



Explaining Student Retention:
The case of the University of Aberdeen

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Abstract

Student retention has risen high on the political agenda in the UK as part of the government's priorities to widen participation in higher education, in particular among groups traditionally under-represented in the sector. These concerns have been reflected in policies of the funding bodies in the UK. In turn Universities across the UK have become increasingly active in developing processes and procedures to meet the challenges of improving student retention while simultaneously widening access and participation in the context of rising student numbers overall. This has led to the desire for accurate data and reliable statistical analysis on which to inform policy at the University of Aberdeen. The purpose of this report is to answer the question: "To what extent can the probability of drop out of a student be explained by student characteristics?" Are mature students more likely to drop out? Is there an empirical distinction between younger and older mature students? Are male students more prone to dropping out? To what extent can the level of entry qualifications explain dropouts? Are there any differences in the impact of below core entry qualifications between male and female students? Do students who performed unsatisfactorily in their first year and who were allowed to repeat this first year drop out less or more often than other students? Have there been any significant trends over time? It is clear that any associations of these characteristics with drop out rates may have important policy implications for the University as it may allow the identification of those potentially "at risk" before they join the University and hence facilitate the targeting of support once students start their studies.

¹ The authors would like to acknowledge David Jones for supplying the data from student records, and the research support of Andrew Kardan.

Executive Summary

The aim of this report was to establish to what extent the probability of a student dropping out is explained by the characteristics of that student, using data available from the Registry at the University of Aberdeen covering four cohorts of students who entered the University between 1994 and 1997. The findings may have important policy implications for the University in permitting the identification of students potentially “at risk” before they join the University and the targeting of support once students start their studies.

The key findings for the University as a whole are:

- Mature and Very Mature students are 70 to 80% more likely to drop out than the very young.
- There are no overall gender effects in the University as far as retention is concerned.
- Students with low, very low and missing qualifications are 1.9 to 2.6 times more likely to drop out in their first programme year than their core qualified counterparts.
- Years 1996 and 1997 had a higher drop out rate (49% and 24% higher chances than the previous years), particularly in Faculties with high teaching loads (Science and Arts). It is not possible to establish if this is the start of a trend or because of the short time span of data used.
- There is a weak effect suggesting that low qualifications females drop out less than their low qualified male counterparts. Note that this effect is over and above the overall gender effect, which is not statistically significant. These results imply that being both male and low qualified increases the probability of an individual dropping out.
- The two faculties that have the highest teaching loads in the University (Science and Arts) have similar dropout propensities even after all age, qualifications, year etc. differences are accounted for in multivariate analysis. Engineering appears to have a lower retention rate over the period of investigation (over and above that explained by the lower entry qualifications and other observed differences). Law and Medicine appear to have a higher retention rate (again, over and above what is explained by their higher entry qualifications and other observed differences).

The report also highlights some important findings for individual Faculties within the University.

On the basis of the statistical analysis presented in this study a number of policy recommendations were suggested:

1. Improvements in data collection, particularly with respect to
 - i. Entry qualifications
 - ii. Social and demographic information -
 - iii. Reasons for leaving
 - iv. Further demographic information from at risk groups
2. Qualitative research into reasons for leaving
3. Targeted monitoring and support
 - i. Study skills training
 - ii. Student tracking and early warning systems
 - iii. Targeted support

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1. Introduction

Student retention has risen high on the political agenda in the UK as part of the government's priorities to widen participation in higher education, in particular among groups traditionally under-represented in the sector. These concerns have been echoed in the Scottish Executive. Hence improving student retention has been reflected in the funding strategies of the Higher Education Funding Councils: HEFCE (England and Wales) and SHEFCE (Scotland). In turn Universities across the UK have become increasingly active in developing processes and procedures to meet the challenges of improving student retention while simultaneously widening access and participation in the context of rising student numbers overall. This has led to the desire for accurate data and reliable statistical analysis to inform University policy. This report was commissioned by the University of Aberdeen to meet that need.

We used the data available from the Registry at the University of Aberdeen covering four cohorts of students who entered the University between 1994 and 1997. The focus of this report is the question: "To what extent can the probability of drop out of a student be explained by student characteristics?" A number of related questions are also considered. Are mature students more likely to drop out? Is there an empirical distinction between younger and Very Mature students? Are there any gender differences in the probability of dropping out? To what extent can the level of entry qualifications explain dropouts? Are there any differences in the impact of below core entry qualifications between male and female students? Do students who performed unsatisfactorily in their first year and who were allowed to repeat this first year drop out less or more often than other students? Have there been any significant trends over time? It is clear that any associations of these characteristics with drop out rates may have important policy implications for the University as it may allow the identification of those potentially "at risk" before they join the University and hence facilitate the early targeting of support once students start their studies.

The remainder of the report is organised as follows. Section 2 gives an overview of the University of Aberdeen and the local and national environment it operates within in the context of student retention using data from student records from 1994-1997. Section 3 details the composition of the student population at the University of Aberdeen. Particular attention is given to female participation, age participation and entry qualifications. Section 4 looks at student performance and reasons for leaving the University. In section 5 statistical and empirical analysis is presented both for the University as a whole and for each Faculty separately. Policy recommendations are given in section 6 and concluding comments are offered in section 7. Appendix I reports the background tables on which the figures in the report are based.

2. University Profile and Background

In this section a brief background on the University of Aberdeen is presented and the national and local environment in which it operates, followed by a description of how the University's policies on retention have come to be shaped in recent years. Finally the data sources available at the University and how these have been used in the present study are discussed.

2.1 The University of Aberdeen: General Background

Aberdeen - the 'Granite City' - is Scotland's third largest city, and the offshore oil capital of Europe. The oil and gas industry supports a buoyant local economy, which combines a rich cultural heritage with a thriving, contemporary community. Aberdeen is the largest centre for higher education in the north of Scotland. The University of Aberdeen was founded in 1495 and offers over 450 first-degree courses. In 2003 over 12,000 students were enrolled, 21% of whom are enrolled on postgraduate courses. The overall student population is 48% men and 52% women. The Times Good University Guide 2004 ranked Aberdeen twentieth in the UK and third in Scotland, implying that it is one of the country's leading universities.

2.2 The National and Local context of widening access and increasing participation

In the UK as a whole, widening access and improving participation in higher education are a crucial part of the Higher Education Funding Council's (HEFCE) mission. They provide funds to recognise the costs of supporting and retaining students who may be less well prepared for higher education through the institutional widening participation allocation. HEFCE have been encouraging higher education institutions to widen participation in higher education for a number of years. However, it was not until 1999 that they asked Universities for initial strategic statements on widening participation. Following the submission of the initial strategic statements, a number of strengths and weaknesses were identified. Although there were strong aims and objectives for widening participation, mechanisms for achieving the aims and objectives and analysis of the profile of the student population were not sufficiently developed. The major weaknesses identified included limited reference to student retention, insufficient use of performance indicators, limited reference to the setting of targets for students from non-traditional group and few links to other institutional policies, particularly learning and teaching strategies.

By the 2001 review², HEFCE noted that most institutions had developed plans for monitoring and evaluating retention policies and were assessing themselves against the national benchmarks. A number of institutions planned to carry out audits to measure the reasons for students withdrawing or experiencing academic difficulties. Some institutions had devolved this information to departments to enable closer monitoring of student performance by module, and were using the obtained data to inform practices aimed at minimising the withdrawal of students at risk. Research activities, including the current project, were also under way at some institutions.

² http://www.hefce.ac.uk/pubs/hefce/2003/03_09/03_09.pdf

In Scotland, the Scottish Higher Education Funding Council (SHEFCE) also has high on its agenda the improvement of both access and retention. Last year it sought to introduce a Widening Access Premium to improve the retention and progression of students from under-represented areas. In the past year just over £3million (approximately Euro 4.5 million) was awarded to higher education institutions under this initiative. The Council has committed itself to develop, and use, the UK Higher Education Performance Indicators for measuring student retention and progression to identify and respond to any incidences of poor performance in Scotland³. It has vowed to work with the University sector to ensure that the Scottish average of the Performance Indicator for student retention and progression rates for the academic session 2002-03 will at least match the comparable average for the UK as a whole.

2.3 University of Aberdeen's Strategies for Retention

With this political backdrop, it is not surprising therefore at the University of Aberdeen that Strategic Aim 1 of the "University's Strategic Vision and Institutional Objectives 2002-2006" concerns access, recruitment and retention⁴. The University's wider access strategy is informed by its commitment to social justice. The Funding Councils' performance indicators identify an under-representation of young, full-time entrants from social classes IIIIM, IV and V and from low participation neighbourhoods. Whilst the HEFCE performance indicators usefully inform development in the area of widening participation and retention, the University consider it to be inappropriate to use them as targets given the expected time-lags. Instead, the University prefers a more proactive policy. In recognition of the importance of continuing to address participation and retention issues, the University purchased and implemented software (ASP) designed specifically to facilitate monitoring and tracking of students. This will be used to set and monitor targets to

³ Together with its UK partners, the Performance Indicators Steering Group, a body which has representatives from all of the UK funding councils, Department for Education and Skills, Universities UK and Universities Scotland.

⁴ <http://www.abdn.ac.uk/secretariat/plan2.hti#access>

extend participation and ensure that processes and procedures promote access and retention. Specifically, the University's objectives include

- (a) the exploitation and maximisation of opportunities for increasing exit and entry points within and across programmes;
- (b) ensuring that there is shared University-wide ownership of recruitment, retention and access targets through College/School planning;
- (c) continuing to increase applications in order to recruit students of the highest calibre who can demonstrate their potential to benefit from higher education, either by traditional high entry qualifications, or in other ways;
- (d) attaining and exceeding the University's benchmarks across all areas published in the national performance indicators;
- (e) establishing and monitoring targets for student retention;
- (f) increasing the population of part-time students by 5%; and
- (g) progressing towards the target of reducing the number of registered students leaving the University without a qualification to the benchmark level.

The progress during 2001/2002 included increasing young full-time first degree entrants from social classes IIIM, IV and V (20%, benchmark 24%), increasing young full-time first degree entrants from low participation neighbourhoods (13%, benchmark 12%), participation of Mature part-time (10%, benchmark 10%), young part-time (31%, benchmark 19%) and Mature full-time first degree entrants from low participation neighbourhoods (18%, benchmark 14%). Actions for 2002/2003 included the establishment a Retention and Progression Team. This would build upon on the foundations made by the Working Group on Student Retention⁵, which had been set up in late 2000 to undertake detailed analysis of patterns of student retention and non-retention in order to recommend strategies as to how long-term retention rates might be improved (of which this project forms a part).

It was also recognised by the University that such policies need to be underpinned by effective welfare, advisory and student support services. The Advising and Student' Progress Review Working Group had agreed with the view that the role of the

⁵ <http://www.abdn.ac.uk/minutes/uctl0201.html>

specialist Adviser of Studies would have to expand and it would be necessary to appoint more Advisers, not least to improve student retention rates. In order to improve retention of Advisers, there was a need to increase the status, recognition and reward attached to the role.

Notably, the Student Recruitment and Admissions Service state⁶ that there is not a direct correlation between qualifications at entry and likelihood of failing university courses and having to drop out.

2.4 Background to the present study

This study examines four cohorts of students, from academic years 1994/95, 1995/6, 1996/97 and 1997/98. The last cohort of students, given a typical degree length of four to five years would be expected to have graduated by July 2002. For the purposes of this study, students are grouped into five “faculties”, which map closely to undergraduate degree programmes on offer. These are “Medicine”, “Law”, “Engineering”, “Science” and “Arts”. The latter two faculties are by far the largest in terms of their contribution to learning and teaching of undergraduates, accounting for on average 80% of undergraduate student numbers in 1997, as shown in Figure 1. “Arts”, which is responsible for almost half of the undergraduate teaching provision, covers undergraduate MA programmes as diverse as International Relations, Divinity, Economics and Hispanic Studies. “Science”, which is responsible for another third of undergraduate teaching provision, has an equally broad range of undergraduate programmes, covering such degrees as Marine Biology, Forest Sciences and Physics.

⁶ <http://www.abdn.ac.uk/minutes/srac1201.html>

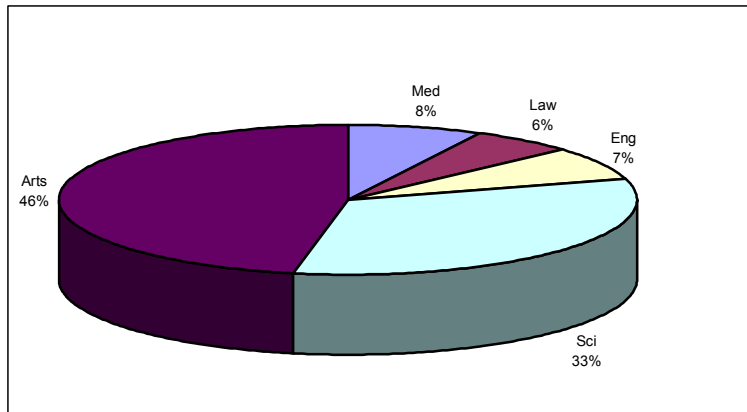


Figure 1 Faculty contribution to Undergraduate Teaching, 1997

Data collection at the University of Aberdeen centres on the on-line student record system (HEMIS). The data used for this study uses HEMIS data supplied by the University Registry as the source data. Data is on the whole complete for fields pertaining to events happening while the student is studying at the University – details of their degree intention, courses taken and grades achieved. Data is often incomplete on fields relating to “before” or “after” events – details of prior qualifications, social class of parents, etc. and reasons for leaving the University. Data is also poor or unreliable on self-reported fields, such as term-time addresses.

The raw HEMIS data set is vast and consists of a series of linked tables. In order to be able to use this data for statistical analysis, substantial data management work was needed. The data was cleaned and reordered using Microsoft Visual Basic programming and then extensively recoded for the purposes of this study. Statistical analysis was performed using STATA 8. A full list of the information used in this report is contained in Table 15 in the Appendices.

3. Student Composition

This section details the composition of the student population at the University of Aberdeen during the period of the study, 1994-1997. It begins by detailing student

numbers, how these are broken down by Faculty, and how they have changed over time. The data on female participation, age participation and entry qualifications is also examined.

During the period considered by this study, first year undergraduate student numbers rose by 6%, from 2210 in 1994 to 2353 in 1997. Almost 8 out of 10 undergraduates are taught in Arts or Science, with Medicine, Law and Engineering making up the balance (Figure 1). In addition, Figure 2 shows that falls in student numbers in Law and Engineering between 1994 and 1997 were more than compensated for by rises in Medicine, Science and Arts.

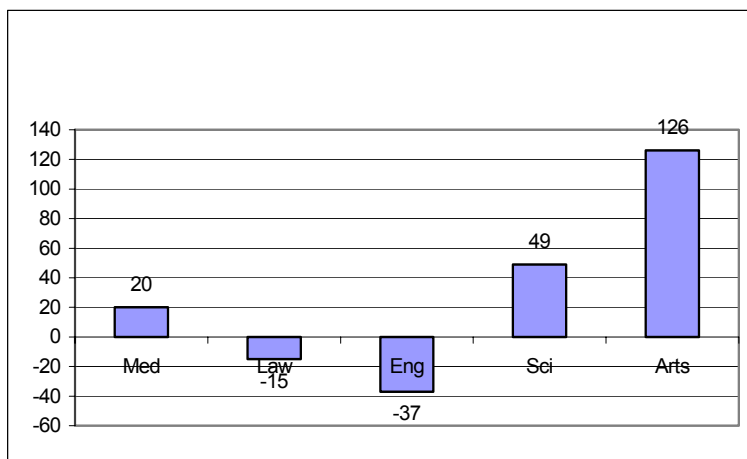


Figure 2 Undergraduate Numbers (change in frequency, 1994-1997)

An important issue of policy debate is the participation of various groups within the undergraduate population – namely mature students, females, and those from underprivileged socio-economic backgrounds. The report now looks at these in turn.

3.1 Female Participation

Female participation at the University of Aberdeen averages 52%. Women are under-represented in the undergraduate student population only in Engineering, though this is changing, as shown in Table 1.

	Med	Law	Eng	Sci	Arts
94	57	58	7	50	58
95	54	54	12	47	57
96	56	58	11	47	56
97	51	62	13	48	57
% rise	-6	4	6	-2	-1

Table 1 Female Participation (%)

3.2 Age Participation

Turning to age participation, the undergraduate population is divided into four age groups. The group normally termed “Mature” students (aged 21 and over) is subdivided into two categories: “Mature” (aged 21-25) and “Very Mature” (aged 26 and over). The remaining students are also subdivided into two categories: the “very young” (aged 18 or less) and the “young” (aged 19-20). Two faculties account for the bulk of Mature and Very Mature students, namely Arts and Engineering, where 34 to 50 per cent of their respective students come from these categories. Law and Medicine, by contrast, have very poor age participation, where as low as 13% in medicine (which has an age limit of 30 years for its intake) and 17% in Law derive from the older student populations (Figure 3). In terms of absolute numbers, it is again the Science and Arts faculties that have the largest numbers of Mature students, with the Arts faculty having a particularly large number of Very Mature students (Figure 4).

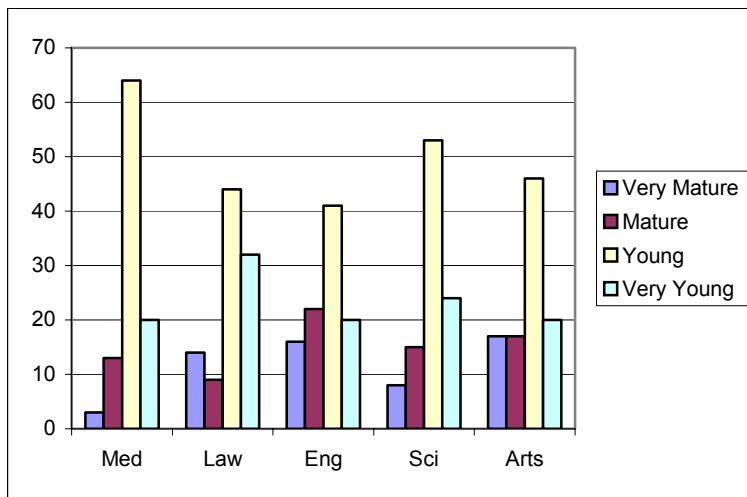


Figure 3 Age Participation by faculty 1997 (%)

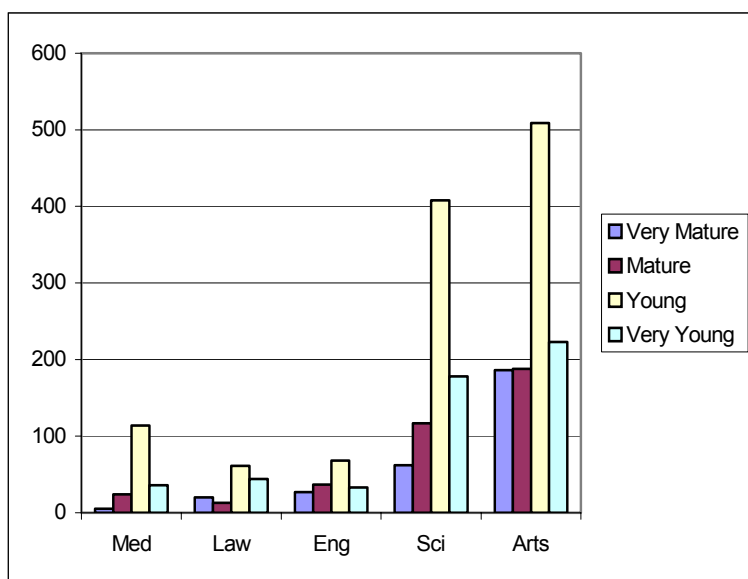


Figure 4 Age Participation by faculty 1997 (frequency)

3.3 Entry Qualifications

Different faculties have different “quoted” entry qualifications, normally expressed in terms of “A-level” or “Scottish Higher” “points”. Students entering the university outwith the normal UCAS system, for example, students from non-traditional backgrounds, may however be admitted without these “quoted” rates. Thus, students entering the University, through clearing for example, may be admitted without achieving the “quoted” entry rates. Moreover, the quoted rates may themselves change over time. The “quoted” rates used in this study are shown in Table 2. It is very clear that Law and Medicine quote much higher rates than the other faculties.

Faculty	A-level	SCE	Core Entry	Low	Very Low
Med	ABB=1x10+2x8=26	AAAAB=4x6+1x4=28	>=26	22-25	<22
Law	BBB=3x8=24	AABB=2x6+2x4=20	>=20	16-19	<16
Eng	CCD=2x6+1x4=16	BBBC=3x4+1x2=14	>14	10-13	<10
Sci	CDD=1x6+2x4=14	BBCC=2x4+2x2=12	>=12	8-11	<8
Arts	CCC=3x6=18	BBBB=4x4=16	>=16	12-15	<12

Table 2 Entry Qualifications and Translation to Points

For the purpose of the analysis that follows, entry qualifications are subdivided into four categories: “core entry” (students with the quoted rates or better), “low qualified” (students within four points below the quoted rates), “very low qualified” (students with more than four points below the quoted rates) and “missing” (that is, no data on qualifications are available). Two qualifications categories warrant investigation at this point, as they can for their own reasons be seen as problematic: the “very low” and the “missing” qualifications.

As can be seen from Figure 5, Arts accept a much higher proportion of students with substantially below the quoted entry rates compared to other faculties. With the exception of Engineering, all faculties accepted a greater proportion of students with “very low” entry qualifications in 1997 compared with 1994. These figures may be a consequence of “widening access”. A noteworthy and possibly worrying feature of this particular data is the large (and increasing) proportions of students with “missing” qualifications, as shown in Figure 6. For Arts and Science faculties, who deliver most of the University’s teaching, the change between 1994 and 1997 is very clear. This may be due to increasing numbers of students without formal qualifications and it points to the need for improving data collection.

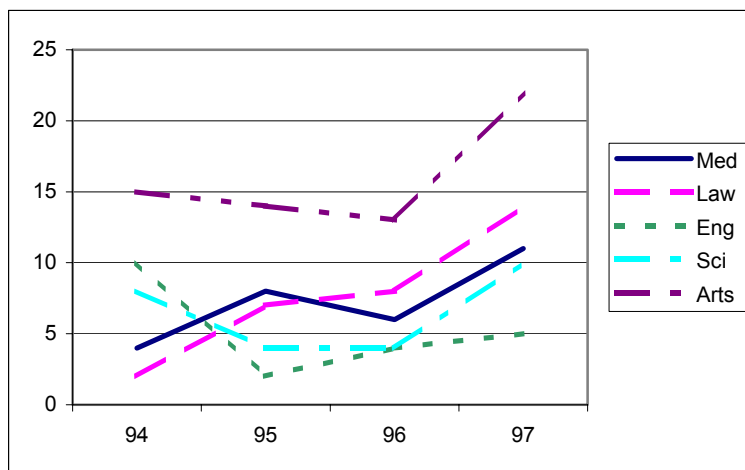


Figure 5 Very Low Entry Qualifications 1994-1997 (%)

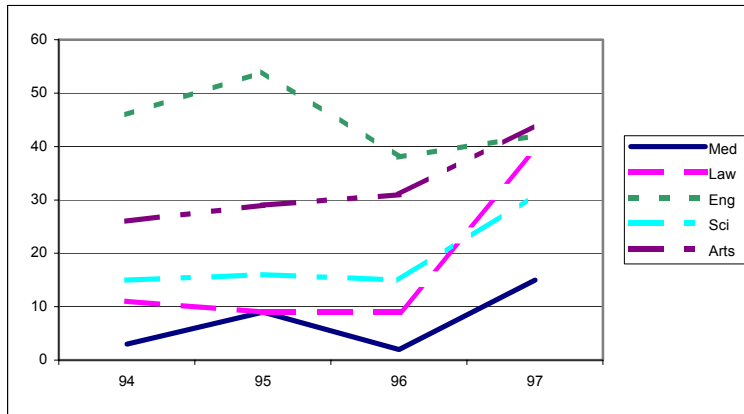


Figure 6 Missing Entry Qualifications 1994-1997 (%)

4. Student Retention

In this section the term “retention” is explained in the context of the present data set, and then information on student retention is presented. Since there may be a relationship between retention and student performance, student performance data is then discussed.

4.1 Reasons for Leaving

In the University records, students who are not retained are identified by the variable “reason for leaving”. For the purposes of this study, the reasons for leaving are grouped into seven categories (Table 3). A somewhat worrying feature of the University’s data collection is the proportion of dropout students for whom the reason for leaving is “unknown” (Figure 7). As the number of students “dropping out” has risen, this issue has become an increasing priority for student retention policy, and hence steps have been taken in conjunction with the University Registry and Advisors of Studies to improve data collection. As the number of cases for whom the reason for leaving is “unknown” has diminished, there has been a corresponding increase in accuracy as shown by the use of specific categories such as “financial problems” and “personal”. Although substantial progress has been made in data collection, for

example in Arts halving the “unknown” rate from 80% to 41%, there appears to be substantial scope for further improvements.

Reason for leaving	94	95	96	97
Health	6%	11%	11%	8%
Academic Failure	16%	17%	18%	19%
Financial Problems	0%	0%	6%	3%
Personal	0%	0%	5%	19%
Unknown	72%	65%	49%	40%
Transfer/Employment	6%	6%	11%	11%
Other Reasons	0%	0%	0%	1%
Total University %	8%	10%	11%	12%

Table 3 Reasons for Leaving (%)

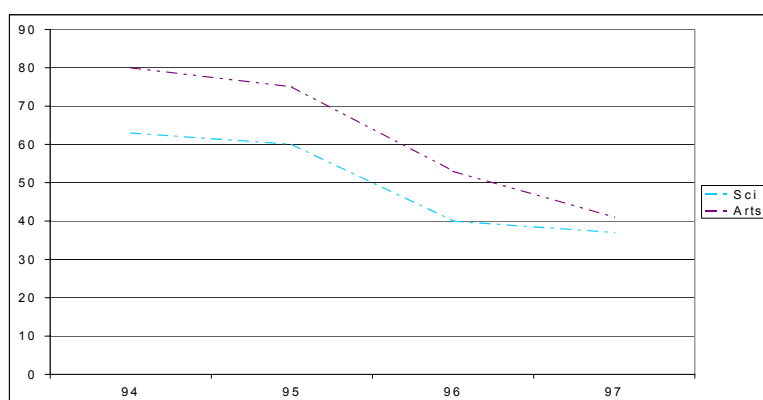


Figure 7 Reasons for Leaving: Unknown (%)

Most students who dropout do so in their first programme year (which may take more than one academic year). In the two largest faculties, for example, 90% of Arts dropouts and 85% of Science dropouts do so in their first programme year. Thus the first programme year of study is where most of the action takes place as far as retention policy is concerned, and hence one should focus attention for policy initiatives on programme year 1.

The number of students not being retained has been increasing steadily throughout the period covered by this study, as shown in Figure 8. After “Reasons for Leaving Unknown”, “Academic Failure” and “Personal” are the next two most prevalent reasons for leaving, although they form a very small percentage, contrary to

expectations. Importantly, barely a quarter of dropouts cite academic failure as the reason for leaving in Science, while in Arts it is never above 14 per cent.

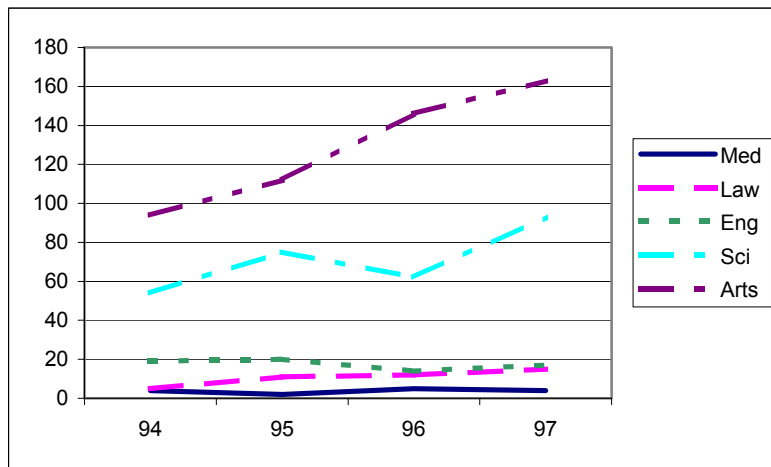


Figure 8 Dropouts in Programme Year 1 (frequency)

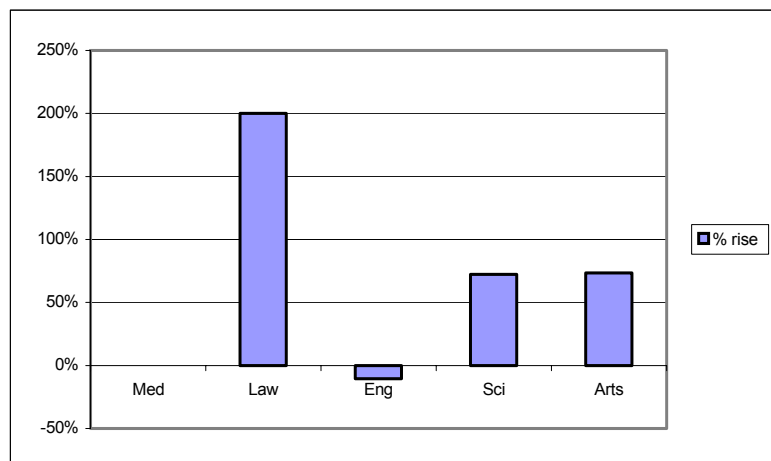


Figure 9 Dropouts in Programme Year 1 1994-1997 (%)

The greatest absolute numbers of dropouts come from the Science and Arts faculties, not surprising given their relative sizes in terms of teaching contributions. Both have experienced rises of 75% over the study period. There have been larger rises in Law, with a 200% increase, a small decline in Engineering of 11%, and little change in Medicine (Figure 9). In Figure 10 and Figure 11 the reasons for leaving is broken down by category for the two largest faculties, Science and Arts respectively. It is worth noting that “Academic Failure” is cited as the reason for leaving by approximately 24% in Science and 14% in Arts.

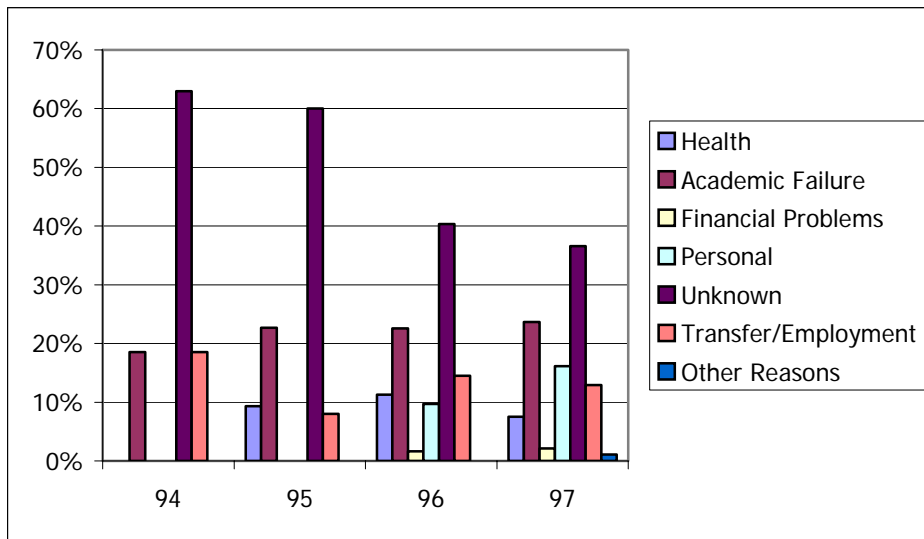


Figure 10 Reasons for Leaving 1994-1997 (Science, %)

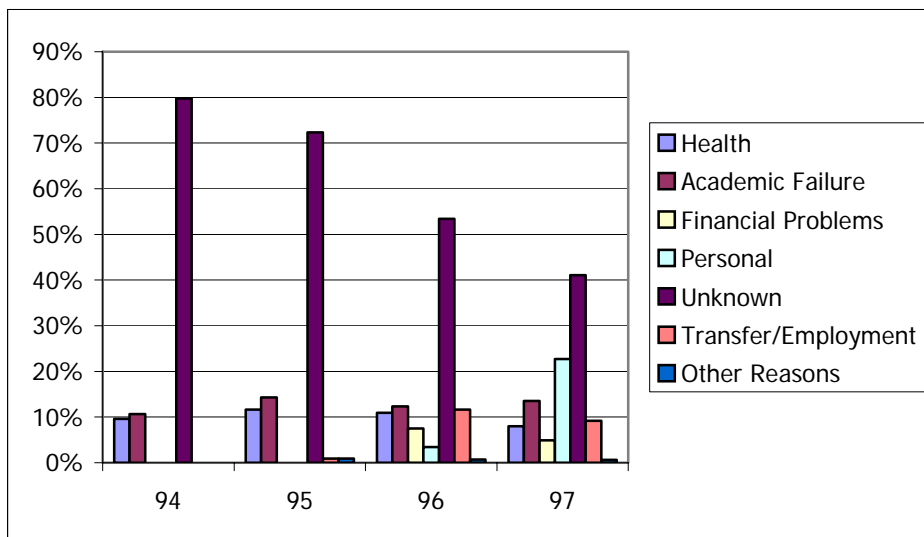


Figure 11 Reasons for Leaving 1994-1997 (Arts, %)

4.2 Student Performance

An important indicator of student performance is the number of ScotCat credits they achieve in the first programme year. The expected annual achievement is 120 credits, and so we refer to students achieving 120 credits or more as having achieved “full credits”. Students achieving less than 80 credits would normally be referred to the Progress Committee. On the MA programme (Arts), for example, most first year courses would be worth 20 credits, and so a full time student would normally be expected to take three such courses in the first semester and three in the second semester.

Between 73 and 98 per cent of students in Law and Medicine achieve full credits, compared to other faculties, where the figures lie between 56 and 84 per cent. The greatest deteriorations between 1994 and 1997 in achieving full credits in the first programme year have been in Arts (a fall of 10%) and Law (a fall of 18%). Arts have the greatest proportion of students achieving zero credits (14%). In contrast, in the Engineering faculty the position has been improving (a five per cent fall to 6%). Law has experienced a deteriorating position (an eight per cent rise to 11%).

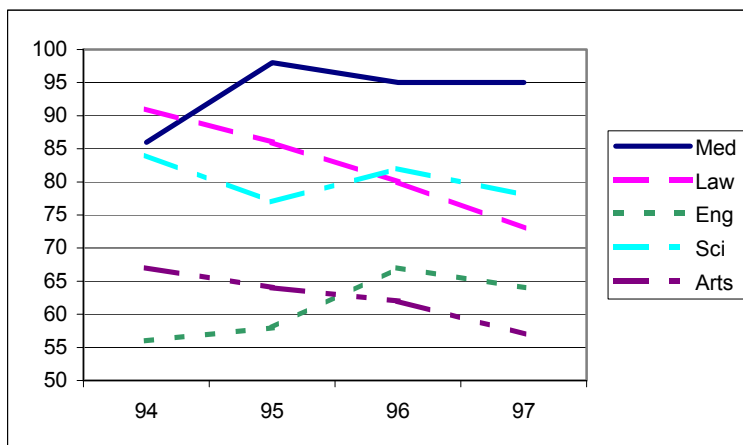


Figure 12 Full Credits Achieved in Programme Year 1 (%)

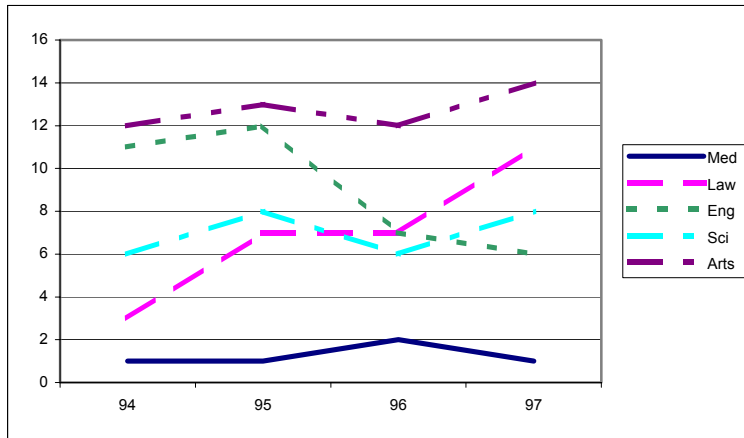


Figure 13 No Credits Achieved in Programme Year 1 (%)

Moreover, between 80 and 96 percent of students who repeat programme year one in the second academic year fail to make even basic progression requirements (80 credits or more) in Arts and Science.

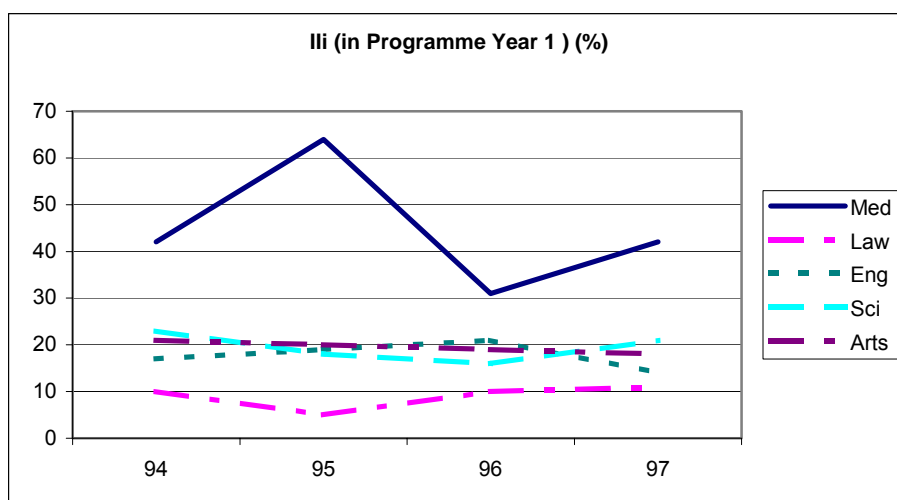
A common assertion in the media (and anecdotal evidence from academics) is that “standards” in higher education are falling. Indeed, it may be the case that the upper second-class degree has taken the place of the lower second class degree as the median degree class and that more “first class degrees” are being awarded. However, this study shows that at first year level, standards have been remarkably constant during the period investigated.

At the University of Aberdeen, students’ performance in each course is assessed on a twenty-point scale known as the CAS (Common Assessment Scale). The CAS scale is rather unusual in that it does not linearly map onto the normal percentage point scale normally used in the higher education sector in the UK. For the purposes of this study CAS marks are grouped into five categories, which correspond to nationally recognised degree classifications (Table 4).

CAS Grade	Class
<9	Fail or no paper
9-11	Third (III)
12-14	Lower Second (Iiii)
15-17	Upper Second (Iii)
18-20	First (I)

Table 4 The Common Assessment Scale (CAS)

In all faculties around 20 per cent of students average upper second class (Iii) grades in first year, except for Law (around 10%) and Medicine (31-64%). In all faculties between 40-50 per cent of students get lower second class (Iiii) (except in Engineering where the figure is closer to 30%). The number of first years averaging third class grades (III) is typically 20-30%, except for Law (as high as 38%) and Medicine (as low as 1%). In Law and Arts there have been small rises in the number of students who fail, but no discernible patterns can be identified in other faculties.



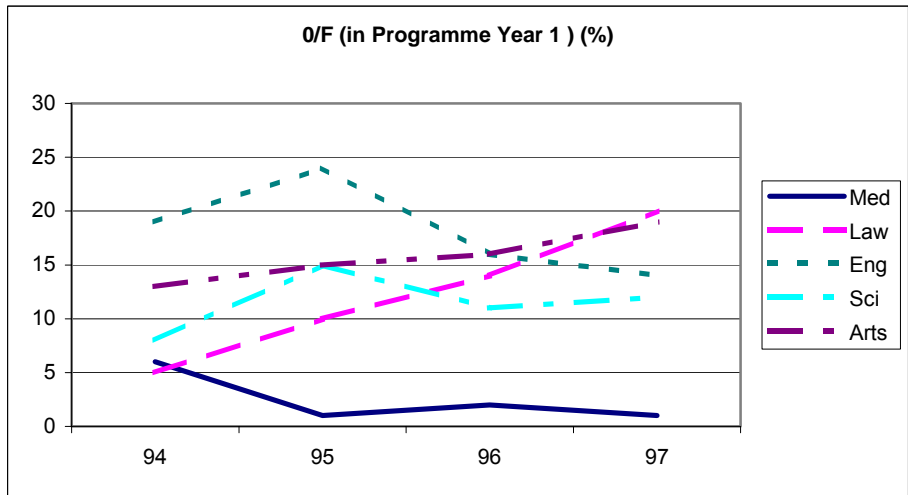
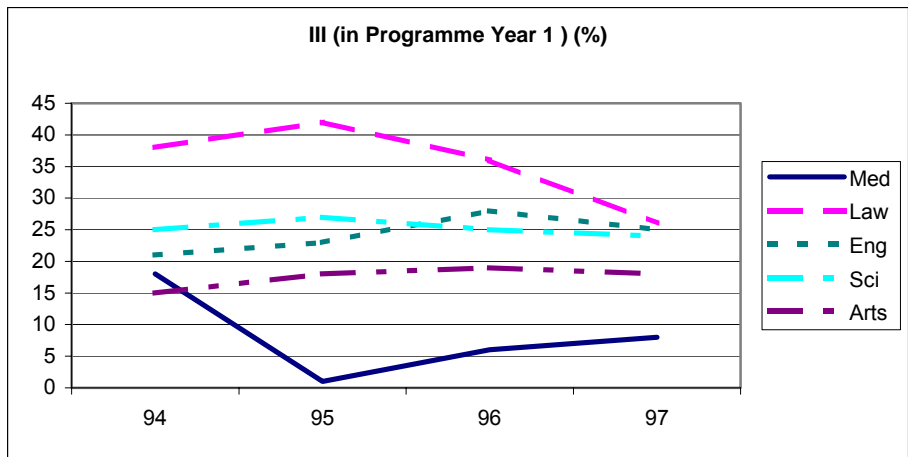
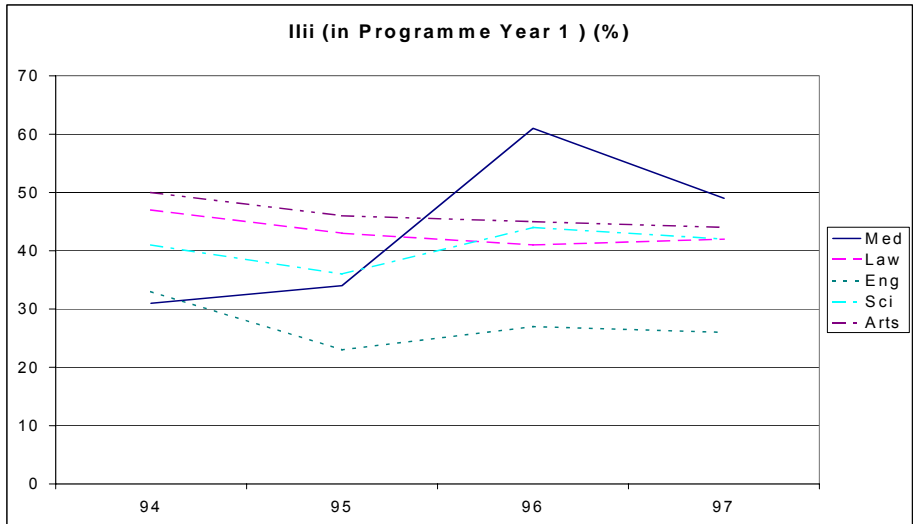


Figure 14 Student Performance in Programme Year 1 by faculty 1994-1997 (%)

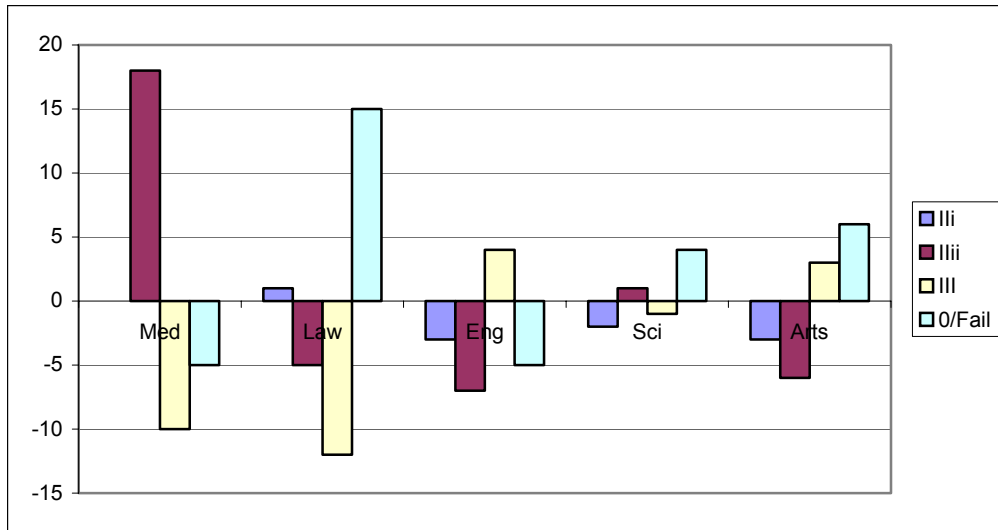


Figure 15 Changing Standards in Programme Year 1 by faculty 1994-1997 (%)

In summary, the overall picture in terms of class of grades achieved (Figure 15) suggests that in Medicine, for example, more lower second class grades and less thirds, zeros and fails are being awarded, whereas in Arts less upper and lower second class grades and more thirds, zeros and fails are being awarded.

5. Statistical Analysis

5.1 Multivariate analysis of drop out probabilities

This section presents results from multivariate LOGIT estimations used to investigate the joint effect of factors such as Age, Gender, Entry Qualifications and other on the drop out rate of students in different faculties. Appendix 2 explains in detail the econometric methods used in order to derive these results.

The purpose of the investigation is to answer the question: “To what extent can the probability of drop out of a student be explained by student characteristics?” In particular, the following characteristics are considered⁷:

- *Age*: Are younger or older students more likely to drop out? Is the received wisdom that mature students drop out more often supported by the evidence? Is there an empirical distinction between Mature and Very Mature students?
- *Gender*: Are male or female students more likely to drop out?
- *Entry qualifications*: To what degree can the level of entry qualifications affect the probability of a student dropping out? How do students with non-traditional qualifications compare with students with below average entry qualifications in their likelihood to drop out? Are there any gender differences in the impact of holding below core entry qualifications in dropout probabilities?
- *Year*: We investigated years 1994 to 1997. Have there been any significant differences between these years? Are there any signs of any trends in the data?

⁷ We expect that other characteristics, such as socioeconomic background, type of accommodation and parental occupation, would also be important for predicting retention probabilities, but unfortunately these were not available or complete for the present study.

- *Repeat Years:* Do students who performed unsatisfactorily in their first year and who were allowed to repeat this first year drop out less or more often than other students?

It is clear that the associations of these factors with drop out rates have important policy implications for the University. First, it can aid screening before students join the University and second, it can target preventive support after students start their studies. The remainder of this section presents the results of the multivariate analysis for each faculty separately and then for the University as a whole.

5.2 Arts Faculty

- Mature and Very Mature students are 60-80% more likely to drop out than their Young and Very Young counterparts.
- There are no gender effects. Male and female students have the same drop out propensities.
- Students with Low, Very Low and Missing qualifications are twice to three times more likely to drop out than core entry qualifications students.
- There does not appear to be a time trend in drop out rates. Year 1997 experienced a considerably higher drop out rate than the other years examined.
- There is a (statistically) weak⁸ effect suggesting that, although females on average dropout as often as males, low qualification females drop out less often than their (low qualification) male counterparts.

5.3 Science Faculty

- Mature and Very Mature students are twice as likely to drop out than their Young and Very Young counterparts.

⁸ The P-value was 0.06.

- There are no gender differences in drop out rates.
- Missing Qualifications (non-traditional entry) students are twice as likely to drop out. Low qualifications students are 80% more likely to drop out.⁹
- There does not appear to be a time trend in the data. Year 1997 suffered considerably higher than average drop out rates than years 1994 and 1995.
- Students who were allowed to repeat their first year exhibited an average drop out rate.
- The effect of qualifications is independent of gender.

5.4 Engineering, Law and Medicine Faculties

- The number of students in the Engineering faculty is too small for useful statistical analysis to be carried out.
- All that seems to matter regarding drop out probabilities is Entry Qualifications.
- Non-traditional entry students (missing qualifications in the University's data set) are six times more likely to drop out than students with core entry qualifications.
- For low and very low qualifications the drop out chances are four times as high as for core entry students.
- The number of students in the Law and Medicine faculties is also too small for useful statistical analysis to be carried out. Moreover, entry qualifications are higher and less dispersed than in other faculties. Consequently, given the small number of observations, the available data is unable to provide the opportunity for reliable investigation of the variation of drop out rates in Law and in Medicine.

⁹ Very low qualifications do not seem to influence drop out rates. One possibility explaining this may be this group of students is very small in number given the low core entry threshold values for this faculty. Alternately, this group may include students with industrial experience and low formal qualifications.

5.5 Overall University Effects

From the above discussion presented so far, it is clear that the faculties of Arts and Science are the only ones that produce statistically useful results. The faculties of engineering, Law and Medicine have too small student numbers to be analysed statistically in isolation. However, the information these faculties contain can be used in conjunction with that of the other two (larger) faculties by analysing the complete University data including an indicator (dummy) variable for each faculty.¹⁰ The last column of Table 14 shows the results of this estimation. The University-wide results are as follows:

¹⁰ Estimating drop out rates for all faculties together makes the implicit assumption that the retention process has a similar structure in all parts of the University. The econometric results obtained support this view. First, the odds ratio size and their signs remain largely the same in the University-wide estimation (e.g. Very Mature students odds ratios are about the same size of 68% in the University-wide estimation as in the Arts (63%) and Science (95%) faculties). Second, the statistical significance of the (largely similar) odds ratios increases in the University wide estimations (using the same example of Very Mature students, the significance of the Arts and Science odds ratios are 2.65 and 2.51 respectively and is increased to 3.79 in the University wide estimation. The results imply that, if there were opposite effects concealed in the Engineering, Law or Faculty, the significance of the odds ratios and/or their size would be reduced through the inclusion of either more noise (no drop out effects in the three smaller faculties) or opposite effects (opposite systematic effects in the three smaller faculties). The advantage of including the three smaller faculties is that the precision of the estimation is increased.

- Mature and Very Mature students are 70 to 80% more likely to drop out than the very young.
- There are no overall gender effects in the University as far as retention is concerned.
- Students with low, very low and missing qualifications are 1.9 to 2.6 times more likely to drop out in their first programme year than their core qualified counterparts.
- Years 1996 and 1997 had a higher drop out rate (49% and 24% higher chances than the previous years). It is not possible to establish if this is the start of a trend or because of the short time span of data used. Nonetheless, it should be noted that this appears to be principally a characteristic of faculties with high teaching loads (Science and Arts).
- There is a weak effect suggesting that low qualifications females drop out less than their low qualified male counterparts. Note that this effect is over and above the overall gender effect, which is not statistically significant. These results imply that being both male and low qualified increases the probability of an individual dropping out.
- The two faculties that have the highest teaching loads in the University (Science and Arts) have similar dropout propensities even after all age, qualifications, year etc. differences are accounted for in multivariate analysis. Engineering appears to have a lower retention rate over the period of investigation (over and above that explained by the lower entry qualifications and other observed differences). Law and Medicine appear to have a higher retention rate (again, over and above what is explained by their higher entry qualifications and other observed differences).

6. Concluding Comments

The descriptive analysis shows that: (i) female participation averages 52% (only in Engineering are women under-represented); (ii) age participation is particularly low in Law and Medicine, with Arts, Science and Engineering having the largest numbers of Mature students; and (iii) all Faculties (except Engineering) are accepting a greater proportion of students with entry qualifications substantially below quoted rates, with Arts having the highest proportion of these students.

The number of students dropping out has risen by one to two percentage points each year of the study period. Academic failure accounts for less than one in every five dropouts, but, despite improvements in data collection, the reason for dropping out is still unknown in two out of five cases. Nine out of ten students who drop out do so in their first programme year (which may be spread over several academic years and end without progression).

In terms of student performance, Law and Medicine have the greatest proportions of students achieving their full credits expected in the first programme year, whereas in Arts it can be as low as 56%. There is little evidence that “standards” have changed over the period of the study, although whereas Medicine is giving more upper second and fewer third class and fail marks, Arts, on the other hand is giving less upper and lower second and more third class and fail grades to first years.

Are older students more likely to drop out? The statistical analysis shows that overall Mature and Very Mature students are 70 to 80% more likely to drop out than the very young. In Arts, Mature and Very Mature students are 60-80% more likely to drop out than younger student, and twice as likely in Science.

Are male or female students more prone to dropping out? The statistical analysis shows that there is no gender effect. Male and female students have the same propensity to drop out, everything else being equal. There is weak evidence in Arts

that females with low qualifications drop out less often than their low qualified male counterparts.

To what degree can the level of entry qualifications explain dropouts? Are there any differences in the impact of below core entry qualifications between male and female students? In the University as a whole, students with low, very low and missing qualifications are significantly more likely to drop out in their first programme year than their core qualified counterparts. In Arts and Science, students with low, very low or missing entry qualifications are twice to three times as likely to drop out as those who enter with the quoted rates. In Engineering, students with missing qualifications are six times as likely to drop out and those with low or very low qualifications four times as likely as those entering with the quoted rates. Thus, it emerges that low entry qualifications is the most important enhancer of the drop out probability. Entry qualifications appear to have the highest association with dropout rates compared with any other of the characteristics examined.

No time trends were found, although 1997 experienced unusually high dropout rates compared to the other years. Students who performed unsatisfactorily in their first year and who were allowed to repeat this first year drop out less often than other students.¹¹

On the basis of the statistical analysis presented in this study a number of policy recommendations may be suggested, as detailed in the final section below.

¹¹ Two statistical caveats may be mentioned at this stage, both relating to the imperfections of the existing data. First, the investigation period may be too short to reveal any existing time trends. Hence, where this report reveals no time trends, a longer data set may reverse this result. Second, there is a large proportion of missing data in some key variables, notably, a large proportion of unknown reason for leaving and missing entry qualifications. If this information is missing from our data in a non-random fashion, the results of the statistical analysis may contain inaccuracies. The present data does not allow for these issues to be investigated and resolved, hence, these results must be seen as the best that can be achieved given the present data constraints. A more accurate, complete longer data set would enable further research and would reduce the statistical risks mentioned above.

7. Policy Analysis and Recommendations

The analysis in this study has clearly demonstrated that there is a trade-off between accepting students with low entry qualifications and retention rates. After low entry qualifications have been taken into account with the use of multivariate analysis, other effects, notably age and gender, appear to play no significant role. The implication of this is that age and gender in themselves do not influence retention, but rather that age and gender are correlated with entry qualifications which are the driving force behind retention differences. We have also identified the first programme year as being the year in which most retention problems occur, and therefore this is the focus of all the analysis conducted and the recommendations that follow:

1. *Improvements in data collection*¹²

- i. *Entry qualifications* – the student admissions service (SRAS) and KEY Learning¹³ be given the responsibility for ensuring that data on entry qualifications exists for all students prior to entry. Special attention should be placed on obtaining reliable data for those students who have non-conventional qualifications, those coming through the “clearing

¹² It should be noted that data collection since 1997 has improved. To try to ensure reliable and accurate data, a Student Record Co-Ordination Group, composed of staff from Registry, PG Registry, Senate, KEY, Admissions and DISS, has been created. The group meets 4 to 5 times a year.

¹³ Currently SRAS and KEY Learning admit students, the latter via the Summer School and are directly responsible for entering their data onto the Admissions System. SRAS take great care to ensure that the qualifications of students who entered through non-conventional routes (i.e. not from UCAS) are recorded. Students who come through Clearing generally complete an UCAS form known as an RPA (Record of Prior Acceptance) or provide SRAS with their Clearing Form (CEF). Since students may see a change in their exam results following publication of in early August, students are also asked at Registration to complete a New Student Data form. This is produced by Registry and details all known information about the student – any amendments/new information is subsequently recorded on the Student Record, by Registry/SRAS, by the end of October. Registry also inform SRAS if data is missing for a student so that SRAS can take the necessary steps to obtain such data. In recent years the direct application forms have also been improved and modified. In the past numerous forms existed for different sections but now one exists for use by SRAS, PG Office and KEY. Developments in on-line data acquisition, such as Portal II, may also help improve data collection.

system” and other forms of direct late entry, and Mature/Very Mature students. For this information to be useful it needs to be collected within the first few months following admission, as most students who drop out do so in their first year.

- ii. *Social and demographic information* - the Registry be given the responsibility for ensuring that data on social class, parental occupation and the complete sequence of home and term-time addresses and reliable information on residence type should be obtained prior to and throughout the duration of the student’s study at the University (as such information appears incomplete or unavailable at present). Again, this needs to be collected during the first few months following admission.
- iii. *Reasons for leaving* – it appears that that considerable and commendable progress has been made the Registry, Advisors of Studies and Senior Management in reducing the proportion of students dropping out for whom their reason for leaving is “unknown”. Although the definition of the categories for reasons for leaving are adequate, progress needs to continue, as the volume of missing data still hinders the statistical analysis required to ensure a complete and accurate picture of student retention.
- iv. *Further demographic information from at risk groups* – the University should also collect, from students with lower than quoted entry qualifications only, the following additional data: class of previous job and whether full or part time; length of last tenure; duration out of work; last date in education and at what level; marital status and number of dependent children. Qualitative analysis which takes into account the above characteristics should be able to establish a more accurate picture of the drop out student’s profile.

2. *Qualitative research into reasons for leaving*

- i. It may be appropriate that a qualitative study is commissioned to establish in depth what students who have dropped out perceive to be the reasons why they dropped out. This can be done by questionnaires targeting dropout students. The questionnaire should include information on employment during their study, the extent to which

students were integrated into “university culture”, and identify any areas of support they felt could have been offered, in addition to the demographic information in 1.iv. above. The sample size should be commensurate with the size of College or Faculty.

3. *Targeted monitoring and support*

- i. *Study skills training* – It may be helpful that all students admitted with below the going entry rates be required to attend a study skills training course which is front loaded in its delivery (for example, in Arts, probably in week 12 on the two days not taken up with the “information skills” course). It should be stressed that this should be centrally provided to ensure uniformity and be over and above any course level provision that may or may not be made.
- ii. *Student tracking and early warning systems* – we recommend that in disciplines where computerised learning is possible in level one courses, this should be actively encouraged. This type of learning offers several advantages as far as retention is concerned. First, it offers a highly structured environment. Second, the monitoring of attendance and progress is made considerably easier and more accurate, especially for large courses. Third, it is easier to identify students who are having difficulties much earlier than the present system¹⁴.
- iii. *Targeted support* – Once students likely to drop out are identified, targeted and non-stigmatory support should be offered very quickly¹⁵

¹⁴ It is understood that the Business School is piloting such a project in conjunction with a recently successful bid for support from the Learning Technology Unit, possibly with synergies with Portal II development also being piloted by the Business School

¹⁵ It appears that much later intervention by the progress committee seems to have been an effective screening mechanism, in that those who are allowed to progress actually then have a lower dropout rate than their original cohort as a whole. However, this does not detract from the need for earlier intervention if possible.

¹⁶. Since there is weak evidence that low qualified males tend to drop out more overall, and this should be borne in mind when developing such support mechanisms¹⁷.

The quantitative analysis in this report utilised a large data set with less than desirable individual level information. The strength of the report lies in that it uses a large number of observations. However, the weaknesses of only using a large data set is the lack of in depth understanding of the reasons, as perceived by drop out students, for leaving the University. It would be highly desirable if the strengths of this study were complemented by the generation and use of in depth individual qualitative data provided by specially designed questionnaires. Then the two types of data sources could work in tandem to inform University policy.

¹⁶ It is understood that Key Learning is already developing such targeted support systems.

¹⁷ This may also impact on course design, such as the amount of coursework and the frequency of assessment. The increasing frequency of thirds and fails being awarded at first year level in the coursework-intensive Arts faculty is perhaps worthy of concern.

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A longer version of this report is available with technical appendices.

Appendix 1

Table 5 Number of Students

	Med	Law	Eng	Sci	Arts	Total
94	159	153	202	716	980	2210
95	167	155	213	703	1017	2255
96	186	164	170	622	1061	2203
97	179	138	165	765	1106	2353
% rise	13%	-10%	-18%	7%	13%	6%
rise	20	-15	-37	49	126	143

Table 6 Age Participation (absolute)

Very Mature

	Med	Law	Eng	Sci	Arts	Total
94	4	15	31	65	233	348
95	7	14	37	62	203	323
96	2	17	22	51	173	265
97	5	20	27	62	186	300
% rise	25%	33%	-13%	-5%	-20%	-14%
rise	1	5	-4	-3	-47	-48

Mature

	Med	Law	Eng	Sci	Arts	Total
94	16	10	70	89	181	366
95	22	15	71	103	169	380
96	30	15	46	79	192	362
97	24	13	37	117	188	379
% rise	50%	30%	-47%	31%	4%	4%
rise	8	3	-33	28	7	13

Young

	Med	Law	Eng	Sci	Arts	Total
94	100	88	65	409	411	1073
95	97	69	69	404	460	1099
96	96	81	74	336	508	1095
97	114	61	68	408	509	1160
% rise	14%	-31%	5%	0%	24%	8%
rise	14	-27	3	-1	98	87

Very Young

	Med	Law	Eng	Sci	Arts	Total
94	39	40	36	153	155	423
95	41	57	36	134	185	453
96	58	51	28	156	189	482
97	36	44	33	178	223	514
% rise	-8%	10%	-8%	16%	44%	22%
rise	-3	4	-3	25	68	91

Table 7 Age Participation (%)

Very Mature

	Med	Law	Eng	Sci	Arts
94	3	10	15	9	24
95	4	9	17	9	20
96	1	10	13	8	16
97	3	14	16	8	17
rise	0	4	1	-1	-7

Mature

	Med	Law	Eng	Sci	Arts
94	10	7	35	12	18
95	13	10	33	15	17
96	16	9	27	13	18
97	13	9	22	15	17
rise	3	2	-13	3	-1

Young

	Med	Law	Eng	Sci	Arts
94	63	58	32	57	42
95	58	45	32	57	45
96	52	49	44	54	48
97	64	44	41	53	46
rise	1	-14	9	-4	4

Very Young

	Med	Law	Eng	Sci	Arts
94	25	26	18	21	16
95	25	37	17	19	18
96	31	31	16	25	18
97	20	32	20	24	20
rise	-5	6	2	3	4

Table 8 Entry Qualifications

Very Low

	Med	Law	Eng	Sci	Arts
94	4	2	10	8	15
95	8	7	2	4	14
96	6	8	4	4	13
97	11	14	5	10	22
rise	7	12	-5	2	7

Missing

	Med	Law	Eng	Sci	Arts
94	3	11	46	15	26
95	9	9	54	16	29
96	2	9	38	15	31
97	15	39	42	31	44
rise	12	28	-4	16	18

Table 9 Dropout (%)

Reason for Leaving: Academic Failure

	Sci	Arts
94	19	11
95	23	14
96	23	12
97	24	14
rise	5	3

Reason for Leaving: Unknown

	Sci	Arts
94	63	80
95	60	75
96	40	53
97	37	41
rise	-26	-39

Dropouts (PYR1, nos.)

	Med	Law	Eng	Sci	Arts	Total
94	4	5	19	54	94	176
95	2	11	20	75	112	220
96	5	12	14	62	146	239
97	4	15	17	93	163	292
% rise	0%	200%	-11%	72%	73%	66%
rise	0	10	-2	39	69	116

Table 10 ScotCat Credits PYR1 (%)

Full credits PYR1/ACYR1

	Med	Law	Eng	Sci	Arts
94	86	91	56	84	67
95	98	86	58	77	64
96	95	80	67	82	62
97	95	73	64	78	57
rise	9	-18	8	-6	-10

No credits PYR1/ACYR1

	Med	Law	Eng	Sci	Arts
94	1	3	11	6	12
95	1	7	12	8	13
96	2	7	7	6	12
97	1	11	6	8	14
rise	0	8	-5	2	2

<80 credits in PYR1/ACYR2

	Sci	Arts
94	80	92
95	94	90
96	88	96
97	86	95
rise	6	3

Table 11 Grades achieved in PYR1 (%)

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	Med	Law	Eng	Sci	Arts
94	42	10	17	23	21
95	64	5	19	18	20
96	31	10	21	16	19
97	42	11	14	21	18
rise	0	1	-3	-2	-3

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	Med	Law	Eng	Sci	Arts
94	31	47	33	41	50
95	34	43	23	36	46
96	61	41	27	44	45
97	49	42	26	42	44
rise	18	-5	-7	1	-6

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	Med	Law	Eng	Sci	Arts
94	18	38	21	25	15
95	1	42	23	27	18
96	6	36	28	25	19
97	8	26	25	24	18
rise	-10	-12	4	-1	3

0/Fail

	Med	Law	Eng	Sci	Arts
94	6	5	19	8	13
95	1	10	24	15	15
96	2	14	16	11	16
97	1	20	14	12	19
rise	-5	15	-5	4	6

Table 12 Dropouts by PYR

Dropouts by PYR (Arts)

	PYR1	PYR2	PYR3	Other	Total	%PYR1
94	94	8	3	0	105	90%
95	112	9	3	1	125	90%
96	146	14	2	0	162	90%
97	163	11	3	2	179	91%
						90%

Dropouts by PYR (Sci)

	PYR1	PYR2	PYR3	Other	Total	%PYR1
94	54	5	3	0	62	87%
95	75	8	5	1	89	84%
96	62	11	2	0	75	83%
97	93	13	3	0	109	85%
						85%

Dropouts by PYR (Eng)

	PYR1	PYR2	PYR3	Other	Total	%PYR1
94	19	0	0	0	19	100%
95	20	1	3	0	24	83%
96	14	0	1	0	15	93%
97	17	1	2	0	20	85%

Dropouts by PYR (Law)

	PYR1	PYR2	PYR3	Other	Total	%PYR1
94	5	0	0	0	5	100%
95	11	1	0	0	12	92%
96	12	0	0	0	12	100%
97	15	1	0	0	16	94%

Dropouts by PYR (Med)

	PYR1	PYR2	PYR3	Other	Total	%PYR1
94	4	0	0	0	4	100%
95	2	0	1	0	3	67%
96	5	0	0	0	5	100%
97	4	0	0	0	4	100%

Table 13 Reasons for leaving in Programme Year 1

Frequency

	All				Med				Law				Eng				Sci				Arts			
	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97
Health	11	24	27	22	0	0	0	2	1	3	3	0	1	1	1	0	0	7	7	7	9	13	16	13
Academic Failure	28	38	42	55	1	0	2	2	2	1	3	4	5	4	5	5	10	17	14	22	10	16	18	22
Financial Problems	0	0	14	10	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	2	0	0	11	8
Personal	0	0	12	56	0	0	0	0	0	0	1	2	0	0	0	2	0	0	6	15	0	0	5	37
Unknown	126	143	116	116	3	1	3	0	2	4	4	7	12	12	6	8	34	45	25	34	75	81	78	67
Transfer/Employment	11	14	27	31	0	1	0	0	0	3	0	2	1	3	1	2	10	6	9	12	0	1	17	15
Other Reasons	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
Total dropout	176	220	239	292	4	2	5	4	5	11	12	15	19	20	14	17	54	75	62	93	94	112	146	163
Total population	2210	2255	2203	2353	159	167	186	179	153	155	164	138	202	213	170	165	716	703	622	765	980	1017	1061	1106

%

	All				Med				Law				Eng				Sci				Arts			
	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97	94	95	96	97
Health	6%	11%	11%	8%	0%	0%	0%	50%	20%	27%	25%	0%	5%	5%	7%	0%	0%	9%	11%	8%	10%	12%	11%	8%
Academic Failure	16%	17%	18%	19%	25%	0%	40%	50%	40%	9%	25%	27%	26%	20%	36%	29%	19%	23%	23%	24%	11%	14%	12%	13%
Financial Problems	0%	0%	6%	3%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	7%	0%	0%	0%	2%	2%	0%	0%	8%	5%
Personal	0%	0%	5%	19%	0%	0%	0%	0%	0%	0%	8%	13%	0%	0%	0%	12%	0%	0%	10%	16%	0%	0%	3%	23%
Unknown	72%	65%	49%	40%	75%	50%	60%	0%	40%	36%	33%	47%	63%	60%	43%	47%	63%	60%	40%	37%	80%	72%	53%	41%
Transfer/Employment	6%	6%	11%	11%	0%	50%	0%	0%	0%	27%	0%	13%	5%	15%	7%	12%	19%	8%	15%	13%	0%	1%	12%	9%
Other Reasons	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	1%	1%	1%
Total %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total University %	8%	10%	11%	12%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%	3%	3%	4%	4%	5%	7%	7%
Total Population	2210	2255	2203	2353	2210	2255	2203	2353	2210	2255	2203	2353	2210	2255	2203	2353	2210	2255	2203	2353	2210	2255	2203	2353

Table 14 Logit Estimations

	Arts		Science		Engineering		Law		Medicine		University	
	O-Ratio	t-ratio	O-Ratio	t-ratio	O-Ratio	t-ratio	O-Ratio	t-ratio	O-Ratio	t-ratio	O-Ratio	t-ratio
Young	0.97	-0.20	1.14	0.76	0.90	-0.31	0.54	-1.47	1.55	0.65	1.00	0.05
Mature	1.79++	3.21	2.08++	3.14	0.85	-0.32	2.02	1.24	2.93	1.09	1.81++	4.57
S-Mature	1.63++	2.65	1.95++	2.51	1.36	0.49	1.40	0.58			1.68++	3.79
Gender	1.01	0.08	1.23	1.47	1.63	0.84	1.34	0.77	1.29	0.44	1.11	1.26
MissQual	2.97++	7.15	2.04++	3.87	6.04++	4.41	2.03	1.29			2.64++	9.08
VLowQual	2.27++	4.18	1.11	0.30	4.19++	2.80	1.06	0.07	1.06	0.04	1.92++	4.46
LowQual	2.34++	3.99	1.82++	2.27	4.47++	3.96			0.53	-0.49	2.17++	5.35
1995	1.00	-0.03	1.29	1.33	0.73	-0.77	1.84	1.11	0.53	-0.71	1.07	0.60
1996	1.58	3.36	1.47++	2.04	0.95	-0.15	2.05	1.38	1.14	0.19	1.49++	3.98
1997	1.17	1.09	1.40+	1.85	0.90	-0.29	2.70+	1.80	0.96	-0.06	1.24++	2.04
RepeatYr	0.61--	-4.21	1.03	0.24	0.88	-0.50	1.19	0.48	1.65	1.16	0.80--	-2.86
FLowQual	0.67-	-1.85	0.85	-0.45	4.73	1.30	3.46	1.28	0.81	-0.14	0.76	-1.63
Eng	-	-	-	-	-	-	-	-	-	-	1.45	2.52
Med	-	-	-	-	-	-	-	-	-	-	0.24	-5.32
Sci	-	-	-	-	-	-	-	-	-	-	1.11	1.24
Law	-	-	-	-	-	-	-	-	-	-	0.67	-2.32
Restr LogL		-1513.04		-890.79		-198.13		-153.24		-70.49		-2881.73
LogL		-1410.69		-854.95		-175.92		-138.78		-68.33		-2678.68
Number of students		3850		2549		472		580		614		8121
PseudoRSq		0.0676		0.0402		0.1121		0.0944		0.0307		0.0705
LR chi2		204.70		71.68		44.42		28.93		4.32		406.10

Note: Dependent Variable is 1 for drop out zero otherwise.

Reference categories: Age (very young), Qualifications (core entry), Year (1994), Faculty (Arts).

Significance: ++/-- significant at 5% level; +/- significant at 10% level

Table 15 List of variables

Field Name	Field Description	Field Values	Comments
S_REF	Student ID number	∞	Primary key
SEX	Student gender	1	Male
		0	Not male
AGE	Student age on entry	17-67	In years
H/OS	Home/Overseas	1	Home
		0	Overseas
DOM	Country of Domicile	-	Over 300 – see table 1
LEA	Local Education Authority	-	Over 100 – see table 2
P'CODE (H)	Home post code	Txt	
P'CODE (T)	Term post code	Txt	
ETHN	Ethnicity	1	White
		2	Black
		3	Indian
		4	Chinese
		5	Not available
		6	Mixed/other
CLS	UCAS Social Class	0	Not known
		1	Professional
		2	Managerial/Technical
		3	Skilled non manual
		4	Skilled manual
		5	Partly skilled
		6	Unskilled
OCCN	Parental Occupation	-	Over 900 – see table 5
DIS	Disability	0	None or not known
		1	Disabled
SCHL		-	Thousands!
HQE	Highest qualifications on entry	-	Over 90
HPTS	Higher points	0-30	
APTS	A level points	0-28	
COMDATE	Commencement date	∞	YYMMDD
ACYR	Academic Year	1990-1998	YYYY
Adviser	Adviser of Studies	Txt	
PROGCDE	UCAS programme code		These map to degrees
Prog Title	Programme title	Txt	
PYR	Programme year	1-5	Years 1 to 5

MOA	Mode of study		60 definitions
FSCE	Fee source		Over 90 – see table 10
ACCM	Term time accommodation	1	Institution maintained
		2	Parental/guardian home
		3	Own home
		4	Other
		5	Not known
		6	Not in attendance
Date Left		∞	YYMMDD
RSN	Reason for leaving	1	Successfully completed course
		2	Academic failure
		3	Transfer to other institution
		4	Health reasons
		5	Deceased
		6	Financial reasons
		7	Other personal
		8	Written off lapsed
		9	Excluded
		10	Into employment
		11	Other reasons
		98	Result not known
		99	Reason unknown
NRCRSE	Number of courses taken	2-21	
NRCRSEN	Number of courses not achieved	0-11	
NRCRSEMC	Number of medical certifications	0-3	As denoted by MC in GRD
AVCREDIT	Average ScotCat Credits per year	0-300	
AVGRADE	Average CAS Grade per year	0-19.83	
SDGRADE	StDevP CAS Grade per year	0-5.91	
TOTYR	Years to completion	1-7	
PYRRPT	Repeat Years	0-3	No repeated years

Appendix 2 – The Logistic Regression

Categorical data analysis is a widely used tool of statistical analysis. Its purpose is to analyse situations where the outcome of interest is of a categorical nature, that is, the outcome has no cardinal numerical representation. For example, in labour economics the participation decision can result in being employed or not (the outcome is either yes or no), in transport economics the more complex choice of mode of transport can result in bus, or train, or car, etc. The outcome of interest in this report is of a clearly categorical nature, as students either drop out or they do not. This is a simple categorical estimation problem of a discrete choice where the outcome is, in essence, binary.

The most widely used discrete choice model is the LOGIT model¹⁸. With respect to the estimation of binary LOGIT models, the dependent random variable y is a binary variable taking on the value 1 if the event occurs and 0 otherwise. The outcomes of y are assumed to be mutually exclusive and exhaustive. The question of interest is the value of the probability $\Pr(\)$ that $y = 1$.

It is assumed that there is an underlying response continuous variable y_i^* defined by the regression relationship:

$$y_i^* = \beta'x_i + u_i$$

Logistic regression can be used when y_i^* is unobservable, but the binary outcome of the discrete choice is observed as the variable y defined by

$$y = 1 \quad \text{if } y_i^* > 0$$
$$y = 0 \quad \text{otherwise}$$

¹⁸ Logistic regression has been discussed by McCullagh (1980), Anderson and Philips (1981), Ashby et.al. (1986) and Greene (2002).

The following can then be derived:

$$\begin{aligned}\Pr(y_i = 1) &= \Pr(u_i > -\beta'x_i) \\ &= 1 - F(-\beta'x_i)\end{aligned}$$

where F is the cumulative distribution function for u .

In this case the observed values of y are just realisations of a binomial process with probabilities given by the above equation, and varying from trial to trial (depending on x_i).

The individuals in the sample are assumed to be categorised independently of each other. Logistic models enable the assessment to be made of the independent contributions to the odds of being in each subsequent range of the dependent variable by each of the x individual characteristics. From the antilog of the logistic coefficient it is possible to estimate the relative odds of being in each subsequent range of the dependent variable for individuals who have a particular characteristic compared to those who do not (e.g. being a man or a woman) after the effect of all other factors in the list of independent variables has been taken into account. The interpretation of each continuous quantitative risk factor is that the antilog of the logistic coefficient represents the estimated increase in the odds of being in each subsequent range of the relevant dependent variable per unit increase in the particular characteristic such as age in years.¹⁹

This report uses LOGIT analysis because it lends itself to clear interpretation of its results, the Odds Ratios. In general, Odds Ratios must be interpreted as follows:

¹⁹The interpretation of logistic regression coefficients is discussed in detail in Koch and Edwards (1988).

$$\begin{aligned} \text{Odds Ratio} &= \frac{\text{Odds that a mature student will drop out}}{\text{Odds that a young student will drop out}} \\ &= \frac{\frac{\text{Probability of drop out amongst mature students}}{\text{Probability of retention amongst mature students}}}{\frac{\text{Probability of drop out amongst young students}}{\text{Probability of retention amongst mature students}}} \end{aligned}$$

The interpretation of Odds Ratios is explained using Table 14 as an example. There are three main cases to be looked at: an Odds Ratio that is less than one, is equal to one, or is larger than one.

An Odds Ratio larger than 1 implies a positive relationship between a variable and drop out rates. In the Arts faculty, the category of mature students has an Odds Ratio of 1.79. The meaning of this result is that, if the average young student has a drop out probability of, say, 10%, the drop out probability of a mature student is estimated to be $1.79 \times 10\% = 17.9\%$. Another way to state this result is to say that mature students stand a 79% higher chance of dropping out than their young counterparts.

An odds ratio of 1 implies that there is no drop out rate difference between the groups in question (i.e. the variable has no effect on the investigated outcome). For example, Gender in the Arts faculty has an Odds Ratio of 1.01. This suggests that female students have a mere 1% higher chance of dropping out than their male counterparts. Clearly, the data suggest that, after all observed differences between male and female students have been taken into account, there is no drop out difference between the two genders.

An Odds Ratio that is less than 1 implies a negative relationship between a variable and drop out rates and needs to be translated into percentages in the following way. Taking the Repeat Year in the Arts faculty as an example, the Odds Ratio of 0.61 suggests that if the average 1st attempt 1st year student has a drop out probability of, say, 10%, the average repeat year student has a probability of $10\% \times 0.61 = 6.1\%$. That is, the average repeat year student is 61% less likely to drop out (10% divided by $6.1\% = 1.61$) than the average 1st year 1st attempt student.

To sum up, an Odds Ratio

- above 1 suggests a positive association between a variable and drop out rate
- equal to 1 suggests no association
- below 1 suggests a negative association between a variable and drop out rate

The next important result to read in Table 14 is the columns containing t-ratios. Each Odds Ratio comes with its own t-ratio, which tells us how precise and trustworthy the Odds Ratio is. The higher the t-ratio the more clear the association between a variable and the drop out rate is. The conventional thresholds to be used here are that a value of less than 1.64 suggests that there is no statistically significant effect, between 1.64 and 1.96 that there is a statistically weak effect and above 1.96 that there is clear statistical significance.²⁰

Putting Odds Ratios and t-ratios together we can interpret results as follows. Taking the Odds Ratio of Arts Very Mature students of 1.63 with its t-ratio of 2.65, we can read that there is a positive drop out effect (Odds Ratio>1) associated with being a Very Mature student and that this effect is precisely estimated (t-ratio>1.96). By contrast, looking at Gender in the Engineering faculty there is an Odds Ratio of 1.63 with a t-ratio of 0.84. Here we should read that there is an equally sized positive effect (Odds Ratio>1), but that this effect is very imprecisely estimated (t-ratio<1.64). The way to read these results is that in the case of Very Mature in the Arts faculty there is sufficient evidence to suggest a positive drop out effect, whilst in the case of Gender in the Engineering faculty there is not sufficient evidence to suggest a drop out effect.²¹

²⁰ It should be borne in mind that t-ratios represent a continuous relationship. Therefore, although the values of 1.95 and 1.96 belong to a different category by convention, there is no practical difference between them.

²¹ It is crucial that one does not feel tempted to read too much into any odds ratios that are not statistically significant. It is best to treat these as zero effects.

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