - i.e. students who got accepted at a Russell group university because of the SCN relaxation - went through a less successful academic path.

Several mechanisms could explain this effect. This version of the work discusses alternative explanations and trace some line to test support them, but more work needs to be done in this direction in future developments of this project.

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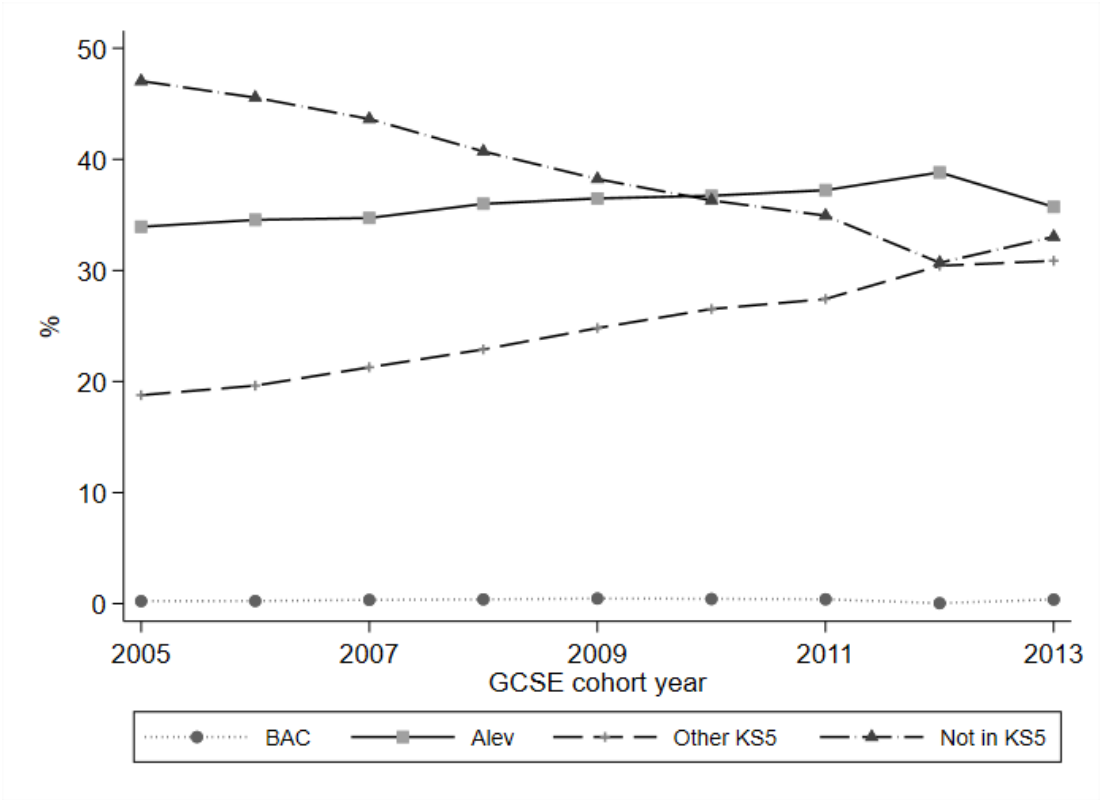
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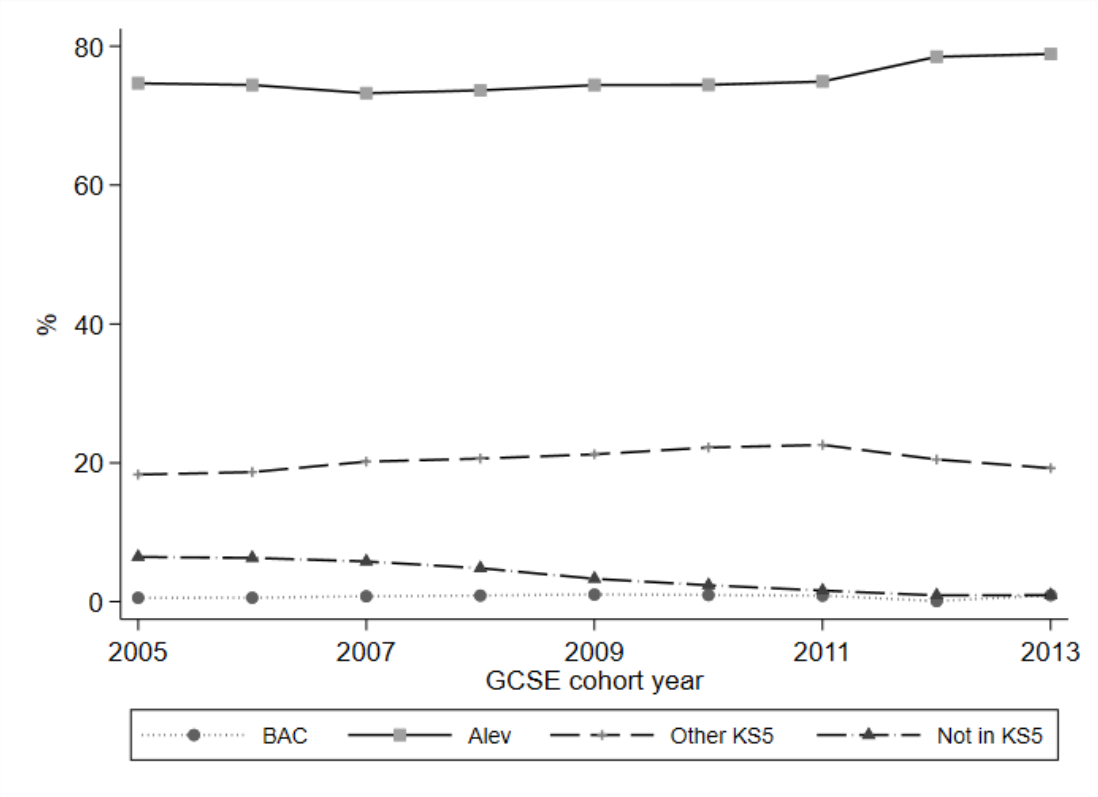
Graphs

Figure 1: Post-GCSE paths, all students sitting for GCSEs in a given year



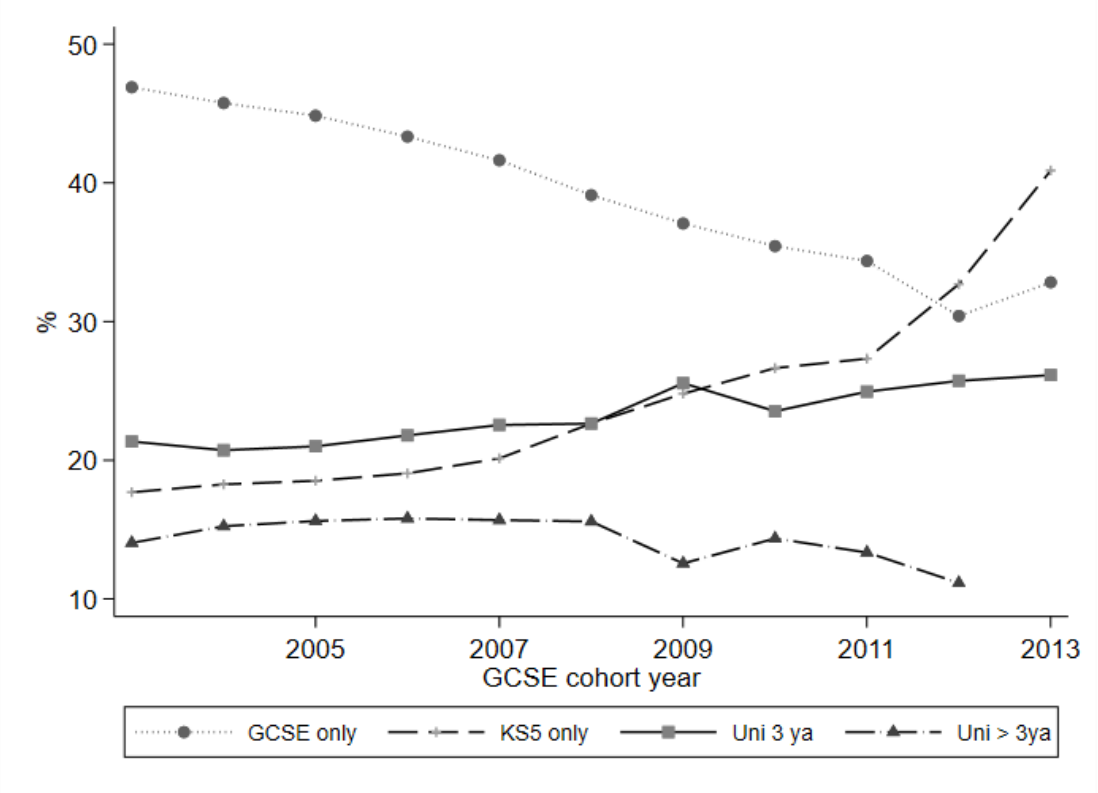
Notes: Vertical axis represents the % of students finishing GCSE in a given year that are afterwards observed in one of the following: (i) *BAC*: International Baccalaureat; (ii) *Alevels*: Academic A levels, defined as students passing at least one Alevel; (iii) *Other KS5*: Other KS5 paths, namely (but not only) BTEC, NVQ, Applied A levels; (iv) *Not in KS5*: Not observed in KS5. Percentages are calculated on the entire cohort of students taking their GCSEs in a given school year , i.e. year 2005 refers to school year 2004/05.

Figure 2: Post-GCSE paths, all students sitting for GCSEs in a given year, conditional on enrolling at university



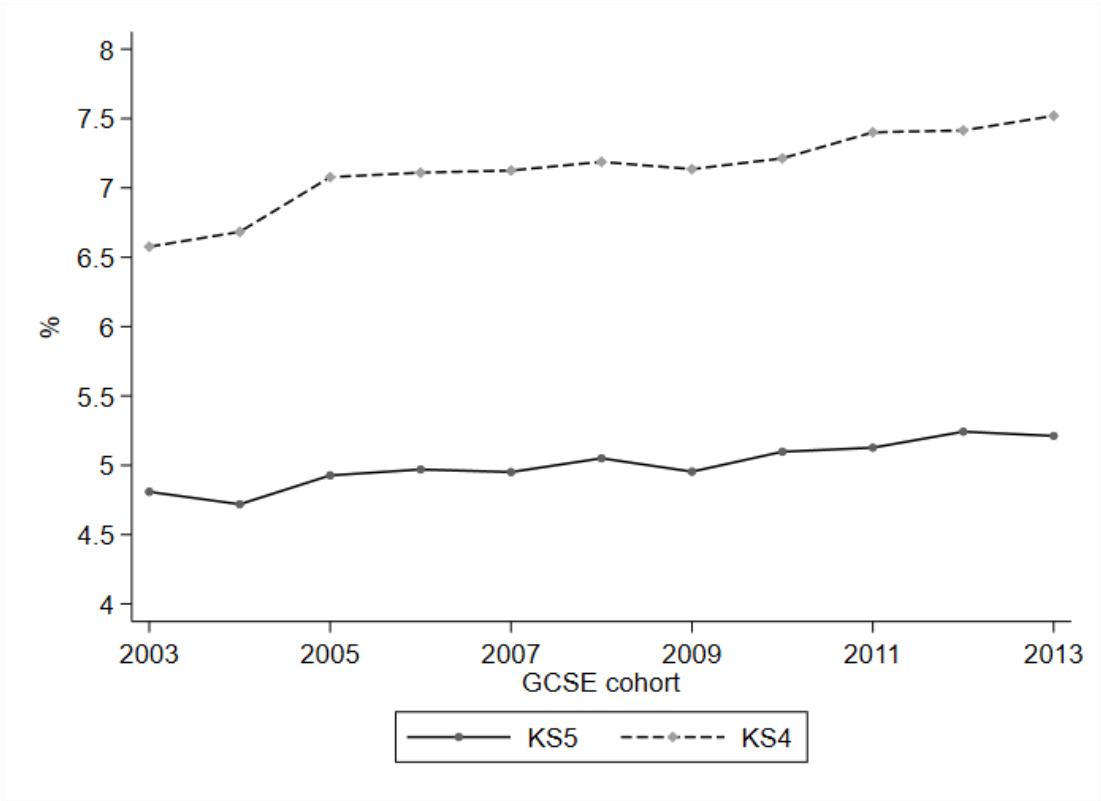
Notes: Vertical axis represents the % of students finishing GCSE in a given year that are afterwards observed in one of the following: (i) *BAC*: International Baccalaureat; (ii) *Alevels*: Academic A levels, defined as students passing at least one Alevel; (iii) *Other KS5*: Other KS5 paths, namely (but not only) BTEC, NVQ, Applied A levels; (iv) *Not in KS5*: Not observed in KS5. Percentages are calculated on the students taking their GCSEs in a given school year who are then observed at univerisity. Year 2005 refers to school year 2004/05.

Figure 3: Post-GCSE paths - University enrolment



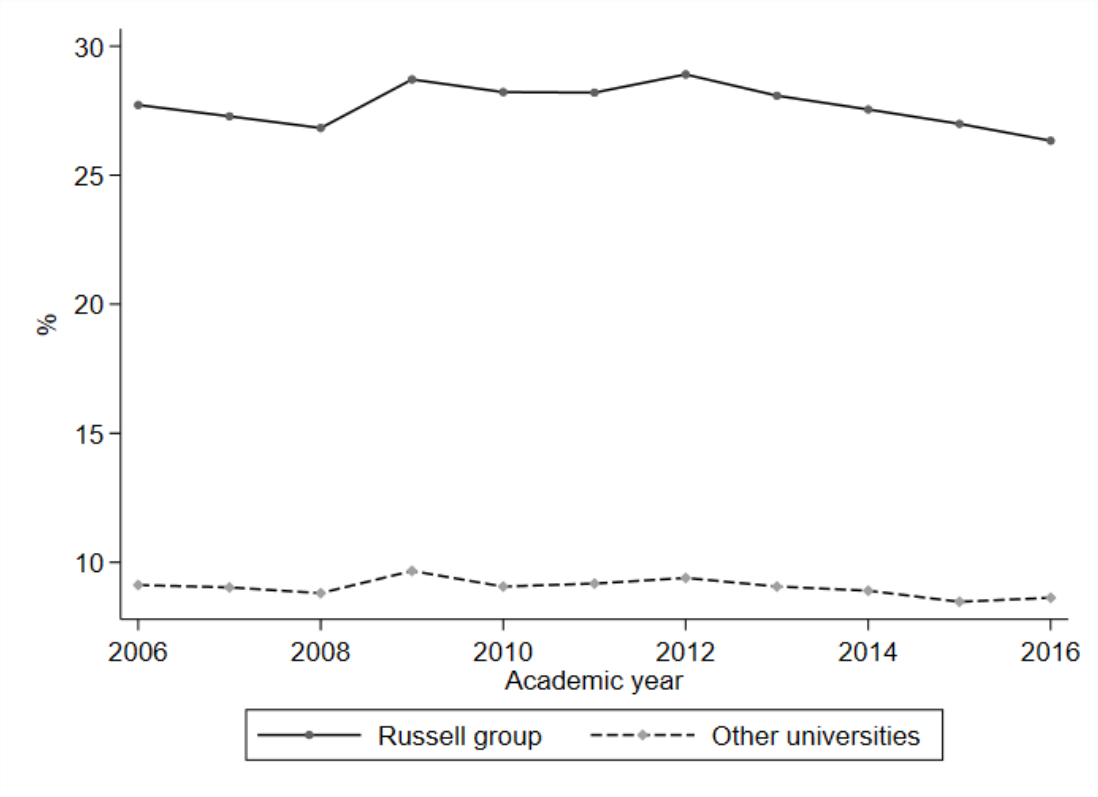
Notes: Vertical axis represents the % of students finishing GCSE in a given year that are afterwards observed in one of the following: (i) *GCSE only*: Not observe in KS5 or at university after GCSEs; (ii) *KS5 only*: Observed in KS5, but ot observed at university afterwards; (iii) *Uni 3ya*: Observed at university 3 years after the end of GCSEs - when 18-19 years old; (iv) *Uni 3ya*: Observed at university more than 3 years after GCSEs. Given the data availability, I am able to follow students at university until the Academic year 2015/16 only. This is clearly affecting the probability of observing people at university with some delay from the end of GCSEs. Percentages are calculated on the entire cohort of students taking their GCSEs in a given school year, i.e. year 2005 refers to school year 2004/05.

Figure 4: Percentage of private school students in KS4 and KS5, by cohort



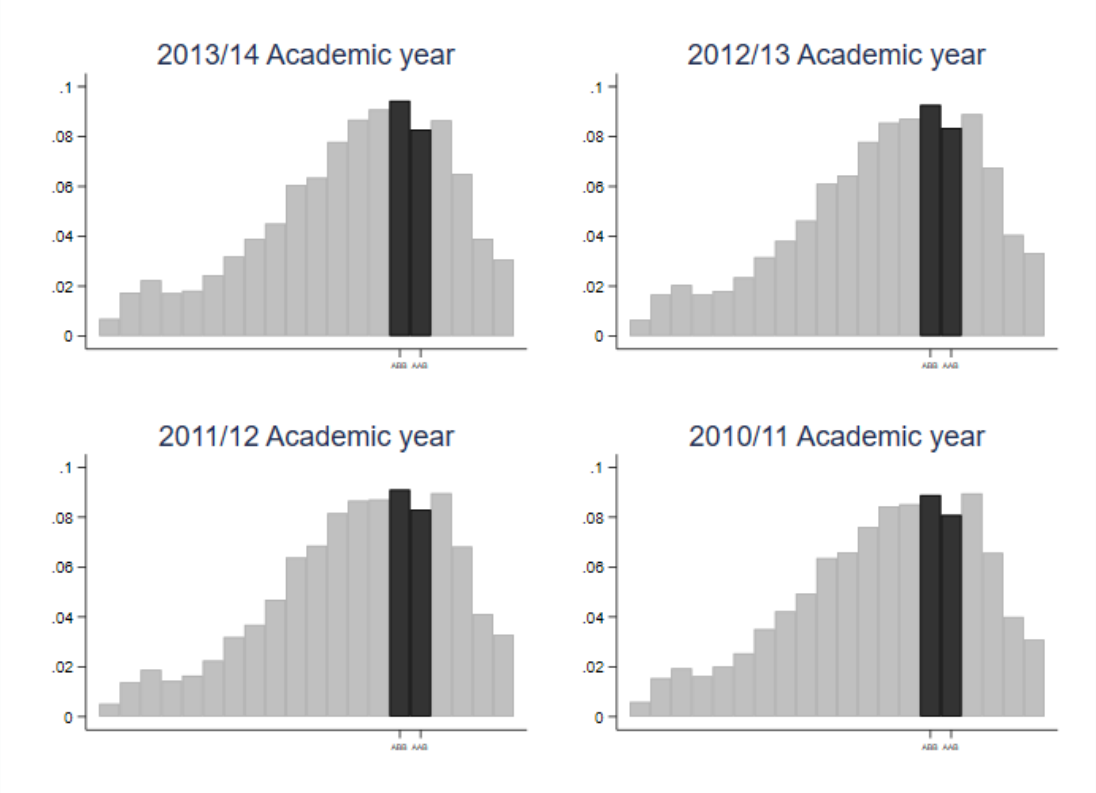
Notes: Vertical axis represents the % of students in private (independent) schools in KS4 and in KS5.

Figure 5: Percentage of university students who were at private schools in KS5 or in KS4, by type of university



Notes: Vertical axis represents the % of students in private (independent) schools in KS5 that are observed at university in every academic year.

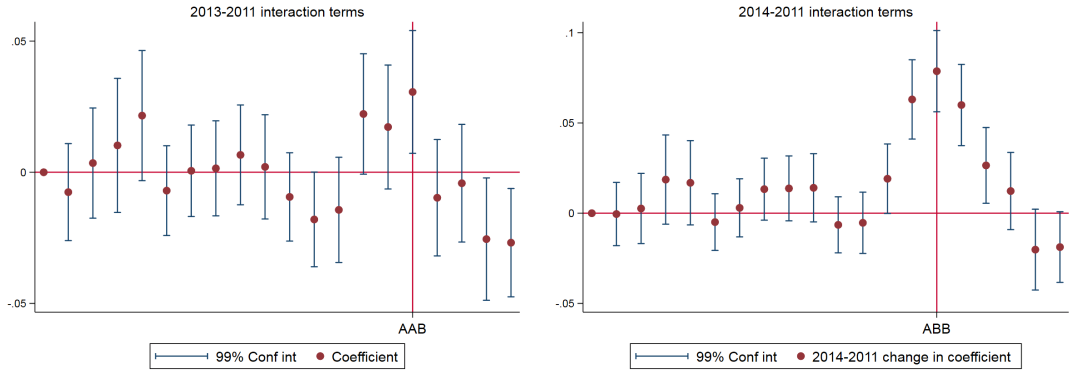
Figure 6: A levels final marks distribution, by Academic Year



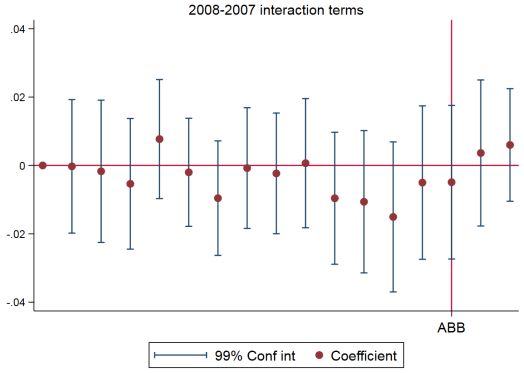
Notes: Academic Year 2012/13 is the first year when SCN exclusion was implemented, excluding $AAB+$ students. In Academic Year 2013/14 also AAB students were excluded from SCN. Academic Years 2011/12 and 2010/11 are for reference of the pre-reform period. Students with exactly AAB and ABB are highlighted in a darker tone.

Figure 7: Changes in the probability of enrolling in a Russell group university

Panel A: Student Control Number reforms

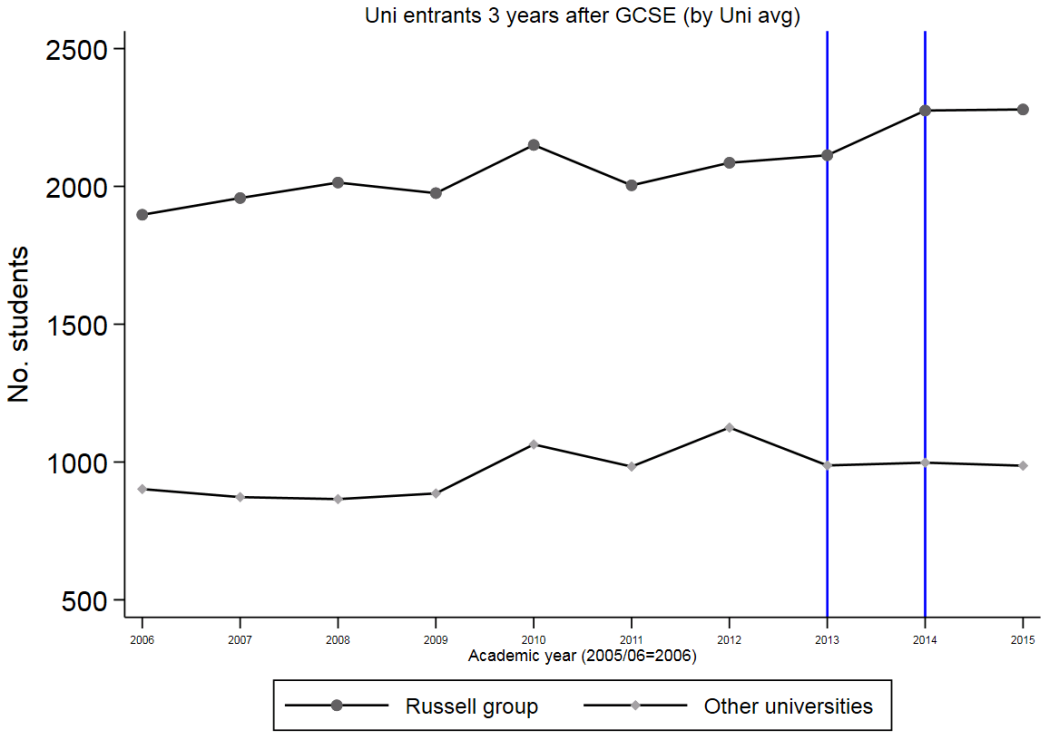


Panel B: Before the reforms



Notes: The graphs show two academic years comparisons. Panel A: The left panel shows changes in the probability of going to a Russell group university between year 2012/13 - the first SCN reform - and 2010/11 for each A level final mark group - the plotted coefficients are interaction terms obtained from an OLS model, no controls included. The right-hand panel shows the same comparison run between years 2013/14 - the second SCN reform - and 2010/11. Panel B: Same specifications as in Panel A for 2008/07 and 2007/06 comparisons.

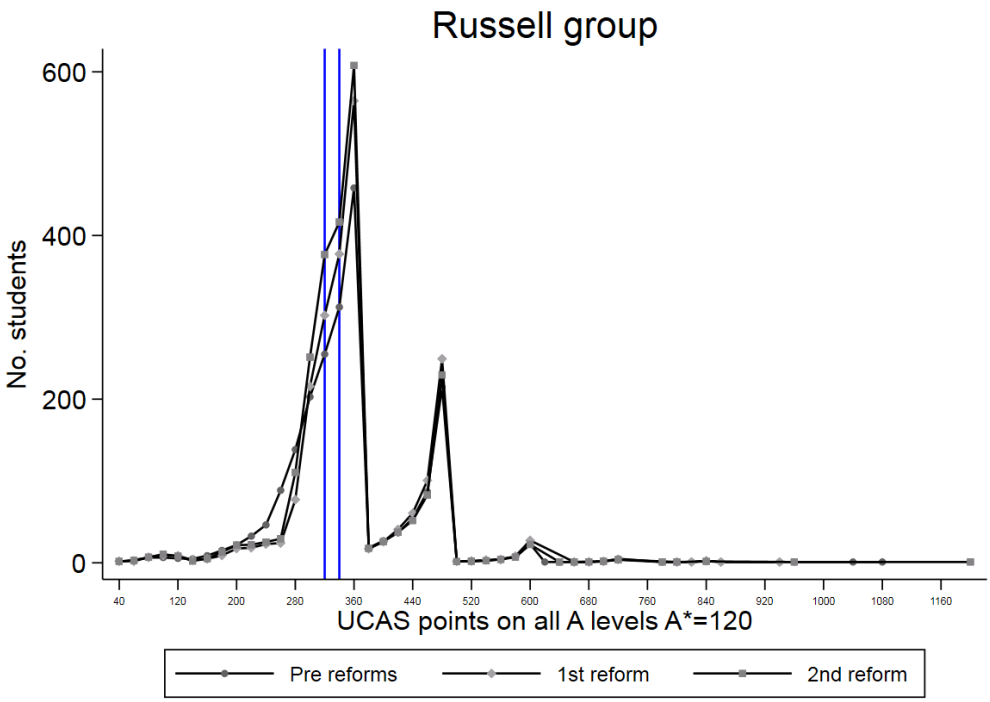
Figure 8: Average cohort size, Russell vs other institutions



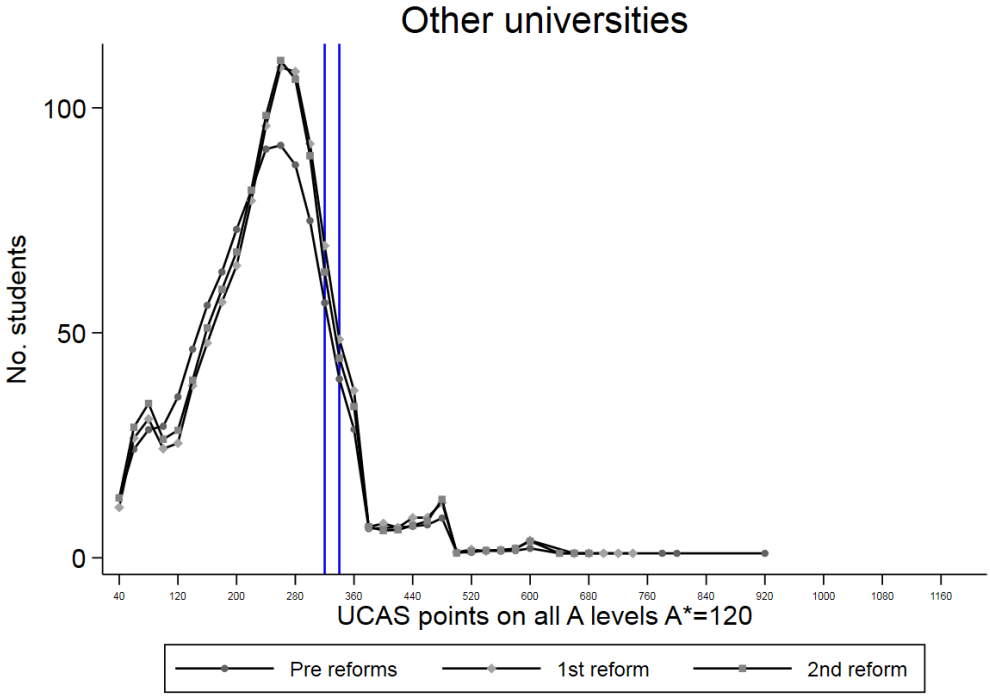
Notes: Average yearly entrants by university.

Figure 9: Shifts in A level distributions, Russell vs other institutions

Panel A: Russell Group

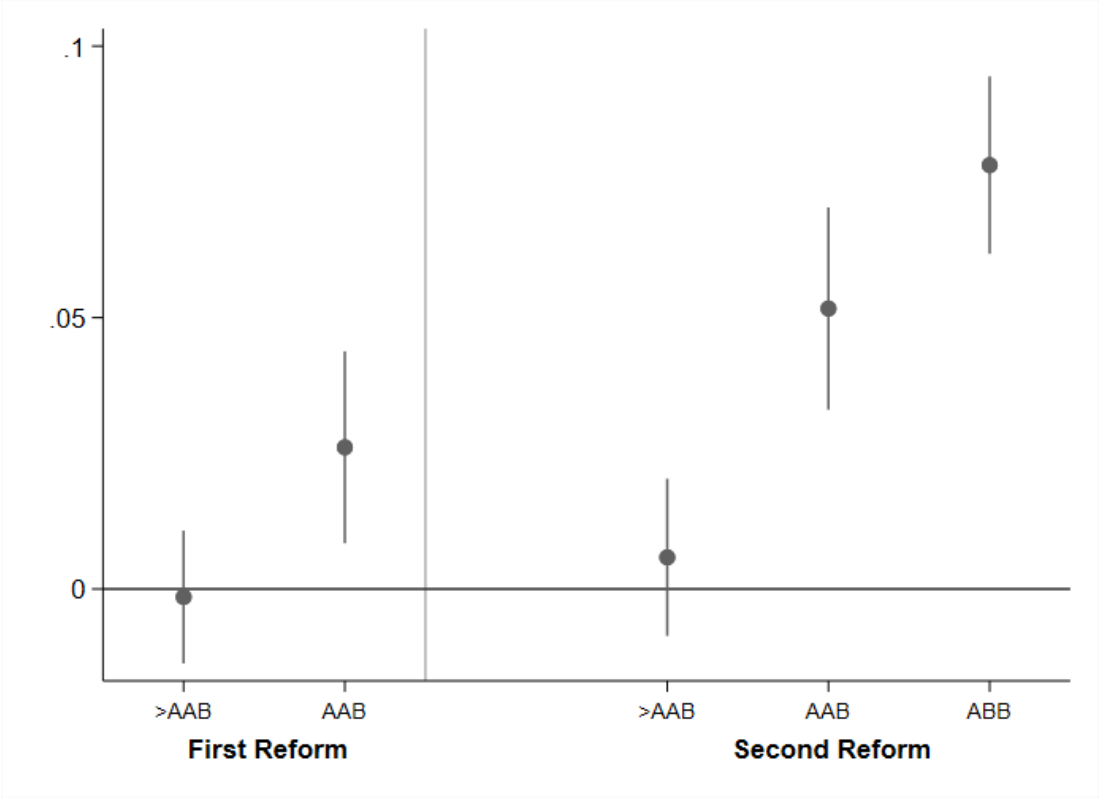


Panel B: Other Universities



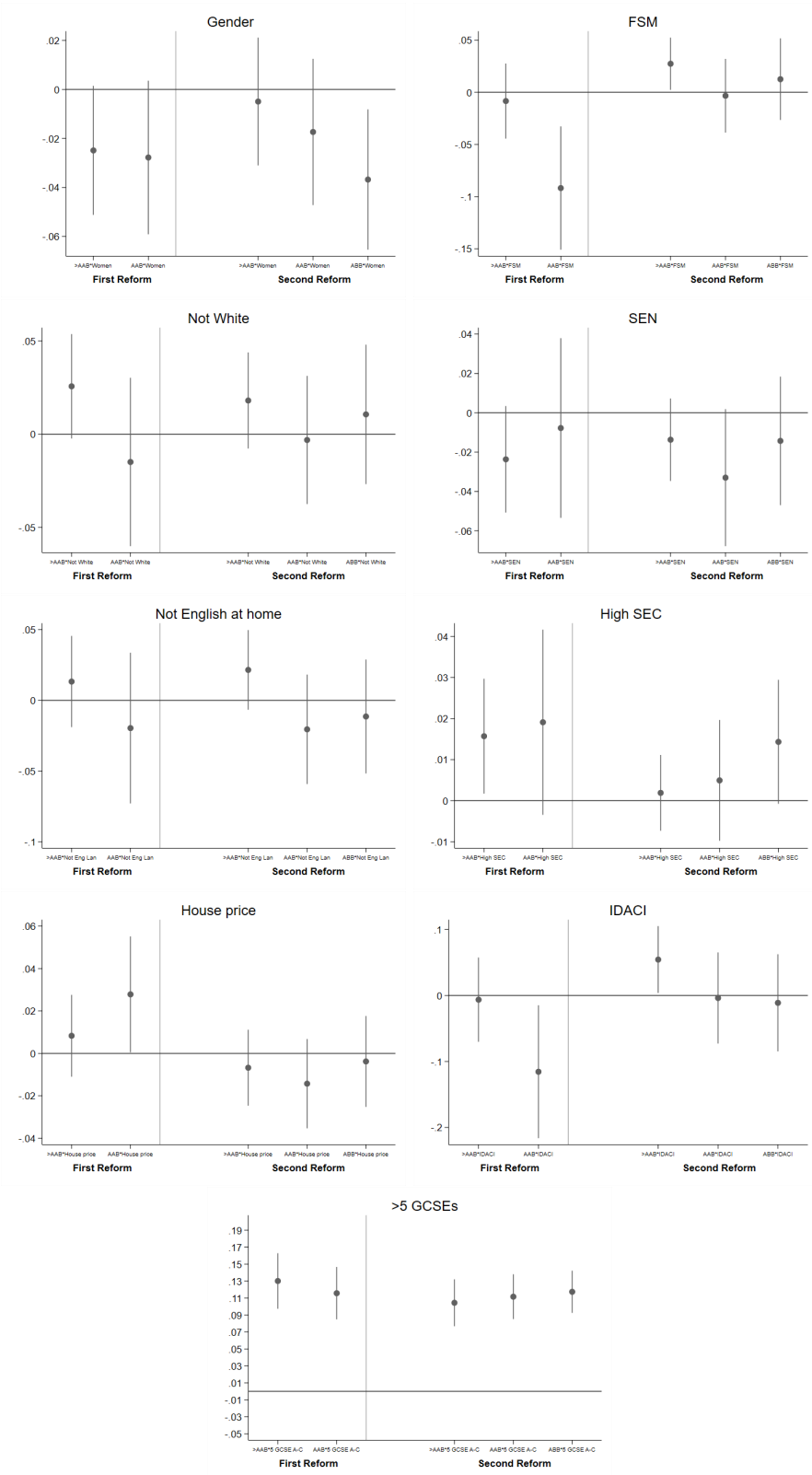
Notes: UCAS points translate A levels combinations into numbers. 140 = $A*$, 120 = A, 100 = B and so on. An AAB corresponds for instance to 340 UCAS points, while an ABB to a 320 UCAS points.

Figure 10: First stage coefficients - All sample



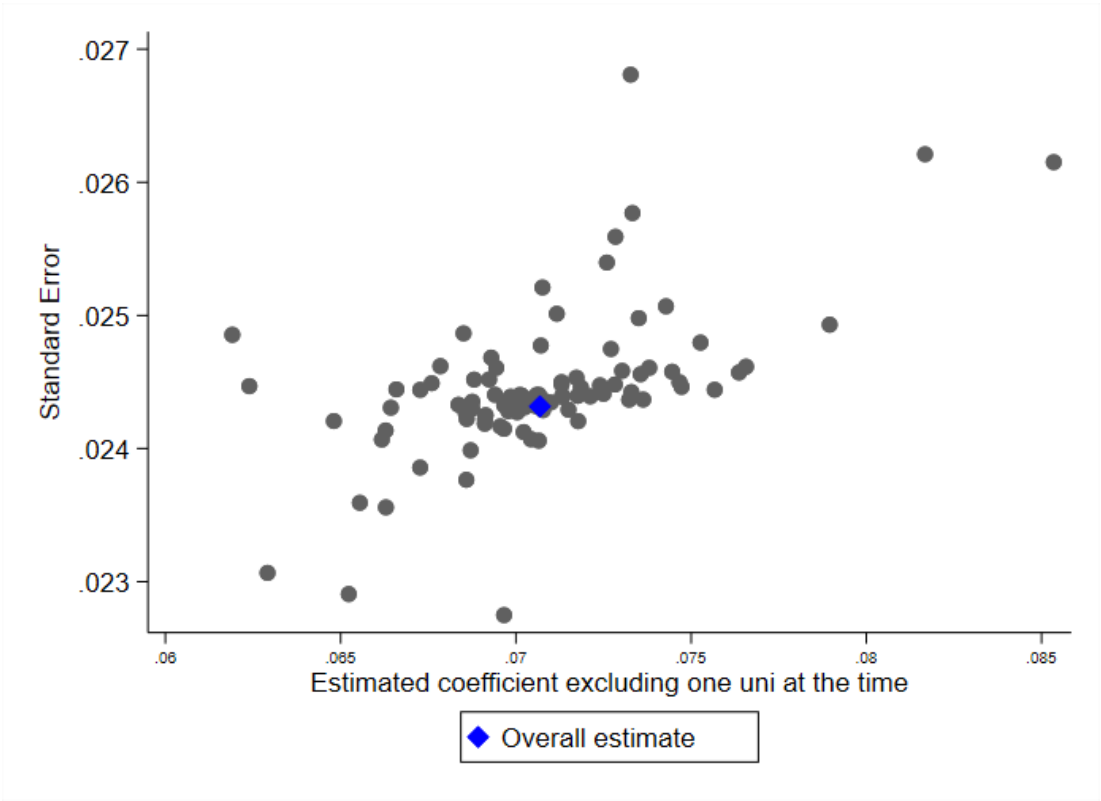
Notes: First stage models represented in this figure control for all past performance, background, census, location variables, and fixed effects included in the main model. Coefficients relate to Column (4) of Table 7

Figure 11: Heterogeneities in the first stage



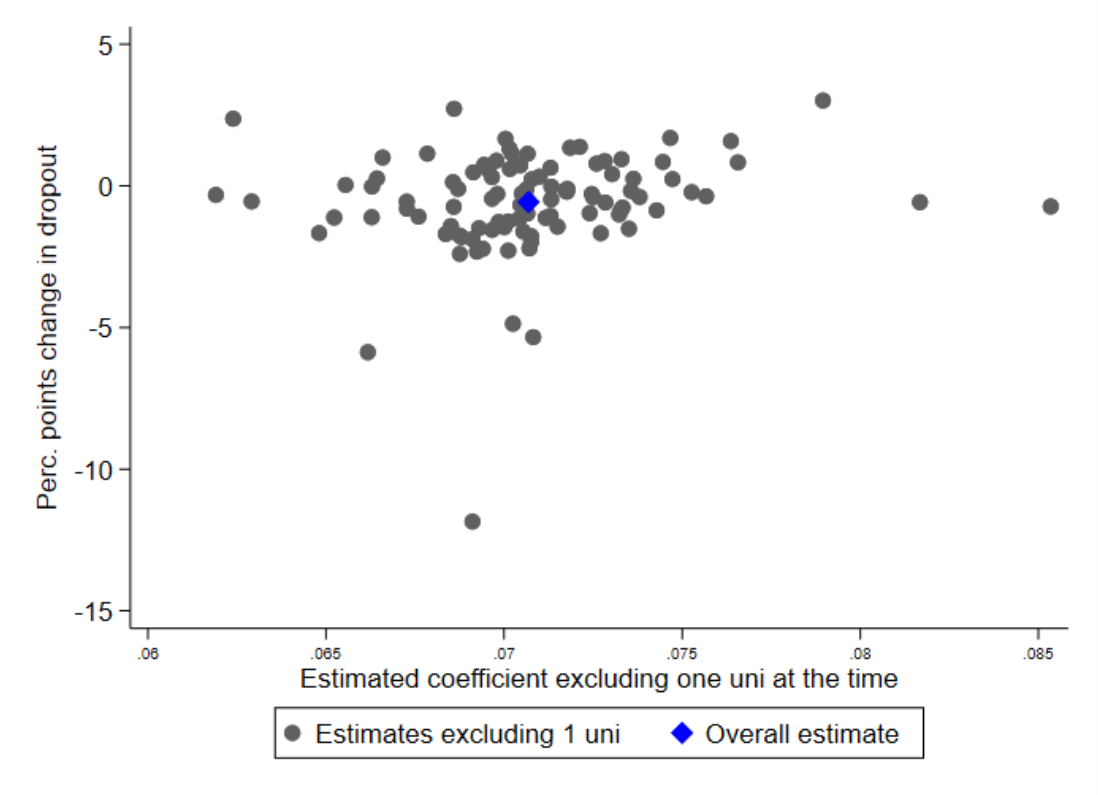
Notes: Interactions between control variables and instruments are represented. Every graph corresponds to a different model. All models include clusters and variables as in Column (4) of Table 7

Figure 12: Estimates replications leaving one university off each time



Notes: Each coefficient is estimated as in Column (4) of Table **??**, excluding one university at the time.

Figure 13: Estimates replications leaving one university off each time, compared to the overall percentage point change in dropout before and after the reforms



Notes: Each coefficient is estimated as in Column (4) of Table 8, excluding one university at the time.

Tables

Table 1: University fees in England.

Year	Fee cap	Characteristics of tuition fees
Until 1998	Free of charge	Not applicable.
1998-2005	£1,000	Payable upfront and means-tested.
2006-2011	£3,000	Deferrable and not means-tested. Inflation adjusted.
2012-2016	£9,000	Deferrable and not means-tested
2016/17 onwards	£9,250	Deferrable and not means-tested

Notes: The *fee cap* refers to the annual cap on fees that universities can charge to students and to their families. *Deferrable* refers to the possibility of getting a student loan.

Table 2: Standardised tests before high-school

School level	Age	Years	Test
Key Stage 1	5-7	1-2	Standardized tests (1998-2003) and teacher assessment.
Key Stage 2	7-11	3-6	Standardized tests and teacher assessment.
Key Stage 3	11-14	7-9	Standardized tests (until 2008) and teacher assessment.
Key Stage 4	14-16	10-11	General Certificate of Secondary Education (GCSE).

Table 3: Dataset description

Variable	Mean	SD	Min	Max
All Students (N = 1,086,508)				
At least 5 A-C GCSEs	0.956	0.205	0	1
Census data (N = 911,766)				
Women	0.567	0.496	0	1
Non-White	0.220	0.414	0	1
Not native English speaker	0.139	0.346	0	1
Free School Meal eligible	0.066	0.247	0	1
Special Education Needs	0.053	0.224	0	1
High managerial/professionals	0.470	0.499	0	1
IDACI	0.161	0.155	0	1
Log of house prices	12.042	0.478	9.523	15.605

Notes: At least 5 A-C GCSEs is a dummy indicating students who have taken at least 5 GCSEs exams and passed them with a final mark between A and C.*Free School Meal eligible* indicates students eligible for free meals during KS4. *Special Education Needs* indicates students in the Special Education Needs programme during KS4. *IDACI* is the Index of Income Deprivation Affecting Children measured in the Lower Super Output Area (LSOA) where students were living at the end of KS4. *Log of house prices* is the logarithm of house prices in the LSOA where living at the end of KS4 (*Source:* HM Land Registry). *High managerial/professionals* indicates whether at least one parent in a higher managerial or professional occupation. The dataset construction is illustrated in Section 3, descriptives are for students enrolling in a 3 years bachelor programme straight after high school. SPecialised universities and universities with less than 200 students per year are excluded.

Table 4: Descriptive statistics by university group

	Russell group	Other Universities
Share of > 5 A-C GCSEs	0.983	0.941
Share of women	0.536	0.578
Not white	0.200	0.228
Mother tongue: Not English (share)	0.123	0.146
Share of FSM eligible	0.042	0.076
Share of SEN eligible	0.037	0.060
High SES	0.554	0.434
Area variables - area where student lived at the end of KS4		
IDACI Score	0.136	0.172
Log avg house prices	12.142	11.998

Notes: Averages are conditional on enrolling straight after high school either in a Russell group university or in another English university.FSM stands for Free School Meal, SEN stands for Special Education Needs, IDACI is the Income Deprivation Affecting Children Index. Dataset constuction is described in Section 3

Table 5: A levels marks distribution before SCN relaxation

Variable	**Russell group**	**Other universities**
More than AAB	0.453	0.044
	(0.498)	(0.206)
AAB	0.176	0.046
	(0.381)	(0.210)
ABB	0.137	0.067
	(0.344)	(0.249)
Less than ABB	0.234	0.843
	(0.411)	(0.368)

Notes: Standard deviations in parenthesis. Averages are conditional on enrolling straight after high school either in a Russell group university or in another English university. Dataset constuction is described in Section 3

Table 6: Descriptives by A-level group, conditional on going to university straight after A-levels

	$> AAB$	AAB	ABB	$< ABB$
Share of > 5 A-C GCSEs	0.995	0.991	0.988	0.937
	(0.066)	(0.095)	(0.107)	(0.243)
Share of women	0.531	0.584	0.590	0.570
	(0.499)	(0.493)	(0.492)	(0.495)
Not white	0.193	0.192	0.203	0.232
	(0.395)	(0.394)	(0.403)	(0.422)
Mother tongue: Not English (share)	0.119	0.117	0.126	0.148
	(0.324)	(0.321)	(0.331)	(0.355)
Share of FSM eligible	0.031	0.044	0.045	0.079
	(0.174)	(0.205)	(0.217)	(0.269)
Share of SEN eligible	0.036	0.037	0.042	0.0610
	(0.187)	(0.189)	(0.200)	(0.239)
High SES	0.582	0.534	0.506	0.429
	(0.493)	(0.499)	(0.500)	(0.495)
IDACI Score	0.127	0.138	0.143	0.175
	(0.129)	(0.140)	(0.145)	(0.162)
Log avg house prices	12.204	12.127	12.098	11.984
	(0.476)	(0.468)	(0.470)	(0.467)
N	149,145	75,261	81,101	606,259

Notes: Standard deviations in parenthesis. Averages are conditional on enrolling straight after high school either in a Russell group university or in another English university. Dataset constuction is described in Section 3

Table 7: First Stage estimations - all sample. Dependent variable: Russell group university indicator

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
1st SCN reform*>AAB	-0.0001	0.0005	-0.0004	-0.0015
	(0.0055)	(0.0055)	(0.0063)	(0.0062)
1st SCN reform*AAB	0.0221***	0.0227***	0.0266***	0.0261***
	(0.0083)	(0.0083)	(0.0091)	(0.0090)
2nd SCN reform*>AAB	0.0049	0.0051	0.0076	0.0058
	(0.0068)	(0.0068)	(0.0074)	(0.0074)
2nd SCN reform*AAB	0.0458***	0.0462***	0.0526***	0.0517***
	(0.0090)	(0.0090)	(0.0095)	(0.0095)
2nd SCN reform*ABB	0.0744***	0.0746***	0.0790***	0.0781***
	(0.0081)	(0.0081)	(0.0083)	(0.0083)
F-test excluded IVs	17.438	17.556	18.481	18.179
N	977,319	977,319	820,697	820,697
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* controls include an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* controls include dummy variables for the socio-economic status. *Census* controls include gender, ethnic group dummy, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, both for the Lower Super Output Area where living during GCSEs. Column (3) and (4) exclude private school students.

Table 8: Probability of dropping out in the first year - Students between 200 and 400 UCAS points, linear probability models

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
		Instrumental Variable		
Russell group institution	0.0948***	0.0924***	0.0677***	0.0707***
	(.0253)	(.0251)	(.0240)	(.02024382)
N	590,896	590,896	513,425	513,425
KP test	19.82	19.95	21.03	20.68
		OLS		
Russell group institution	-0.0130***	-0.0130***	-0.0111***	-0.0104***
	(.0014)	(.0014)	(.0014)	(.0014)
N	697,966	697,966	580,846	580,846
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

Table 9: Instrumental Variable models. Probability of dropping out in the first year - Overall score. 400-200 A level equivalent points

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
Overall score	0.0091***	0.0088***	0.0068***	0.0072***
	(.0024)	(.0023)	(.0023)	(.0023)
N	639,551	639,551	532,141	532,141
KP test	19.93	20.26	19.06	18.66
Effect rescaled to Russell group difference	0.079	0.077	0.059	0.063
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

Table 10: Probability of finishing with a First degree. 200-400 A level point equivalents

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
		Instrumental Variable		
Russell group institution	-0.2804**	-0.2886**	-0.2740**	-0.2802**
	(.1154)	(.1128)	(.1140)	(.1172)
KP test	9.20	8.76	9.28	9.03
		OLS		
Russell group institution	-0.0706***	-0.0708***	-0.0745***	-0.0749***
	(.0083)	(.0083)	(.0083)	(.0083)
N	403,900	403,900	338,713	338,713
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

Table 11: Probability of finishing with a First degree - Overall score

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
Overall score	-0.0200**	-0.0199**	-0.0194**	-0.0195*
	(.0099)	(.0094)	(.0097)	(.0099)
N	292,641	292,641	245,887	245,887
KP test	10.20	13.62	10.37	10.07
Effect rescaled to Russell group difference	-0.174	-0.173	-0.169	-0.170
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

Table 12: Dependent variable: Pre reforms ranking based on entrants' UCAS points - 200-400 UCAS point sample

	(1) Ranking (Avg UCAS)	(2) Ranking (Min UCAS)
Russell*1st SCN reform*>AAB	2.9587***	3.8865***
	(.2155)	(.2324)
Russell*1st SCN reform*AAB	5.7905***	5.8595***
	(.2453)	(.2646)
Russell*2nd SCN reform*>AAB	3.4363***	4.2611***
	(.1554)	(.1676)
Russell*2nd SCN reform*AAB	5.3534***	5.8782***
	(.1749)	(.1886)
Russell*2nd SCN reform*ABB	6.8773***	7.0461***
	(.1484)	(.1600)
N	570,933	570,933

Notes: Standard errors in parentheses. Standard errors take into account clusters at the university∗subject level. All regressions control for a set of dummy variables for A-level results and for school and cohort FE. The full set of control variables include GCSE performance, socio-economic status, ethnic group, gender, mother tongue, free school meal status, special education needs status, IDACI score, house prices in the residential area.Results conditional on 200-400 total UCAS points on A levels.

Table 13: Comparisons with peers' quality and ranking. Probability of dropping out in the first year - Overall score. 400-200 A level equivalent points

	(1) Base model	(2) Relative ranking	(3) Peers' quality	(4) Ranking and peers
Russell group	0.0707***	0.0874***	0.0193	0.0237
	(.0243)	(.0319)	(.0445)	(.0437)
Share of higher performing students		-0.0614		-0.1336*
	(	(.0621)		(.0748)
Peers' average UCAS points			0.0008	0.0013**
	(		(0.0006)	(.0006)
N	580,846	580,846	580,499	580,499
KP test	20.68	11.65	6.91	5.33
Effect rescaled to Russell group difference	0.079	0.077	0.059	0.063
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

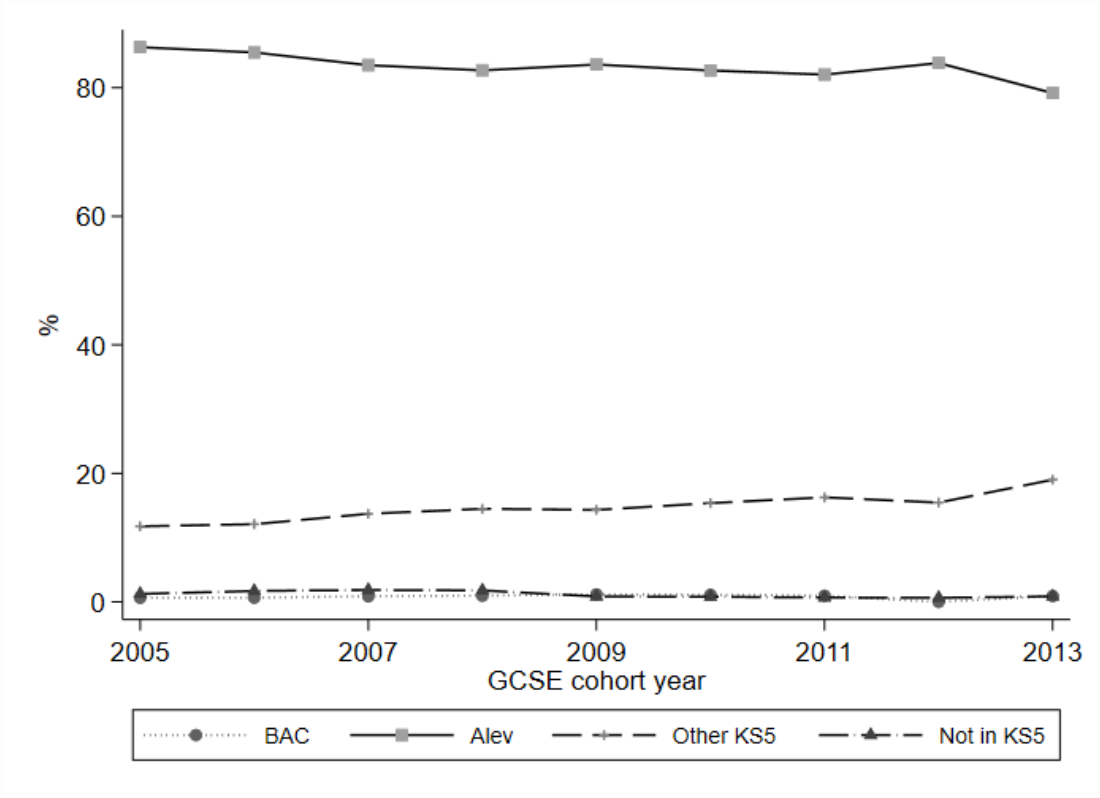
Table 14: Comparisons with measures of resources availability. Probability of dropping out in the first year - Overall score. 400-200 A level equivalent points

	(1) Base model	(2) Relative ranking	(3) Peers' quality	(4) Ranking and peers
Russell group	0.0707***	0.0644***	0.0461*	0.0366
	(.0243)	(.0248)	(.0248)	(.0248)
Hirings inteaching staff		0.1886		0.2575
	(	(.2630)		(.2598)
Teaching staff expenses over research grants			0.0003*	0.0003*
	(		(0.0001)	(.0002)
N	580,846	580,846	580,499	580,499
KP test	20.68	11.85	40.97	17.05
Effect rescaled to Russell group difference	0.079	0.077	0.059	0.063
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* is an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* is dummy variables for the socio-economic status. *Census* controls include gender, ethnic group, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, all for the Lower Super Output Area where living during GCSEs. Column (3)-(4) exclude KS4 private school students.

A Appendix : Graphs and Tables

Figure A.1: Post-GCSE paths, all students sitting for GCSEs in a given year, conditional on enrolling at university 3 years after GCSEs (18-19 years old)



Notes: Vertical axis represents the % of students finishing GCSE in a given year that are afterwards observed in one of the following: (i) *BAC*: International Baccalaureat; (ii) *Alevels*: Academic A levels, defined as students passing at least one Alevel; (iii) *Other KS5*: Other KS5 paths, namely (but not only) BTEC, NVQ, Applied A levels; (iv) *Not in KS5*: Not observed in KS5. Percentages are calculated on the students taking their GCSEs in a given school year who are then observed at univerisity 3 years after their GCSE, so when they are 18-19 years old. Year 2005 refers to school year 2004/05.

Figure A.2: AAB equivalences, Academic Year 2012/13

AAB+ equivalences

Students who are commencing an undergraduate course and hold at least one of the following qualification/grade combinations will be considered part of the AAB+ equivalent population.

Best three A-levels (including VCE advanced and Scottish Advanced Highers), grades are either:

- A*, A*, A*
- A*, A*, A
- A*, A, A
- A*, A*, B
- A, A, A
- A*, A, B
- A*, A*, C
- A, A, B
- A*, A*, D
- A*, A, C
- A*, B, B
- A*, A* and an A at AS-level

A Double Award A-level counts as two single awards at the grade awarded.

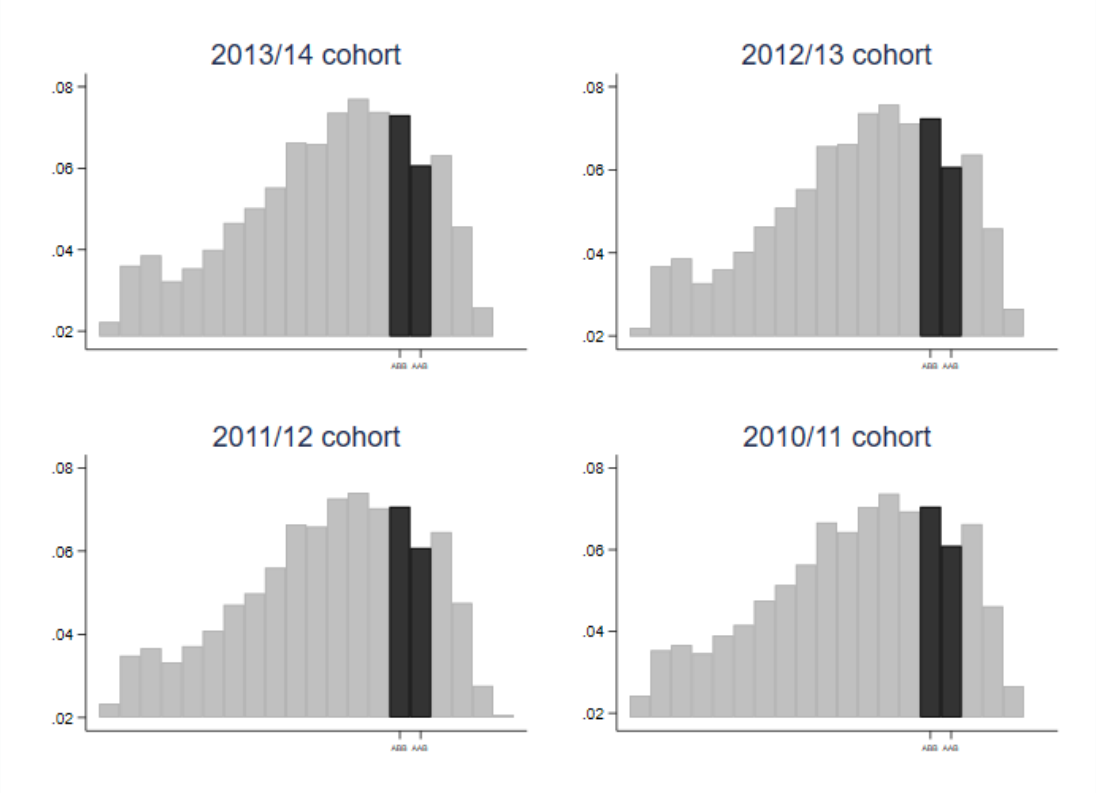
Notes: Source: HEFCE, The National Archives, AAB equivalences 2012-13

Figure A.3: AAB equivalences, Academic Year 2013/14

Single Qualifications		
Qualification	Grades required	Explanatory note
A-level, International A-level and AS-level	Best **three** grades, either: A* A* A* A* A* A A* A* B A* A* C A* A* D A* A* E A* A A A* A B A* A C A* A D A* B B A* B C A A A A A B A A C A B B A* A* + A at AS-level A* A* + B at AS-level A* A* + C at AS-level A* A + A at AS-level	This includes all A-levels awarded by an accredited UK awarding body including International A-levels and the Advanced Vocational Certificate of Education A double-award A-level counts as two single awards at the grade awarded For the double-award AS-level the higher of the two single grades awarded will be counted.

Notes: Source: HEFCE, The National Archives, ABB equivalences 2013-14

Figure A.4: A levels final marks distribution, by GCSE cohorts that could potentially have entered at university in a given Academic Year



Notes: Cohort 2012/13 is the first cohort for which SCN exclusion was implemented, excluding $AAB+$ students. For cohort 2013/14 also AAB students were excluded from SCN. Cohorts 2011/12 and 2010/11 are for reference of the pre-reform period. Students with exactly AAB and ABB are highlighted in a darker tone.

Table A.1: Dataset description - All NPD records excluded from the analysis (people not going at university and people delaying their entry at university)

Variable	Mean	SD	Min	Max
All Students				
At least 5 A-C GCSEs	0.391	0.488	0	1
Private school	0.038	0.192	0	1
Public School Students				
Women	0.469	0.499	0	1
White	0.832	0.374	0	1
Not native English speaker	0.099	0.298	0	1
Free School Meal eligible	0.185	0.388	0	1
Special Education Needs	0.272	0.445	0	1
IDACI	0.230	0.179	0	0.996
Log of house prices	11.818	0.519	9.242	16.339

Notes:At least 5 A-C GCSEs is a dummy indicating students who have taken at least 5 GCSEs exams and passed them with a final mark between A and C. *Private school* is a dummy indicating students who attended private - independent - institutions at KS5. *Free School Meal eligible* indicates students eligible for free meals during KS4. *Special Education Needs* indicates students in the Special Education Needs programme during KS4. *IDACI* is the Index of Income Deprivation Affecting Children measured in the Lower Super Output Area (LSOA) where students were living at the end of KS4. *Log of house prices* is the logarithm of house prices in the LSOA where living at the end of KS4 (*Source:* HM Land Registry). Variables available only for university students are excluded.

Table A.2: First Stage estimations - 200-400 UCAS point sample. Dependent variable: Russell group university indicator

	(1)	(2)	(3)	(4)
	School FE & A-level controls Private included	& School performance Private included	& demographics Private excluded	& demographics Private excluded
1st SCN reform*>AAB	0.0080	0.0084	0.0088	0.0080
	(0.0066)	(0.0066)	(0.0074)	(0.0074)
1st SCN reform*AAB	0.0332***	0.0337***	0.0382***	0.0378***
	(0.0086)	(0.0086)	(0.0094)	(0.0094)
2nd SCN reform*>AAB	0.0201**	0.0203**	0.0236***	0.0219**
	(0.0080)	(0.0079)	(0.0087)	(0.0086)
2nd SCN reform*AAB	0.0551***	0.0555***	0.0622***	0.0613***
	(0.0094)	(0.0094)	(0.0100)	(0.0100)
2nd SCN reform*ABB	0.0798***	0.0801***	0.0843***	0.0834***
	(0.0081)	(0.0081)	(0.0084)	(0.0084)
F-test excluded IVs	19.821	19.955	21.026	20.681
N	697,966	697,966	580,846	580,846
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* controls include an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* controls include dummy variables for the socio-economic status. *Census* controls include gender, ethnic group dummy, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, both for the Lower Super Output Area where living during GCSEs. Column (3) and (4) exclude private school students.

Table A.3: Instrumental Variable results. Probability of dropping out in the first year. 200-400 A level point equivalents - Fee reform year excluded

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
		2011/12 excluded		
Russell group institution	0.1212***	0.1171***	0.0832***	0.0874***
	(0.0283)	(0.0279)	(0.0262)	(0.0267)
N	601,014	601,014	499,824	499,824
KP test	17.25	17.44	17.79	17.48
		2011/12 and 2012/11 excluded		
Russell group institution	0.1164***	0.1124***	0.0795***	0.0839***
	(0.0281)	(0.0277)	(0.0258)	(0.0264)
N	513,100	513,100	426,475	426,457
KP test	15.90	16.09	16.38	16.07
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* controls include an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* controls include dummy variables for the socio-economic status. *Census* controls include gender, ethnic group dummy, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, both for the Lower Super Output Area where living during GCSEs. Column (3) and (4) exclude private school students.

Table A.4: Instrumental variable models. Probability of dropping out in the first year. Different sample restrictions

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
	Panel A: All A level equivalent points			
Russell group institution	0.0654***	0.0627**	0.0423*	0.0442*
	(.0259)	(.0252)	(.0245)	(.0247)
N	977,319	977,319	820,697	820,697
KP test	17.44	17.56	18.48	18.18
	Panel B: Above 100 A level equivalent points			
Russell group institution	0.0817***	0.0786***	0.0590**	0.0607**
	(.0258)	(.0256)	(.0248)	(.0250)
N	934,187	934,187	779,524	779,524
KP test	17.57	17.73	18.71	18.41
	Panel C: Above 200 A level equivalent points			
Russell group institution	0.0831***	0.0812***	0.0632***	0.0645***
	(.0244)	(.0242)	(.0236)	(.0238)
N	795,144	795,144	650,494	650,494
KP test	20.2	20.33	20.95	20.70
	Panel D: 250-400 A level equivalent points			
Russell group institution	0.0946***	0.0937***	0.0787***	0.0810***
	(.0256)	(.0255)	(.0257)	(.0260)
N	527,983	527,983	437,498	427,498
KP	19.40	19.49	19.52	19.33
	Panel E: 250-360 A level equivalent points			
Russell group institution	0.0840***	0.0834***	0.0712***	0.0738***
	(.0250)	(.0249)	(.0253)	(.0257)
N	471,948	471,948	985,832	385,832
KP	21.66	21.72	22.10	21.86
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* controls include an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* controls include dummy variables for the socio-economic status. *Census* controls include gender, ethnic group dummy, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, both for the Lower Super Output Area where living during GCSEs. Column (3) and (4) exclude private school

Table A.5: Different clusters. Instrumental variable models. Probability of dropping out in the first year. 400-200 A level equivalent points

	(1) School FE & A-level controls Private included	(2) & School performance Private included	(3) & demographics Private excluded	(4) & demographics Private excluded
	Panel A: Clusters at the University level ($N_g = 101$)			
Russell group institution	0.1017***	0.0967***	0.0677**	0.0766**
	(.0376)	(.0368)	(.0323)	(.0323)
N	774,528	774,528	580,846	580,846
KP test	7.53	7.57	9.35	8.66
	Panel B: Clusters at the University*A level group ($N_g = 1107$)			
Russell group institution	0.1017***	0.0967***	0.0677**	0.0766***
	(.0300)	(.0293)	(.0279)	(.0273)
N	774,528	774,528	580,846	580,846
KP test	9.47	9.63	10.56	10.81
	Panel C: Clusters at the KS4 school level ($N_g = 3516$)			
Russell group institution	0.1017***	0.0967***	0.0677***	0.0766***
	(.0195)	(.0193)	(.0217)	(.0201)
N	774,528	774,528	580,846	580,846
KP test	135.24	137.94	101.45	122.48
KS4 school FE	✓	✓	✓	✓
A level marks	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓
Previous attainment		✓	✓	✓
Census			✓	✓
Area			✓	✓
Background			✓	✓

Notes: Standard errors clustered at the university-subject level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All models are run on the sample of students passing at least 1 A level, enrolling at university 3 years after GCSEs - when 18/19 years old - conditional on finishing a 3-year bachelor. For more detail on the sample construction, please refer to Section 3. *KS4 School FE* are fixed effects for the school where GCSE, *A level marks* is a set of dummy variables categorising the results in A levels(General Studies excluded) *Cohort FE* are fixed effects for the GCSE cohort. *Previous attainment* controls include an indicator of whether the student passed at least 5 GCSEs with marks from A to C. *Background* controls include dummy variables for the socio-economic status. *Census* controls include gender, ethnic group dummy, free school meal eligibility and special education needs in KS4, and mother tongue. *Area* controls include the (log of) house prices and the Income Deprivation Affecting Children index, both for the Lower Super Output Area where living during GCSEs. Column (3) and (4) exclude private school