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Some determinants of Academic Exclusion and Graduation in three faculties at UCT

by

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Some determinants of Academic Exclusion and Graduation in three faculties at UCT

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Abstract

University graduation rates have become increasingly important for institutions and policymakers alike. Academic exclusion, or other forms of withdrawal from university, represents a loss to the individual, the institution and broader society. This paper investigates the determinants of graduation and academic exclusion in UCT's Commerce, Engineering and Built Environment and Science faculties using survival analysis. The sample consists of 11 959 students who registered for a degree in one of these three faculties between 2006 and 2013.

The results suggest that there are large differences in graduation and academic exclusion rates between different groups of students. Factors which increased the likelihood of graduating were being female, white, ineligible for financial aid (suggestive of greater affluence), proficient in English, attending a Quintile 5 or independent school and having obtained good Grade 12 grades. On the other hand, students who are male, eligible for financial aid (indicative of coming from poorer backgrounds), non-English-speaking, have attended poorly resourced schools and achieved low school grades are more likely to be academically excluded. Relative to the Commerce faculty, the Science and EBE faculties exclude a substantially greater proportion of poorly performing students in the first and second years. The Commerce Faculty excludes relatively few students in the first two years, but the exclusion rate increases sharply in the third and subsequent years.

1 Introduction

Student retention, also known as student persistence, is the ability of a university to retain a student from first-year until graduation, and has concerned educational policymakers for decades. This topic has received widespread attention because the costs incurred when a student fails to complete his or her studies are substantial for the student, the institution and society at large. The opportunities of students who do not complete their degrees to pursue successful careers are much diminished. In South Africa, the monthly earnings premium between a graduate and an individual with only a matric certificate increased from 182% in 2000 to 241% in 2007 (Branson et al., 2009). Furthermore, failing to complete a degree represents a substantial opportunity cost because the time spent at university could have been used for more productive purposes.

From the perspective of a university, the most direct effect of a student failing to complete a degree is the loss in tuition fees and government subsidy. The university also loses a potential future income stream as research has shown that graduates are more likely to donate to their alma mater than those who did not complete their studies (Swail, 2004). The loss of revenue reduces the ability of the university to attract and retain high-quality academics, undermining the academic reputation of the university. Moreover, potential and existing students will look elsewhere to study, further reducing future revenue streams.

The cost to society of students who fail to complete their studies is considerable. Firstly, every student attending a public university in South Africa is subsidised by the government (DHET, 2004). A student who fails to complete a degree programme represents an inefficient use of taxpayers' money because society will derive only a partial benefit from the subsidy it provided. Students who fail to graduate are more likely to rely on government services (such as welfare benefits) than graduates (Swail, 2004). Finally, graduates contribute more in taxes than non-graduates and have greater civic participation (Baum et al., 2013), increasing the nation's social capital.

Given the substantial benefits from graduating and the costs of failing to graduate, student retention should be a national priority. Laudably, the Department of Higher Education and Training (DHET) has understood the importance of increasing graduation rates at South African universities (Letseka and Maile, 2008). On the surface, the political pressure applied to universities to increase the graduation rate appears to have worked: the graduation rate increased from 38% for the 2000 cohort (i.e. those who entered university in 2000) to 52% for the 2006 cohort (Scott et al., 2007; Ndebele et al., 2013). However, even the improved figure of 52% is troublesome.

Part of the problem in improving the graduation rate arises from its complex and intricate nature. There is a large array of observable and unobservable factors that affect the academic success of a university student.

The purpose of this paper is to elucidate the relationships between a set of observable factors with the probability of graduating and academic exclusion. University of Cape Town (UCT) undergraduate students from the Commerce, Engineering and Built Environment (EBE) and Science faculties were selected due to the emphasis placed on the quantitative skills of degrees offered by these faculties.

2 Literature Review

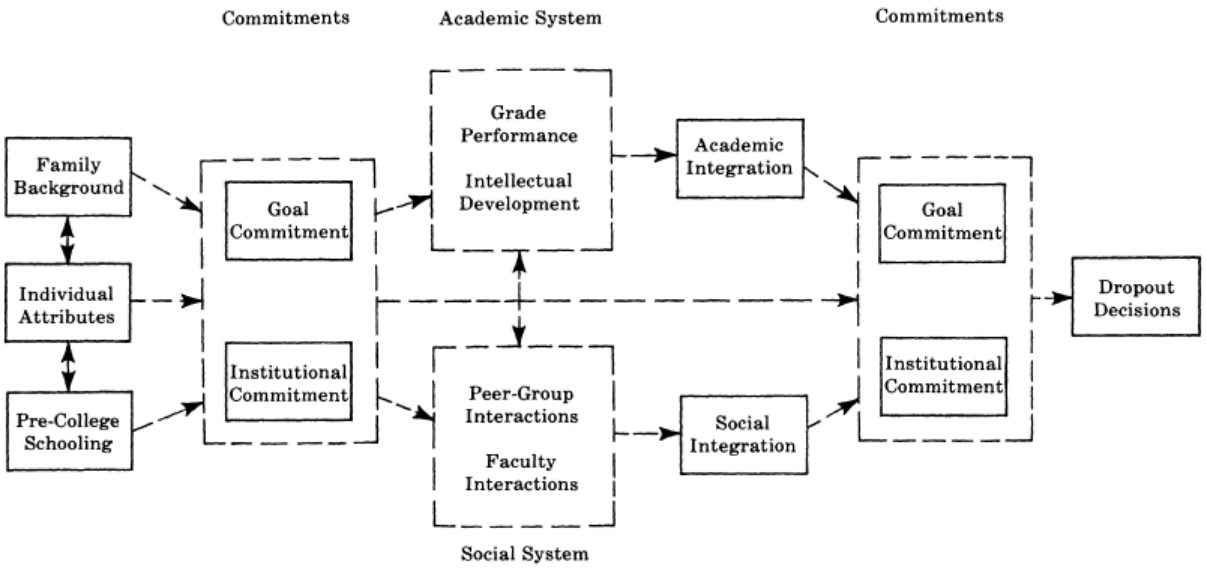
This section consists of two parts. The first part examines the most prominent models of student retention. The second part looks at individual factors which have shown to influence student retention. In South Africa, research in this field has almost exclusively focused on explaining academic performance of first or second-year economics students (Horn and Jansen, 2009; Horn et al., 2011; Parker, 2006, 2007, 2010; Potgieter et al., 2010; Smith and Edwards, 2007; Smith and Ranchod, 2010; Van Walbeek, 2004; Van Zyl et al., 2012). Most of the literature on student retention considered in this paper is from outside South Africa.

2.1 Models of Student Retention

2.1.1 Student Integration Model

Tinto's (1975) conceptual framework is unequivocally the most popular student retention model used in higher education research (Miller, 2006). The model's popularity derives from its simple and intuitive nature regarding the factors which influence student retention. A schematic representation of the Student Integration Model is given below.

FIGURE 1: Tinto's Student Integration Model



Source: (Tinto, 1975)

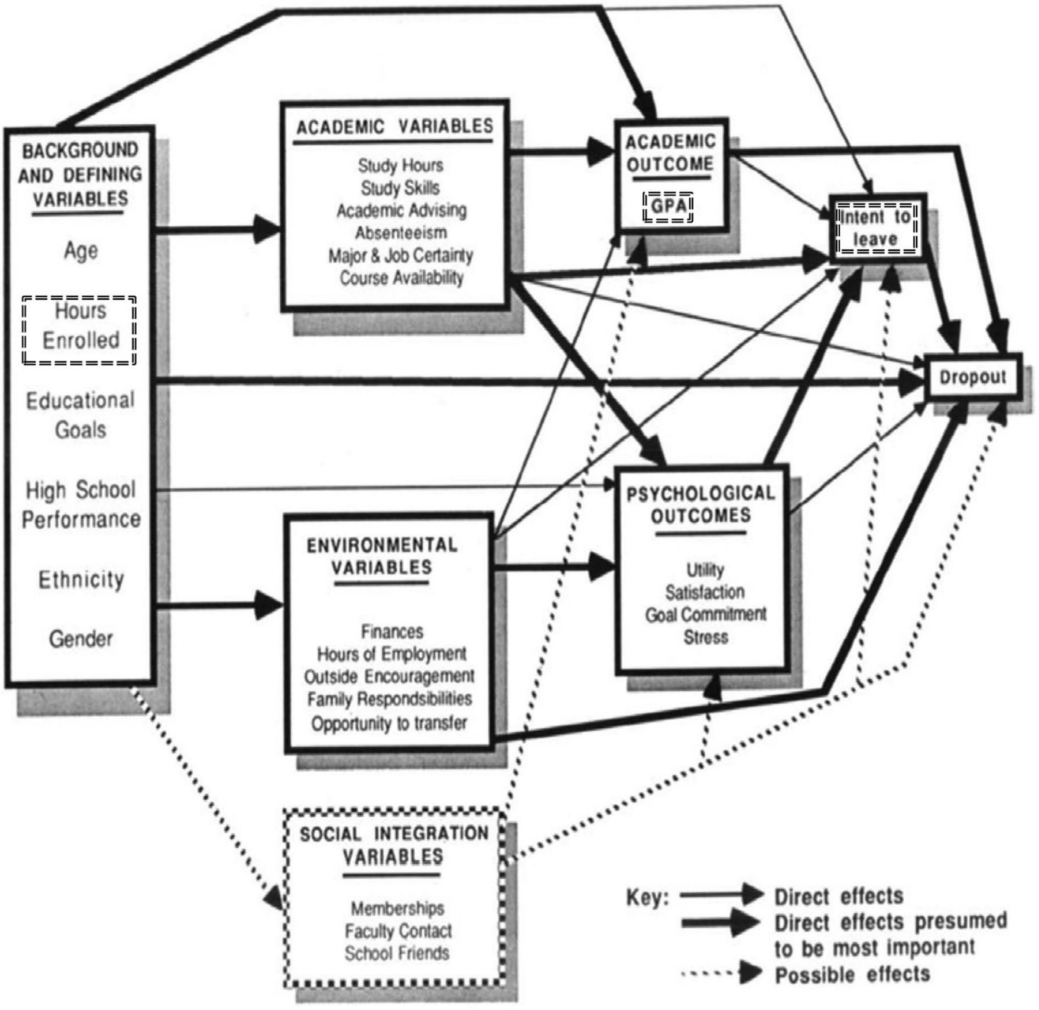
Tinto posits that both academic and social integration are crucial in determining whether a student is retained. First-time university students have several pre-enrolment characteristics which affect their initial commitment towards their (personal) goals and the institution. Family background variables include the parents' educational background, their wealth, the quality of relationships between family members, and the expectations they have for their children (Tinto, 1975). Individual characteristics refer to factors such as ability and motivation, while pre-college schooling refers both to the academic standard and resources of the school (Tinto, 1975). According to the model, students who come from an affluent family, attend a good school and achieve excellent grades will initially have greater clarity about their goals and be more devoted to their university studies.

Once students enter university, the ability to attain their goals is linked to academic integration at the university. Academic integration refers not only to marks achieved, but also to students' enjoyment of the subjects and the value they place on their education (Tinto, 1975). Students who have strong career aspirations are more likely to integrate into the academic life of the university than those who do not have a clear idea about their ultimate career. Social integration refers to the degree of engagement with staff and fellow students, and participation in societies or sports clubs (Tinto, 1975). The greater the level of interaction and participation, the greater the congruence between students and their campus environment. Academic and social integration in turn force students to re-evaluate their commitment to their goals and institution, ultimately determining whether a student remains at university. The higher the academic and social integration, the more likely a student is to graduate.

2.1.2 Student Attrition Model

Bean and Metzner's (1985) student attrition model specifically focused on non-traditional students. They defined a non-traditional student as 'older than 24, or does not live in a campus residence (e.g., is a commuter), or is a part-time student, or some combination of these three factors; is not greatly influenced by the social environment of the institution; and is chiefly concerned with the institution's academic offerings' (Bean and Metzner, 1985, p.489). They maintained that non-traditional students come to university with very specific goals in mind and that social integration was less important because their social support structures were to a large extent drawn from family and friends outside the university. In the South African context, there is another group of students who are neither 'traditional' nor 'non-traditional' but rather 'aspirational'. Owing to historical factors, these individuals are first-generation students and typically have limited funds. They may have to work to finance their studies or care for their younger siblings. In addition, their families often pressure them to succeed at university because a degree is regarded as a crucial step to improving their life circumstances. Accordingly, Bean and Metzner's (1985) model, which can account for a diverse range of student experiences, is more applicable to South Africa's multi-cultural higher education environment than Tinto's model.

FIGURE 2: Bean and Metzner's Student Attrition Model



Source: (Bean and Metzner, 1985)

In relation to Tinto's model, there are obvious similarities, especially the sets of academic, background and social integration variables. In the Psychological Outcomes category, two new variables - utility and stress - were added. Utility refers to the value of the degree unlocking future employment opportunities. Stress describes the level of anxiety that students experience both within and outside the university environment. However, the most crucial insight of the model was the addition of a set of environmental variables such as finances, hours worked and family responsibilities, which are outside the university's control. This understanding of student retention behaviour has big policy implications for universities. In contrast to Tinto's model, universities do not have much power in retaining students.

2.2 Individual Factors which Affect Student Retention

There are a large number of factors which influence the decision to remain at university. However, given the size of the sample, only variables which were available on the university's student database (and thus measurable) were included in this paper. While we acknowledge that variables such as motivation, career aspirations and interaction with peers and faculty are important in determining student retention, they are difficult to measure and are not available on the student database.

The variables below have been classified into three groups: academic, demographic and environmental.

2.2.1 Academic Variables

High school Grade Point Average (GPA) has consistently been found to be a good predictor of success at university, although much of the research has focused on explaining first-year performance (for an excellent review see Smith (2012)). Many of the studies which have examined determinants of graduation or cumulative GPA are drawn from the international literature, and the evidence is clear: the effect of high school GPA persists throughout the duration of a student's university career (Adelman, 1999, 2006; De Angelo et al., 2011; Geiser and Santelices, 2007; Krejci, 2011; Mendez et al., 2008; Min et al., 2011; Murtaugh et al., 1999; Smith and Naylor, 2001, 2005; Smith, 2012; Tumen et al., 2008; Zhang et al., 2004; Zwick and Sklar, 2004).

Even in South Africa, where the validity of the Grade 12 examination as a predictor of success at university has been questioned by many people, there is evidence that it is, in fact, a strong predictor of university success (Smith, 2012).

Research into the effects in **high-school mathematics** on the probability of graduating is limited. Nevertheless, the studies which have been conducted have all reached the same conclusion: high school mathematics scores are good predictors of graduation (De Winter and Dodou, 2011; Parker, 2005; Rose and Betts, 2001; Zhang et al., 2004). For example, Zhang et al. (2004) found that a 10-point increase in the quantitative section of the Scholarly Aptitude Test (out of 800) led to to a 3 to 8% increase in the probability of graduating among engineering students.

2.2.2 Demographic Variables

The evidence regarding the effect of **age** on student retention is mixed (van Stolk et al., 2007; Cantwell et al., 2001; Grayson, 1997; Murtaugh et al., 1999; McNabb et al., 2002; Ott et al.,

1984; Pyke and Sheridan, 1993; Roberts, 2011; Smith, 2012; van Stolk et al., 2007; Weng et al., 2008). Older students typically have two opposing influences which affect their performance at university: (1) work and family responsibilities, which reduce the time they can dedicate to their studies, and (2) stronger motivation to succeed.

A substantial body of literature concerning the role of **gender** suggests that women are more likely to graduate than men (Astin and Oseguera, 2005; Council on Higher Education, 2009; McDaniel, 2011; McNabb et al., 2002; Peter and Horn, 2005; Radcliffe et al., 2006; Rask and Tiefenthaler, 2008; Smith, 2012). This is ascribed to, amongst others, higher job expectations of today's women compared to women of previous generations, increased age of first marriage, the invention of the contraceptive pill, and greater emotional maturity than young men (Goldin et al., 2006).

The issue of **home language** education has been debated extensively within the South African educational community. Nash (2006) compared the differences between students who completed their Information Systems (IS) degree in three years with those who took four years at the University of Cape Town. She established that students who had a higher English matriculation score were more likely to finish their degree within three years. However, overall matriculation score (excluding English) was the best predictor in determining time taken to complete an IS degree. Smith (2012) found no significant difference in the likelihood of graduating between students who took English First Language Higher Grade and those who wrote English Second Language Higher Grade. However, he also found that speaking English at home increased the probability of graduation by 8% for mainstream Engineering students.

With regards to **race**, Murtaugh et al. (1999) found that while white students had a higher probability of graduating than black students, black students with similar characteristics to white students (e.g. age, high-school GPA, type of faculty enrolled etc.) had a higher probability of graduating. Fletcher and Tienda (2010) suggested that the type of high-school attended can explain the racial differences in graduation rates at four public Texas universities. Specifically, controlling for the type of school attended, the disparity in graduation rates was reduced by between 40% to 50%. Smith (2012) showed that white students in the mainstream programmes were 9-10% more likely to graduate in the Commerce, EBE and Science faculties than non-white students at UCT.

2.2.3 Environmental Variables

As university access has expanded over the decades, an increasing proportion of students are taking **academic support** or remedial courses. The aim of remedial education is to teach students foundational skills - usually in mathematics, reading and writing - which will make them

better prepared for university courses. Early research into the effectiveness of remedial courses was plagued by selection bias: differences in the type of student who went into mainstream and remedial courses were not taken into account (O'Hear and MacDonald, 1995). Later studies have used an instrumental variable approach or Regression Discontinuity Design (RDD) to remove this bias. Calcagno and Long (2008) found there was no effect of remedial courses on the probability of graduating.

Previous South African studies on academic support programmes, as outlined by Smith (2012), are either descriptive in nature or used small samples. Smith's study found that the AD programmes in the Commerce, EBE and Science faculties at UCT had no significant impact on the probability of graduating.

There has been a paucity of research into the effect of **needs-based financial aid** on graduation. Much of the current literature has focused on how needs-based financial aid affects enrolment decisions. Smith (2012) found no effect of needs-based aid on graduation. The National Student Financial Aid Scheme (NSFAS) - which provided funding for 659 000 South African students between 1999 and 2009 to the tune of R12 billion - stated that of the 67% of NSFAS students no longer studying, 28% had graduated while 72% had not completed their degree (DHET, 2010).

Visser and Hanslo (2006) looked at a sample of undergraduates who attended UCT between 1995 and 2002. Pupils from disadvantaged **schools** were significantly more likely to be excluded from UCT than those from advantaged schools. Somewhat surprisingly, Smith (2012) showed that mainstream Engineering students at UCT from former Department of Education and Training schools[1] were 12% more likely to graduate than mainstream Engineering students who had either attended a former Model C or private school, controlling for other factors.

Smith (2012) found that **Western Cape** students at UCT were 3% and 6% more likely to graduate in the mainstream Commerce and Science faculties than students from other provinces, respectively. Smith (2012) speculated that students who reside in the Western Cape can adapt more easily to student life since they are more likely to have strong social support structures (e.g. friends and family) nearby.

Turning our attention to **residences**, Pascarella and Terenzini (2005, p.421) declared, after reviewing fifteen studies, that there was 'remarkably consistent evidence that students living on campus are more likely to persist and graduate than students who commute.' Snyder (2009) observed no relationship between residency and academic performance. A South African, preliminary study conducted by the Department of Higher Education and Training (2011) concluded

[1]These types of schools were exclusively for black students, according to apartheid legislation.

that although residence students passed more courses in first-year, this superior academic performance did not carry through to graduation, where there was no consistent pattern.

3 Research Methodology

3.1 Survival Analysis

Survival analysis - which is also known in various fields as reliability, duration or event history analysis - is a term given to a collection of statistical methods which focus on the occurrence and duration to events (Allison, 2010). Although survival analysis was originally developed by bio-statisticians to model the time until the death of a person (hence the name), it is now widely used in sociology, economics, political science, engineering and finance.

The first step in survival analysis is to define the events of interest (Allison, 2010). While many applications of survival analysis assume that an individual is at risk of experiencing one event, competing risks models have been developed to account for situations where this is not the case (Allison, 2010). In the context of this paper, a student is at risk of experiencing the following:

1. Graduating within the faculty in which the student initially registered.
2. Being academically excluded from the faculty in which the student initially registered.
3. Transferring from one faculty to another.
4. Leaving in good academic standing
5. Other (death, leave of absence)

There were 799 (6.0% of total) transfer students and 471 (3.6% of total) students who left in good academic standing. The focus of this paper will be on the first two events.

An event is the transition from one state to another (Allison, 2010). At the outset, all individuals are in the same state - currently studying - since no-one has experienced the events of interest - graduating or academic exclusion from university. At the end of each academic year, the student is at risk of being academically excluded. At the end of three or four or more years, they are also subject to the risk of graduating.

Another important feature of survival analysis data is that of censoring. Some individuals in a study will not experience the events of interest and therefore the data on these individuals is incomplete (Allison, 2010). These individuals will experience the event, but at a later date than

the end of the study, or they may never experience the event. For example, some students will not have graduated by the end date of this study, but will graduate at some time in the future. Likewise, some students will never graduate, although they are still at university at the end of the study period.

Scott and Kennedy (2005) developed a discrete time competing risks model. In this model, the risk of experiencing the events of interest (i.e. academic exclusion or graduation) are modeled simultaneously and the probability of experiencing an event is conditional on not having experienced another event of interest. This is the model used in this paper.

3.2 Data

All the data for this study were obtained from UCT's Institutional Planning Department, with the exception of the Residence data, which were acquired from UCT's Student Housing and Residence Life Department. The data were anonymised so that no individual could be identified and comprised of students who were initially registered for undergraduate degrees in the Commerce, EBE and Science faculties between 2006 and 2013. The final sample was composed of 11 959 students.

Only full-time students who wrote the final South African school-leaving examination and lived in South Africa were included in the final analysis. This was motivated for two reasons. Firstly, foreign students are not subsidised by the South African government, and therefore withdrawing from university before graduating does not represent a 'cost' to South African society. Secondly, comparing marks across different types of school-leaving examinations is challenging and a common school-leaving examination allows us to be more confident in interpreting our results.

The dependent variable is time to an event. The events are (1) academic exclusion or (2) graduation in the faculty in which the student was originally registered. Students who experienced other events (e.g. transferring to another faculty or withdrawing from university in good academic standing) were excluded from the sample. Duration to an event only includes the years in which the student was registered at UCT. Students who met the conditions of the degree but had an outstanding fee account (and thus could not graduate for financial reasons), were treated as though they graduated. A summary of the independent variables used in this analysis is presented in Table 1, and some are discussed in more detail below.

TABLE 1: Description of Independent Variables

Independent Variable	**Code**	**Units**
Female	Female	Binary Variable: 1 = Female, 0 = Male
Age	Age	Continuous
Race	Coloured, Indian/Asian, White, Black	Categorical
Financial Aid	Financial Aid	Binary Variable: 1 = eligible for financial aid, 0 otherwise
Academic Development	Academic Development	Binary Variable: 1 = AD programme, 0 otherwise
English Home Language	English Home Language	Binary Variable: 1 = if declared Home Language is English (or English and another language) and student wrote English on the Home Language level, 0 otherwise
School Quintile	Quintile	Categorical (1 = worst, 5 = best), 6 = independent
Western Cape	Western Cape	Binary Variable: 1 = resides in Western Cape, 0 otherwise
Adjusted Grade 12 GPA (%)	Grade 12 GPA	Continuous (out of 400)
Grade 12 Mathematics Mark (%)	Mathematics Mark	Continuous (out of 100)
Grade 12 English Mark (%)	English Mark	Continuous (out of 100)
Grade 12 Physical Science	Science	Binary Variable: 1 = took Physical Science, 0 otherwise
University Residence	Residence	Binary Variable: 1 = in residence, 0 otherwise

The Adjusted Grade 12 GPA is an average of the top four subjects, excluding English, Mathematics[2] and Life Orientation. For students entering UCT under the Senior Certificate system, only the symbols ('A', 'B' etc.) for individual subjects were available. Subjects were taken on either Higher Grade or Standard Grade. Percentages were assigned according to Table 2. Standard Grade and English 2nd language Higher Grade were assigned 75% of the grade of Higher Grade symbols because under the Senior Certificate system, these subjects were marked out of 300, while Higher Grade subjects were marked out of 400.

[2]Mathematics marks refer only to the marks obtained in the mathematical exam written by all candidates. Additional Mathematics and Mathematics Paper 3 marks were excluded from the analysis in this paper.

TABLE 2: Conversion of Symbols to Percentages

Symbol	**Higher Grade (%)**	**Standard Grade (%)**
A	85	64
B	75	56
C	65	49
D	55	41
E	45	34
F	35	26

For students who wrote the National Senior Certificate (NSC), introduced in 2008, exact percentages were available, and all students around South Africa wrote the same paper. In the old system, students had to write a minimum of six subjects, while currently the minimum is seven subjects. However, since we excluded Life Orientation from our analysis, we are effectively looking at a minimum of six subjects for both types of students. If students were recorded as writing fewer than five subjects, they were excluded from the analysis. For students who were recorded as having written five subjects (including Mathematics and English), their top three subjects (excluding Mathematics and English) were taken as an average. For the small number of students who did Mathematical Literacy ($N = 7$), rather than Mathematics, we awarded them the the minimum Mathematics marks required to enter the programme for which they were initially registered. For example, a student who obtained 95% for Mathematical Literacy and registered for a BCom programme would have their Mathematics mark set to 60%.

Age refers to the age (in years) of an individual when they first registered at UCT and was rounded off to two decimal places, in order to account for the exact date they were born. Home language is self-reported. Students were categorised as having English as a home language if he/she reported English as a home language and wrote the English Home Language Grade 12 exam. If either of these requirements were not met, they would not be classified as having English as a home language.

Financial aid pertains to students who were eligible for *needs-based* financial aid and is used in this paper as a proxy for socio-economic disadvantage.

The school quintile variable indicates the resources of government schools. Quintile 1 schools are very poorly resourced, while quintile 5 schools are the best resourced. Independent schools are classified as a homogeneous group, despite wide variation in resources between these schools.

Regarding the Residence variable, this refers to students staying in a university residence only. For the years 2011 to 2013, information on the duration of stay in a residence was available. If students stayed less than 60% of the year in residence, then they were regarded as non-residence students. If they stayed more than 60% of the year in residence, they were regarded as residence students. Since such detailed data was not available for the years 2006 to 2010, all students were who were recorded as "residence students" were assumed to be in residence for more than 60% of the year.

3.3 Descriptive Statistics

Table 3 presents summary statistics of variables of interest for the entire sample. The number of students registered for courses in these three faculties has gradually increased. There was a large increase between 2008 and 2009, which might be the result of UCT's admission office misjudging the new NSC, where marks obtained in Grade 12 were higher than expected. There is no obvious explanation for the even larger increase between 2011 and 2012.

Gender parity is gradually being achieved, with the male share decreasing by approximately 7 percentage points. The racial make-up of UCT has also changed, with an increasing proportion of black students and a decreasing proportion of white students. The proportion of coloured and Indian/Asian students has remained roughly constant.

The percentage of students on needs-based financial aid has increased between 2006 and 2009 but has decreased substantially subsequently. The percentage of students on AD programmes has averaged between 20% and 25% over the period. More than 80% of new entrants come from quintile 5 or independent schools; this percentage has not changed much over the study period.

Table 3: Summary Statistics

	Incoming Cohort							
	2006	2007	2008	2009	2010	2011	2012	2013
Students Registered	1340	1411	1550	1706	1368	1336	1622	1626
Gender (%)								
Male	62.3	65.1	58.0	56.9	56.0	56.1	58.0	55.4
Female	37.7	34.9	42.0	43.1	44.0	43.9	42.0	44.6
Race (%)								
White	44.0	43.5	40.7	35.7	40.1	40.0	38.9	38.0
Black	30.0	32.9	35.4	37.6	35.5	34.1	38.1	34.7
Coloured	15.6	13.2	13.3	13.3	11.3	12.2	12.1	14.0
Indian/Asian	10.5	10.4	10.7	13.4	13.2	13.7	11.0	13.3
Financial Aid (%)	18.6	21.8	25.6	29.2	24.1	21.3	18.4	14.5
AD Programme (%)	23.7	20.6	18.9	21.6	22.2	27.2	24.2	23.4
English Home Language (%)	69.4	67.7	64.7	63.3	66.1	61.3	63.4	65.6
School Quintile (%)								
1	1.9	1.7	1.6	1.4	1.6	1.3	1.2	1.2
2	2.8	2.8	2.9	3.3	3.2	2.4	3.1	2.6
3	8.4	6.8	8.9	8.6	9.1	10.4	8.7	6.6
4	3.9	4.3	6.1	7.2	5.5	6.4	4.3	4.7
5	46.7	47.8	44.4	45.3	43.4	43.9	42.0	44.0
Independent	36.4	36.6	36.1	34.2	37.1	35.6	40.7	40.8
Western Cape (%)	50.0	44.7	42.3	41.2	38.5	39.6	38.4	38.1
Initial Registration (%)								
Commerce	56.1	54.9	53.1	45.5	52.9	57.0	56.4	60.3
EBE	21.1	25.8	22.1	29.5	25.8	25.9	23.8	22.8
Science	22.8	19.4	24.8	25.0	21.3	17.1	19.7	16.9

TABLE 4: Summary Statistics: Academic

	Incoming Cohort							
	2006	2007	2008	2009	2010	2011	2012	2013
Students Registered	1340	1411	1550	1706	1368	1336	1622	1626
Average Adjusted Grade 12 GPA (%)	75.7	75.8	75.4	76.0	77.7	79.7	80.3	81.1
Average Mathematics Mark (%)	74.5	75.1	74.1	83.5	85.4	85.0	81.7	82.1
Average English Mark (%)	73.9	74.1	74.1	73.2	76.2	74.9	75.6	76.2
Proportion Science (%)	85.8	90.8	88.9	87.0	86.5	84.5	84.3	82.7

Table 4 considers the academic characteristics of the different cohorts. Both the Adjusted Grade 12 GPA and English mark have gradually increased over time. In contrast, there was a clear 'break' in Mathematics, with the average Mathematics mark increasing by over 9 percentage points in 2009 compared to 2008. Clearly, the new Mathematics curriculum is easier than the old one, and this has potentially allowed weaker students to be admitted to programmes with high mathematical requirements.

Table 5 shows whether students experienced an event (graduation or academic exclusion) or not (censored) for each faculty. Looking firstly at the Commerce faculty, there is a higher proportion of women (50.7%) graduating than men (49.6%). Furthermore, a smaller proportion of women (6.2%) are academically excluded than men (8.7%). In the EBE faculty, on the other hand, a smaller proportion of women (33.8%) graduate than men (36.4%). However, slightly fewer women are academically excluded (20.6%) than men (21.9%). The Science faculty shows the biggest gap between men and women, with 5.3% more women graduating than men (49.3% to 44.0%) and 11.0% fewer women being academically excluded (20.2% to 31.2%).

The graduation rate in the Commerce Faculty is higher than the average of the three faculties for all races, and academic exclusion rates are below average. With regards to the EBE faculty, the graduation rates are lower and the academic exclusion rates higher than the average of the three faculties. In the Science faculty, the proportion of black students (44.5%) excluded is nine times that of white students (5.1%) - the highest of any faculty. Furthermore the academic exclusion rates for black (44.5%), coloured (30.6%) and Indian/Asian (29.1%) are the highest for any faculty.

In the Commerce faculty, the mainstream and AD academic exclusion rates are 5.7% and 13.7%, respectively, compared to the overall rates of 10.8% and 28.7%, respectively. Thus, the academic exclusion rate for mainstream and AD Commerce students is half that of the overall sample.

In contrast, 41.4% of AD students had been academically excluded in the EBE faculty. In the Science faculty, 51.8% of AD students were excluded - almost double the overall sample figure.

While the 2009 cohort (i.e. students that typically completed Grade 12 in 2008) performed poorly as a whole, this is not true for the 2009 Commerce Faculty cohort. Nearly 81% of the Commerce 2009 cohort have graduated (overall figure: 64.9%). Furthermore, the Commerce 2009 cohort academic exclusion rate of 9.7% is far below that of the overall 2009 cohort academic exclusion rate of 24.9%. In contrast, only 51.2% of the 2009 EBE cohort had graduated, and 32.3% had been academically excluded. The latter figure is the highest of any other cohort, and suggests many students in that cohort were unprepared for the academic intensity of the various EBE programmes. The poor performance of the 2009 cohort is also seen in the Science faculty, with only 51.9% having graduated by the end of 2013, and 43.9% having been academically excluded. In comparison, 69.8% of the 2010 Science cohort has already graduated, with 21.0% having been academically excluded.

TABLE 5: Descriptive Statistics (%): Commerce, EBE and Science faculties. Key: **C**: Commerce, **EBE**: Engineering and the Built Environment, **S**: Science, **T**: Total

Variable	**Graduation**				**Academic Exclusion**				**Censored**			
	C	**EBE**	**S**	**T**	**C**	**EBE**	**S**	**T**	**C**	**EBE**	**S**	**T**
Total	50.1	35.8	46.4	45.8	7.5	21.6	26.1	14.9	42.4	42.7	27.5	39.3
Gender												
Male	49.6	36.4	44.0	44.3	8.7	21.9	31.2	17.3	41.7	41.7	24.9	38.5
Female	50.7	33.8	49.3	48.0	6.2	20.6	20.2	11.5	43.1	45.7	30.5	40.5
Race												
White	59.8	50.8	64.5	58.7	3.0	7.8	5.1	4.6	37.2	41.3	30.4	36.7
Black	38.7	22.2	31.0	32.5	13.1	34.9	44.5	26.3	48.2	43.0	24.5	41.2
Coloured	49.8	36.4	40.2	44.5	7.4	21.9	30.6	16.1	42.8	41.6	29.2	39.5
Indian/Asian	48.9	32.7	46.2	44.6	7.9	20.5	29.1	13.3	43.3	46.9	24.7	42.1
Financial Aid												
Ineligible	52.1	38.0	53.2	48.7	5.5	17.7	17.0	10.6	42.4	44.3	29.8	40.7
Eligible	40.7	26.5	33.8	35.2	17.2	37.5	42.9	30.3	42.1	36.1	23.3	34.5
Programme												
Mainstream	55.4	40.5	54.3	51.3	5.7	17.3	16.4	10.8	38.9	42.3	29.3	37.9
Academic Dev.	32.5	14.1	25.3	27.1	13.7	41.4	51.8	28.7	53.8	44.5	22.8	44.2
English Home Language												
Yes	55.1	44.1	56.3	52.8	4.9	13.3	14.1	8.6	39.9	42.6	29.6	38.6
No	38.8	22.3	32.7	32.8	13.4	35.0	42.7	26.6	47.8	42.7	24.6	40.6
School Quintile												
1	34.6	14.1	34.0	26.1	30.8	49.3	45.3	42.6	34.6	36.6	20.8	31.3
2	30.2	25.6	28.8	28.1	16.0	36.4	50.9	35.1	53.8	38.0	20.3	36.8
3	32.0	21.7	30.0	27.7	17.5	41.9	45.8	35.3	50.5	36.5	24.2	37.0
4	37.7	17.7	30.0	29.5	17.7	38.0	46.7	32.0	44.5	44.3	23.3	38.5
5	52.0	41.0	51.4	49.2	6.9	16.2	20.7	12.0	41.1	42.9	27.9	38.9
Independent	52.5	40.7	54.3	50.4	5.3	13.9	14.8	8.6	42.2	45.5	31.0	41.0
Western Cape												
Yes	55.1	42.1	52.0	51.3	5.9	16.2	20.0	11.6	39.0	41.7	28.0	37.0
No	46.8	31.6	41.5	41.9	8.6	25.1	31.5	17.2	44.6	43.3	27.1	41.0
Year of First Registration												
2006	87.8	70.3	69.5	79.9	11.3	29.0	28.2	18.9	0.9	0.7	2.3	1.2
2007	88.2	68.7	68.5	79.4	10.1	30.0	30.8	19.2	1.7	1.4	0.7	1.4
2008	87.1	63.6	66.2	76.7	10.3	30.6	32.3	20.3	2.6	5.8	1.6	3.0
2009	80.9	51.2	51.9	64.9	9.7	32.3	43.9	24.9	9.4	16.5	4.2	10.2
2010	62.6	36.8	69.8	57.5	6.4	19.0	21.0	12.7	31.1	44.2	9.3	29.8
2011	15.8	0.0	37.3	15.3	7.2	18.2	23.4	12.8	77.0	81.8	39.8	71.9
2012	0.0	0.0	0.0	0.0	5.4	7.5	13.4	7.5	94.6	92.5	86.6	92.5
2013	0.0	0.0	0.0	0.0	1.7	4.9	5.1	3.0	98.3	95.1	94.9	97.0

4 Analytical Results

4.1 Survival Data Tables

An important benefit of survival analysis is that it looks at the behaviour of people over time. In the context of this paper, we can examine the flow of students through the system. The tables below describe the graduation and academic withdrawal behaviour of the overall sample and the separate faculties, with the Commerce faculty further divided into BCom and Business Science students.

TABLE 6: Presentation of survival data for the whole sample ($N = 11\,959$).

Legend: Y: Academic Year of Study; RS: Risk Set; G: Graduated; AE: Academically Excluded; C: Censored; HRG: Hazard Ratio – Graduates; HRAE: Hazard Ratio – Academically Excluded. 95% confidence intervals given in parentheses below the point estimates.

Y	**RS**	**G**	**AE**	**C**	**HRG** (%)	**HRAE** (%)
1	11 959	0	725	1619	0.0 (0.0 ; 0.0)	6.1 (5.6 ; 6.5)
2	9 615	0	474	1513	0.0 (0.0 ; 0.0)	4.9 (4.5 ; 5.4)
3	7 628	1271	335	966	16.7 (15.8 ; 17.5)	4.4 (3.9 ; 4.9)
4	5 056	2797	145	405	55.3 (54.0 ; 56.7)	2.9 (2.4 ; 3.3)
5	1 709	1144	77	170	66.9 (64.7 ; 69.2)	4.5 (3.5 ; 5.5)
6	318	236	15	24	74.2 (69.4 ; 79.0)	4.7 (2.4 ; 7.0)
7	43	27	7	5	62.8 (48.4 ; 77.2)	16.3 (5.2 ; 27.3)
8	4	3	0	1	75.0 (32.6 ; 117.4)	0.0 (0.0 ; 0.0)

Table 6 shows the flow the students through the system for the whole sample. The risk set is the number of students at risk of experiencing an event. If a student experiences an event

or is censored, then they are removed from the risk set. For instance, the risk set in year 2 (9615) is obtained by subtracting the number of students who were academically excluded (725) and censored (1619) from 11 959 (the risk set in year 1). The number of censored students is comprised of those students who are still studying - mainly 1st years from the 2013 cohort, 2nd years from the 2012 cohort and 3rd years from the 2011 cohort.

The hazard ratio for a particular event is calculated by dividing the number of students who experienced that event in a particular year by that year's risk set. For example, in Year 1, 11 959 students were at risk, and 725 of them were academically excluded. Dividing 725 by 11959 gives an exclusion rate of 6.1%. Excluding years 7 and 8 from the discussion, which have small sample sizes and should be treated with caution, the first-year has the highest academic exclusion rate. This rate gradually decreases until year 4 but increases significantly in year 5 and subsequently becomes unstable due to small sample sizes. Given that the minimum time to graduate is three years, the graduation hazard rate in the first two years is zero. The probability of graduating steadily increases from years three to six. The longer a student spends at university, the more likely they are to experience either of the two events of interest.

Table 7 provides the graduation and academic exclusion hazards ratios for all three faculties. In the case of the Commerce faculty, it is further subdivided into the BCom and Business Science (BBusSci) programmes.

Looking at the Commerce Faculty, it is noticeable that with the exception of fourth-year, the academic exclusion rate increases after first-year. This suggests that students who should have been excluded earlier, are kept in the system, struggle for another year or two and are then excluded. This represents an unnecessary waste of resources. This increase in the academic exclusion rate over time prompted a division of the Commerce Faculty into B.Com and Business Science students. While the Business Science academic exclusion rate is fairly constant, the B.Com exclusion rate increases from between 1.7% to 4.3% in the first four years to 10.7% in fifth-year, and remains at 10% in sixth-year. An interpretation is that readmission committees are too lenient in letting students back into the BCom programme in the first few years, only to exclude a sizable proportion of them in subsequent years.

In contrast to the Commerce faculty, the EBE faculty has a high academic exclusion rate in first-year (10.3%) which gradually reduces over time. This method of excluding students is more efficient than in the Commerce faculty. Despite the relatively low academic exclusion rates in fourth, fifth and sixth-year, the probability of graduating with an engineering degree is on average, below that of B.Com and Business Science students.

The last column reveals that, of the three faculties considered, the Science faculty has the highest first-year academic exclusion rate (12.9%) . The exclusion rate remains high in subsequent years.

TABLE 7: Presentation of survival data for the Commerce, EBE and Science faculties ($N = 11\,959$).

95% confidence intervals given in parentheses below the point estimates.

Year	**Hazard Ratio — Graduation**					**Hazard Ratio — Academically Excluded**				
	Commerce $N = 6508$	BCom $N = 2560$	BBusSci $N = 3948$	EBE $N = 2949$	Science $N = 2502$	Commerce	BCom	BBusSci	EBE	Science
1	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	1.5 (1.2 ; 1.8)	1.7 (1.2 ; 2.2)	1.4 (1.0 ; 1.7)	10.3 (9.2 ; 11.4)	12.9 (11.6 ; 14.2)
2	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	3.0 (2.6 ; 3.5)	3.8 (3.0 ; 4.7)	2.5 (2.0 ; 3.0)	7.3 (6.2 ; 8.4)	7.5 (6.3 ; 8.7)
3	14.3 (13.2 ; 15.3)	35.1 (32.8 ; 37.4)	1.6 (1.2 ; 2.1)	0.0 (1.2 ; 1.8)	43.5 (41.0 ; 46.1)	2.9 (2.3 ; 3.4)	4.3 (3.3 ; 5.3)	2.0 (1.5 ; 2.5)	5.2 (4.1 ; 6.2)	8.0 (6.6 ; 9.4)
4	61.0 (59.3 ; 62.7)	55.2 (51.7 ; 58.7)	63.0 (61.0 ; 65.0)	42.9 (40.3 ; 45.5)	55.4 (51.5 ; 59.3)	1.7 (1.3 ; 2.2)	2.9 (1.8 ; 4.1)	1.3 (0.9 ; 1.8)	3.2 (2.3 ; 4.2)	7.5 (5.4 ; 9.6)
5	72.5 (69.6 ; 75.4)	63.6 (57.7 ; 69.6)	76.0 (72.7 ; 79.2)	57.2 (53.2 ; 61.2)	70.4 (64.2 ; 76.6)	4.4 (3.1 ; 5.7)	10.7 (6.9 ; 14.5)	2.0 (0.9 ; 3.0)	3.4 (1.9 ; 4.8)	8.3 (4.5 ; 12.0)
6	79.9 (73.2 ; 86.5)	73.5 (61.1 ; 85.5)	83.3 (75.6 ; 91.0)	68.0 (60.5 ; 75.5)	79.3 (64.6 ; 94.0)	5.0 (1.4 ; 8.7)	10.2 (1.7 ; 18.7)	2.2 (−0.8 ; 5.3)	3.3 (0.5 ; 6.2)	10.3 (−0.7 ; 24.7)
7	75.0 (53.8 ; 96.2)	71.4 (38.0 ; 104.9)	77.8 (50.6 ; 104.9)	56.0 (36.5 ; 75.5)	50.0 (−19.3 ; 119.3)	18.8 (−0.4 ; 37.9)	14.3 (−11.6 ; 40.2)	22.2 (−4.9 ; 49.4)	12.0 (−0.7 ; 24.7)	50.0 (−19.3 ; 119.3)
8	100.0 (100.0 ; 100.0)	100.0 (100.0 ; 100.0)	0.0 (50.6 ; 104.9)	66.7 (13.3 ; 120.0)	0.0 (1.2 ; 1.8)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)	0.0 (0.0 ; 0.0)

4.2 Regression Results

Table 8 presents the results of various multinomial logistic regressions. For ease of interpretation, the coefficients are the odds of the event occurring. As the dependent variable has multiple categories, a base category needed to be chosen. Academic exclusion was chosen the base category; the odds ratio is interpreted as the risk of graduating relative to the risk of being academically excluded. An odds ratio of 1 indicates that, for the variable to which it applies, the likelihood of graduation relative to the likelihood of academic exclusion is the same as that of the base category. An odds ratio of less (more) than 1 indicates that, for variable to which it applies, the likelihood of graduation relative to the likelihood of academic exclusion is less (more) than that of the base category.

With the exception of the EBE faculty, the odds ratio on the female variable is significant and suggests that females are between 1.62 and 1.95 more likely to graduate than to be academically excluded compared to males. The lack of significance on the Female variable in the EBE faculty is most likely caused by the small proportion of females in that faculty (24.2%). Looking at the other sub-samples, the superior performance of females is greatest in the Science faculty (1.79), while it is smallest in the Business Science (1.63) and BCom (1.62) programmes. Smith (2012) found superior academic performance of female students in the EBE and Science faculties and speculated that this might be due to self-selection.

The age variable is insignificant with the exception of the Business Science and BCom regressions, and the significant results suggest differing interpretations with regards to the effects of age. On the one hand, older students who take Business Science degree are less likely to graduate than be academically excluded. On the other hand, older students are more likely to graduate than be academically excluded in the BCom programmes.

Examining the race variable, it is clear that coloured students do not differ significantly from black students. Contrary to received wisdom, Indian/Asian students seem to perform substantially worse at university than black students, if all other quantifiable factors are controlled for. The odds ratios for whites ranges from 2.68 to 12.55 and are statistically significant. In other words, white students are between 2.7 and 12.5 times more likely to graduate than be academically excluded compared to black students, holding all other factors constant.

Students eligible for financial aid are significantly more likely to be academically excluded than those who do not require financial support. Eligibility for financial aid is a proxy for socio-economic disadvantage. The smallest difference between students who are eligible for financial and those who are not occurs in the EBE faculty (0.75) while the biggest difference occurs in the Business Science (0.42) and BCom programs (0.40). This result should not be misconstrued. We are not making a judgement on financial aid per se, but we indicate that students who come

TABLE 8: Regression Results

Variable	**Base**	**All**	**Commerce**	**B.Bus.Sci**	**BCom**	**EBE**	**Science**
Female	Male	1.953‡	1.711‡	1.626‡	1.617‡	1.005	1.793‡
		(0.137)	(0.194)	(0.269)	(0.269)	(0.162)	(0.253)
Age		1.010	0.920	0.761‡	1.288†	1.066	1.072
		(0.039)	(0.065)	(0.071)	(0.160)	(0.080)	(0.075)
Coloured	Black	1.099	1.122	1.482	0.774	1.048	1.276
		(0.186)	(0.327)	(0.600)	(0.340)	(0.354)	(0.461)
Indian/Asian	Black	0.670†	0.488†	1.021	0.337‡	0.565*	0.947
		(0.114)	(0.137)	(0.443)	(0.137)	(0.187)	(0.384)
White	Black	5.123‡	2.953‡	3.510‡	2.679†	4.748‡	12.548‡
		(0.841)	(0.817)	(1.361)	(1.112)	(1.465)	(4.620)
Financial Aid		0.678‡	0.397‡	0.420‡	0.400‡	0.754*	0.706†
		(0.056)	(0.054)	(0.077)	(0.081)	(0.129)	(0.118)
Academic		0.911	0.930	1.116	0.783	0.897	0.574‡
Development		(0.083)	(0.132)	(0.211)	(0.175)	(0.184)	(0.124)
English Home		1.401†	1.716‡	1.472	2.265‡	1.739*	1.293
Language		(0.208)	(0.433)	(0.512)	(0.864)	(0.493)	(0.418)
School Quintile 1	Quintile 3	1.016	1.051	1.250	0.516	0.794	1.469
		(0.244)	(0.456)	(0.610)	(0.783)	(0.375)	(0.627)
School Quintile 2	Quintile 3	1.291	1.161	0.966	1.653	1.846*	0.968
		(0.242)	(0.449)	(0.455)	(1.175)	(0.634)	(0.307)
School Quintile 4	Quintile 3	0.920	0.771	0.818	0.559	0.827	0.744
		(0.140)	(0.211)	(0.276)	(0.287)	(0.252)	(0.206)
School Quintile 5	Quintile 3	1.760‡	1.351	1.412	1.616	1.845†	1.527*
		(0.218)	(0.301)	(0.390)	(0.687)	(0.465)	(0.362)
Independent	Quintile 3	1.663‡	1.203	1.312	1.626	1.789†	1.335
		(0.219)	(0.284)	(0.399)	(0.708)	(0.472)	(0.338)
Western Cape		1.145	1.275*	1.144	1.661†	1.073	0.950
		(0.099)	(0.183)	(0.235)	(0.358)	(0.192)	(0.167)
Grade 12 GPA		1.119‡	1.119‡	1.156‡	1.111‡	1.148‡	1.134‡
		(0.007)	(0.011)	(0.017)	(0.016)	(0.014)	(0.014)
Mathematics Mark		1.007†	1.012†	1.005	1.048‡	1.054‡	1.022‡
		(0.003)	(0.006)	(0.008)	(0.009)	(0.008)	(0.006)
English Mark		1.013‡	1.012	1.006	1.038‡	1.007	1.003
		(0.004)	(0.008)	(0.011)	(0.012)	(0.009)	(0.008)
Science		−−−	1.053	1.352*	1.239	−−−	1.252
			(0.136)	(0.233)	(0.255)		(0.557)
Residence		1.117	1.401†	1.240	1.061	1.019	0.937
		(0.102)	(0.209)	(0.259)	(0.238)	(0.195)	(0.169)
Controls for Time		Yes	Yes	Yes	Yes	Yes	Yes
Observations		36 333	20 409	7 408	13 001	9 169	6 755
Pseudo R^2		0.397	0.451	0.420	0.574	0.419	0.431

Standard errors in parentheses

* $p < 0.05$, † $p < 0.01$, ‡ $p < 0.001$

from poor socio-economic backgrounds are more likely to be excluded from UCT than those from more affluent backgrounds.

The finding that the AD programme is generally insignificant in explaining graduation behaviour is consistent with the results of Smith (2012). This is disconcerting because it suggests that holding all other factors constant, the AD programmes have been unable to improve the graduation rates among students on these programmes. It is especially disconcerting in the Science faculty where the odds ratio is less than one and statistically significant. This suggests that the AD programme has not only been not beneficial, it is associated with a reduced probability of graduation relative to academic exclusion.

Students who have English as their home language are between 1.29 to 2.27 times more likely to graduate than be academically excluded compared to those who do not have English as their home language. As UCT's medium of instruction is English, this is an expected result.

Quintile 3 was the base category for schools, as quintiles 1, 2 and 4 had too few observations to be a meaningful base case category. The impact of having attended quintile 1-4 schools do not differ significantly from each other. On the other hand, students who attended quintile 5 and independent schools are significantly more likely to graduate than those in less well resourced schools. At the faculty level, this is also true of the EBE and Science Faculties, but not the Commerce Faculty.

Students who reside in the Western Cape and study for a BCom degree are 1.6 times more likely to graduate than be academically excluded compared to BCom students who live in another province. In general though, living in the Western Cape does not affect student performance.

Grade 12 GPA has a large influence on whether students complete their studies. A 1% increase in Grade 12 GPA increases the probability of students graduating (relative to academic exclusion) by between 1.10 to 1.15 times. This result confirms the importance of Grade 12 marks in predicting university success. Grade 12 mathematics marks has a modest effect on the performance of students, with a 1% increase in Grade 12 mathematics marks increasing the probability of graduating relative to academic exclusion by between 1.01 and 1.05 times. The odds ratio on BCom students (1.05) is larger than that of Science students (1.02), which is surprising, given that many Science programmes require a greater understanding of mathematical concepts than Commerce programmes.

5 Conclusion

The National Development Plan - which is endorsed by the government - sets a target of producing 425 000 graduates per year by 2030, with an emphasis on increasing the number of graduates from the science, technology, engineering and mathematical fields (National Planning Commission, 2011). This target is a considerable increase over the current number of 168 000 graduates produced per year (National Planning Commission, 2011). An important factor in determining whether this goal will be achieved is the graduation rate, which is low at 52% (Ndebele et al., 2013).

The first aim of this paper was to provide some descriptive statistics of academic exclusion and graduation rates in three faculties where proficiency in mathematics is important. The sample consisted of South African students in the Commerce, EBE and Science faculties who registered as first-year students at UCT between 2006 and 2013. We found that there are large differences in academic exclusion rates between the different faculties. Academic exclusion rates in the EBE and Science faculties are high in the first two years, but are either reduced or remain stable in subsequent years. In contrast, the Commerce faculty - and more specifically the BCom programme - has low academic exclusion in first two years, but this rises sharply in the third and subsequent years.

The second aim of this paper was to examine some of the determinants of graduation and exclusion at UCT using a survival analysis approach. Firstly, there is a substantial gender disparity, with females more likely to graduate than be academically excluded in the Commerce and Science faculties, than males. There is not much evidence to suggest that age is a significant factor in shaping university success. There are significant racial differences, with whites more likely to graduate than be academically excluded compared to the other race groups, holding all other factors constant.

Financial aid students - who are also likely to be the least prepared for university and face large socio-economic disadvantages - are more likely to experience academic exclusion than graduation. Being proficient in English is advantageous, while attending a quintile 5 or independent school has a modest, positive impact on succeeding at university even after controlling for other measures of school quality typically associated with wealthy schools (such as Grade 12 GPA). Students who have good Grade 12 GPAs are far more likely to graduate. Mathematics and English marks at school have a positive influence on graduation. In general, having done Science at school and living in residence has little effect on the chances of students graduating after controlling for other factors.

5.1 Limitations

This study has some limitations. Firstly, only variables which could objectively and/or quantitatively be measured were included in the analysis. Motivation, interest in the degree, self-confidence and sociability also affect the probability of students graduating, although such variables are difficult to measure and may vary over time. Secondly, the duration variable was measured in years, even though a university year is split into two semesters. As a result, we do not know the true length of time that a student was enrolled at university, as some students graduate in June. In cases like these, the length of time to graduation and for which we had data, is biased upwards. Lastly, the sample only consisted of UCT students and may thus not apply to other South African universities. As such, the results are not generalisable.

5.2 Policy Implications

Despite significant flaws in the secondary school system, the Grade 12 GPA and mathematics mark achieved in school-leaving examinations are significant determinants of graduation success. As Spaull (2011) noted, school marks are strongly correlated with the type of school attended. It is the challenge to policymakers to emulate the excellent schools (i.e. Quintile 5 and independent schools) in order to give students from poorer backgrounds a greater chance of being accepted at universities and graduating.

The lack of significance of the AD programme variable, and the positive correlation between students who are eligible for financial aid and academic exclusion should not be interpreted as evidence to remove the AD programmes or to not finance poor students. Smith (2012) correctly points out that in order for South Africa to grow economically, many more future graduates must be drawn from socially and educationally disadvantaged backgrounds, as they comprise the majority of the population. In this study, 916 students eligible for financial aid and 734 AD students graduated, with 348 of those students being both on the AD programme and eligible for financial aid. These are not insignificant figures, which suggests that academic and financial support programmes can be used to overcome socio-economic disadvantages faced by some students. However, this is not to say AD programmes cannot be improved: Smith (2012) suggests that AD courses could either be extended into second and third year or mainstream courses should be adapted to meet the 'epistemological, educational and psychological needs of the majority of South Africa's students' (Smith, 2012, p. 225). This study supports these sentiments.

5.3 Recommendations for Further Research

Further research in this field could involve conducting qualitative studies of a sample of students and following them until they graduate, are academically excluded or leave university for some other reason. The questionnaire would involve asking students about their emotional well-being, their friendships, whether they have had health issues, their enjoyment of a course, etc. The survey would be conducted on a regular basis, and provide additional insight as to why some students succeed at university and others do not.

The research could also be enhanced by the inclusion of more 'background' variables such as parents' and grandparents' educational attainment. Currently, this a voluntary question on UCT's application form, but will become compulsory in 2016 in line with UCT's revised admissions policy, which aims to move away from race as a proxy for socio-economic disadvantage. It will be useful to see how the inclusion of such variables influences the overall results.

A further avenue of research could look at the impact of Readmission Appeal Committee (RAC) decisions. In particular, a study could focus on what happens to students who are re-admitted to UCT through the RAC. The key question would be whether re-admitted students eventually graduate, or whether their re-admittance delays the time until they are academically excluded from university. A related question, based on the evidence presented in this paper, is whether RACs, especially in the Commerce Faculty, should adopt a more rigorous position when deciding who to re-admit. A further question relating to RACs is determining whether there are some crucial first-year and second-year courses that are highly predictive of whether a student graduates or not.

The results of the National Benchmarking Tests (NBTs) are increasingly being used by South African universities (in conjunction with high school leaving examination results) to determine whether a student is admitted to university. The need for NBTs arose due to concerns about whether NSC results were a good indicator of a student's ability (Rankin et al., 2012). Initially, the NBTs were voluntary. However, they are now explicitly included in the Commerce, EBE and Science faculties' admission criteria and are compulsory for students who are writing the NSC (Commerce Faculty, 2014; EBE Faculty, 2014; Science Faculty, 2014). It would be useful to know whether the increasing importance given to NBT results are justified in terms of a superior ability to predict whether a student will graduate or not, relative to Grade 12 marks.

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southern africa labour and development research unit

The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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