THE RELATIONSHIP BETWEEN FINANCIAL AID AND ON-TIME DEGREE COMPLETION FOR ACCOUNTING STUDENTS AT A SOUTH AFRICAN UNIVERSITY

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RSXLIL001

Research dissertation presented for the University of Cape Town Senate's approval in part fulfilment of the requirements for the degree of Master of Commerce (Specialising in Financial Reporting, Analysis and Governance) in approved courses and a minor dissertation. The other part of the requirement for this qualification was the completion of a programme of courses.

I now declare that I have read and understood the regulations governing the submission of Master of Commerce dissertations, including those relating to length and plagiarism, as contained in the University's rules and that this dissertation conforms to those regulations.

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(FEBRUARY 2022)

ACKNOWLEDGEMENTS

I wish to honour God, who gave me the strength to complete this ‘impossible endeavour." With men, *it is* impossible, but … with God, all things are possible" *Mark: 10:27.*

I owe my gratitude to the Faculty of Commerce members who have contributed to my completing this dissertation. I wish to acknowledge their encouragement and guidance. Specifically, to my supervisor, Associate Professor Riley Carpenter, thank you for your patience and support over the three years. I am also grateful to Professors Suki Goodman and Kanshukan Rajaratnam for their practical advice, support and continued interest throughout this dissertation.

I wish to express my gratitude to Jane Hendry from IPD at the University of Cape Town (UCT) for discussing my data needs, working through several requests and correctly matching the data. To the Statistical Consultancy Services at UCT, especially Anneli Hardy, thank you for your expertise and technical assistance in ensuring sound statistical analysis.

Most importantly, I wish to thank my family for their love and support, which helped me overcome setbacks and kept me moving forward. My thanks especially to Hendrik, my husband, for your unconditional love, patience, and encouragement throughout this process.

ABSTRACT

Financial aid contributes significantly to higher education participation in South Africa. However, while research focused on how financial aid improved access to University, little is known about its effect on ‘on-time’ degree completion. Therefore, this research aimed to investigate to what extent financial aid affected the likelihood of on-time graduation as a function of selected student input and higher educational factors for students’ success in studying towards a Bachelor of Commerce (BCom) at the University of Cape Town (UCT).

To better understand the above factors, the researcher conducted a quantitative study applying Event History Analysis (EHA) and the Input-Environment-Output (I-E-O) model (Astin, 1993). A logistic regression within a discrete-time model with a person-period dataset was performed. Data from the 2013 to 2018 UCT student records formed the basis of this research with a sample size of N=842. Based on the literature review, the input variables were gender, race, age, school type, final grade 12 marks and students' performance in the National Benchmark Tests (NBT). The environmental variables were enrollment in the academic development and support programme ‘Step-Up’ and financial aid.

Contrary to expectation, the results for the environmental variables surprisingly revealed that receiving financial aid decreased the likelihood of on-time graduation. Receiving GAP Aid indicated no statistically significant association with on-time graduation. Furthermore, enrolment in Step Up significantly increased the likelihood of on-time graduation, all else being equal. The findings for the input variables indicated that females and younger students were more likely to graduate on time than males and older students. White students were more likely to graduate on time than Black, Coloured and Indian/Asian students, which shows that this issue remains a transformation issue for Higher Education Institutions (HEIs). Another unexpected result was that the type of school attended and participation in NSC English indicated no association with on-time graduation. Most notably, students with NSC Accounting had a more significantly positive likelihood of on-time graduation than students with NSC Mathematics only.

The research findings contribute value to the discussions on accounting education research and how to improve on-time degree completion. Secondly, the results could benefit policy decisions for student admission to the BCom programme. While the research results will reflect the nature of this specific university, the findings may also be valuable to other public HEIs with similar admission standards and student bodies.

Keywords: Accounting students, Financial Aid, GAP Aid, Student success, On-time graduation, On-time completion, I-E-O model, Event History Analysis (EHA)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abreviation	Explanation
ACT	American College Testing
ADU	Academic Development Unit
AL	Academic Literacy
BCom	Bachelor of Commerce
CETAP	Centre for Educational Testing for Access and Placement
CHE	Council for Higher Education
DHET	Department of Higher Education and Training
EHA	Event History Analysis
FTE	Full-Time Equivalent
GPA	Grade Point Average
HE	Higher Education
HEIs	Higher Education Institutions
HEMIS	Higher Education Management Information System
HESA	Higher Education South Africa
I-E-O	Input Environmental Output
MAT	Mathematics
NBT	National Benchmark Test
NSC	National Senior Certificate
NSFAS	The National Students Financial Aid Scheme
QL	Quantitative Literacy
SA	South Africa/African
SASSE	South African Survey of Students Engagement
SAT	Scholastic Assessment Test
SATAP	Standardised Assessment Test for Access and Placement
SFWS	Student Financial Wellness Survey (SFWS)
TALL	Test of Academic Literacy Levels
UCT	University of Cape Town
US UWC	United States University of the Western Cape

LIST OF DEFINITIONS

GAP Aid – financial assistance given to students who do not meet the National Student Financial Aid Scheme (NSFAS) eligibility criteria but require some financial assistance to fill the gap between what they can afford to pay for tuition and actual tuition cost.

Financial Aid – total bursary allocation from NSFAS

CHAPTER 1. INTRODUCTION

1. UNDERSTANDING STUDENTS ACADEMIC SUCCESS

Understanding students' success is complicated and indicates its multifaceted nature (Granito & Santana, 2016; Morris, 2016). It, thus, is crucial to define the term before assessing it. York et al. (2015) described academic success as "inclusive of academic achievement, attainment of learning objectives, acquisition of desired skills and competencies, satisfaction, persistence, and post-college performance". This practice ensures accurate outcome measurement and allows Higher Education Institutions (HEIs) to measure and understand factors that influence students' ability to succeed on time. De Valero (2001, p. 341) summarised the importance of understanding these factors:

> Given the high costs associated with graduate education, the current national climate of diminishing resources for higher education… understanding and examining the factors that affect students ability to complete their degree requirements in a timely manner and considering the implications of these factors become crucial.

2. THE CHALLENGES FACED BY HIGHER EDUCATION INSTITUTIONS IN SOUTH AFRICA

The South African Higher Education Sector (HESA) inherited low participation of Black[1] South African (SA) students when the country became a democracy in 1994 (Council on Higher Education (CHE), 2017). Since then, HEIs have strived to equalise students' access and refine the quality of academic success based on the change in students' social composition and demographic profile (Department of Higher Education and Training (DHET), 2015. Despite challenges, the HEIs saw exceptional growth in Black SA students' enrolments (CHE, 2016a. Regretfully, there was no paralleled increase in these Black students' success as measured by on-time graduation (CHE,

[1]During the apartheid era, the government introduced the racial classification and segregation of "African", "Coloured", "White" and Indian/Asian" for political, social and economic purposes (Christopher, 2002; Henrard, 2002). Presently, race is being used to provide historical context and comparisons to describe and measure the effects of present policies and practices on redressing the inequities of the past (DHET, 2014). DHET uses the composite term "Black" (2014; p6) to refer to the racial descriptors of "African", "Coloured", and "Indian/Asian" and uses these descriptors for planning, monitoring and funding purposes.

2016a. On-time graduation means that Full-Time Equivalent (FTE) students graduate in the designated “time-to-degree” for their programme – completing a three-year bachelor’s degree programme in three years and a four-year degree in four years. As mentioned above, Improving SA students’ success is still a significant challenge for HESA, particularly with increased enrolments (Badat, 2010; DHET, 2016b).

3. STATEMENT OF THE PROBLEM

Since the introduction of democracy in 1994, the HESAs have been tasked to equalise access to HEIs and refine the quality of academic success based on changes in students' social composition and demographics (DHET,2015. HEIs saw exceptional Black SA student enrollment growth despite the challenge(CHE, 2016a). However, there was no paralleled increase in these students’ success as measured by on-time graduation (DHET, 2016a, 2017). Improving thus the situation is still a significant challenge for HESAs because of consistent student enrollment figures (Badat, 2010; DHET, 2016b, 2017).

While the national undergraduate graduation rate is low, the University of Cape Town (UCT) reported improving this area for the 2012 cohort. In the 2016 Teaching and Learning Report (UCT, 2017), UCT informed DHET that it exceeded its 2011 targeted cohort completion rates for all undergraduate programmes. There was a potential graduation rate of 80% against its planned pace of 75%, with 72% graduating on time. UCT acknowledged that “the factors leading to the improvements were varied and required further investigation” (UCT, 2017, p 8). Close inspection of the demographics revealed that for students with low National Senior Certificate (NSC) and Academic and Quantitative Literacy scores, the performance gap between Black and White students was more significant in the first year. However, the same groups' success rates improved for the third and fourth-year levels. The institution voiced “the need for further investigation into the experiences of Black students and the range of obstacles that impede their capacity to thrive academically” (UCT, 2017, p 9).

The subsequent report to DHET (UCT, 2018a) indicated that 2017’s success rate for the overall undergraduate course dropped to 85%, from 87,8% in 2016 and 88,4% in 2015. The widening gap in success rates at the first-year level between White (at the upper extreme) and Black SA students (at the lower extreme) inevitably affected the

time to completion and graduation rate. The gap improved from 12 percent in 2013 to 11 percent in 2016 and 14 percent in 2017. UCT partially attributed this decline to the class disruptions and student protests in prior years.

3.1. The Primary Problem

Bhorat and Pillay (2017) investigated The National Students Financial Aid Scheme (NSFAS) beneficiaries' performance from 2000 to 2012 by demographics and subject pass rates. Using the subject pass rate as an indicator of performance, they found a positive relationship between the award size and the subject pass rate. This relationship suggests that higher National Student Financial Aid Scheme (NSFAS) awards might enable students to perform better at HEIs. However, the researchers did not compare the NSFAS data with Higher Education Management Information System (HEMIS) data to examine the dropout or graduation rates (Bhorat & Pillay, 2017). UCT offers a GAP funding programme to provide financial assistance to students not eligible for NSFAS funding but who require some contribution towards their tuition costs (UCT, 2022). In SA, research about financial aid's influence focuses on improving higher education (HE) access but not how it contributes to degree completion.

3.2. The Secondary Problem

The literature review further indicated a mixture of other factors that affected students' success, including race and gender (CHE, 2010; Manik, 2015); high school grade point average (GPA) (Lewin & Mawoyo, 2014; Murray & Oosthuizen, 2017); family income (Scott-Clayton, 2015); first-generation status (DHET, 2016b; Wohlgemuth et al., 2007); mathematics and science (Zewotir et al., 2011); academic preparation as measured by the National Benchmark Test (NBT) scores including proficiency scores for Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT) (van Rooy & Coetzee-Van Rooy, 2015); English proficiency (Dooley et al., 2012) and high school quality as classified by the school quintile (van Broekhuizen et al., 2016) on degree completion.

The vision for HESAs is to increase throughput, graduation and participation rates (CHE, 2013; DHET, 2013; Ministry of Education, 2001). Recent research implied that SA’s undergraduate students have high dropout and low graduation rates, and completion of degrees exceeds the prescribed time (CHE, 2016a; DHET, 2015; van

Broekhuizen et al., 2016). In SA, funding for HE is closely linked to students' access and success (CHE, 2016b; Lewin & Mawoyo, 2014). DHET (2017) noted a remarkable increase in students' access to HE and directed that HEIs should pay serious attention to improving students' success. Therefore, HEIs must gain insight into the factors that enhance or impede on-time graduation to provide the necessary support for academic success (CHE, 2016b; USAf, 2016).

4. THE MOTIVATION AND PURPOSE OF THE RESEARCH

HEIs have a dual objective insofar as they need to make higher education accessible to all eligible students and ensure that students graduate timeously. The centre of the students' protests was the fees must fall campaign, in which students advocated free tertiary education (Cloete, 2015). While this demand was indicative of financial distress that may have influenced students' success, it sparked the researcher's interest in investigating the relationship between financial aid and on-time degree completion.

While multiple factors affect students' success pathways, limited attention has been given to understanding the influence of financial support. The principal objective of this research study is to investigate whether there is a relationship between financial aid and on-time graduation for students studying towards a Bachelor of Commerce (BCom) degree, specialising in Financial Accounting: Chartered Accountant Stream, at UCT for the period 2013 to 2018. Hereafter, this specific course is referred to as BCom (CA).

Furthermore, because HESAs report on enrolments, dropout and throughput rates against the backdrop of past injustices, the secondary objective is to investigate whether there is a relationship between financial aid and on-time graduation for students aggregated by selected variables identified in the literature.

The purpose of the research is to add value to the discussions of accounting students' success factors, creating awareness and a better understanding of how financial aid or the lack thereof may aid or prevent timely graduation. While the research results will reflect the nature of UCT, the findings may also be valuable to other public HEIs with similar admission standards and student bodies.

5. RESEARCH QUESTIONS AND HYPOTHESES

The hypotheses and research questions were developed to investigate whether there is a relationship between financial aid and on-time graduation for students studying towards a BCom (CA) at UCT from 2013 to 2018, aggregated by selected input and environmental factors.

5.1. Hypotheses

H0: There would be no significant difference between students who received financial assistance and those who self-pay for on-time graduation.
Ha: There would be a significant difference between students who received financial assistance and those who self-pay for on-time graduation.

H0: There would be no significant difference between students who received financial assistance and those who self-pay in on-time graduation aggregated by selected input and environmental factors.
Ha: There would be a significant difference between students who received financial assistance and those who self-pay in on-time graduation aggregated by selected input and environmental factors.

5.2. Research Questions

To test the above hypotheses, the researcher examined the following questions:

1. To what extent does financial assistance affect students' on-time graduation?
2. To what extent do students' input and environmental factors affect students' on-time graduation?

These hypotheses and questions guided the literature review to highlight previous research on students' academic success and on-time completion.

CHAPTER 2. LITERATURE REVIEW

1. INTRODUCTION

HEIs over the past few decades revealed an increased focus on growing the rate at which students graduate from universities. With this emphasis, researchers investigating the factors facilitating or preventing students' on-time degree completion measured various student outcomes and selected academic success aspects (Carpenter & Kraus, 2020; Carpenter & Roos, 2021; Papageorgiou & Carpenter, 2019; Theune, 2015; Tinto, 1975; Zewotir et al., 2011). However, the cognitive and non-cognitive processes of learning and development are complex. Similarly, measuring academic success is often challenging because students' attitudes, strategies, skills, and behaviours cannot be measured through grading, scores and standardised testing (Carpenter & Shamsoodien, 2021; Fook & Sidhu, 2015).

Most commonly, researchers measured academic success in terms of student's educational achievements, such as those who achieved or exceeded a specified grade or GPA (Latino et al., 2017; Yue & Fu, 2017); credit accumulation (Denning, 2019; Donhardt, 2013), degree completion (Arendt, 2013; Murray, 2014; Runyan, 2011) and time to degree completion (Letkiewicz et al., 2014). Measuring student outcomes cannot fully reveal why some students succeed and others with similar characteristics drop out (Murray, 2014) or stop-out (interrupting students' enrolment) from HE (DesJardins & McCall, 2010). In attempts to develop a more holistic approach, research studies include not only students' outcomes in their models but also students' attributes at the time of enrolment and the educational environment, i.e. the student's social and academic integration into the educational environment and the relationship between financial aid from time of admission to time to degree completion.

2. THE INPUT–ENVIRONMENT–OUTPUT (I-E-O) ASSESSMENT MODEL

Student development literature examines how university influences psychological, affective and cognitive development, whereas university impact literature focuses on the behavioural outcomes (non-cognitive) that result from college attendance. Many researchers investigated the influence of the HE environment on students' outcomes but reflected different categories of conclusions that students might experience, including stop-out (DesJardins & McCall, 2010); dropout (Gury, 2011); persistence

(Flynn, 2014); and success (Schreiber & Yu, 2016). There are numerous theoretical models testing students' outcomes, including Astin's involvement model (Astin, 1999), Tinto's integration model (Tinto, 1975), Bean's attrition model (Bean, 1980), and the Briggs 3P model (Biggs, 1987). This research follows Astin's Input–Environment–Output (I-E-O) Assessment Model (Astin, 1993) as a theoretical framework.

Astin (1993), encouraged by the increasing demand for accountability in HEIs, proposed a HE assessment methodology to evaluate those factors that may lead to better educational outcomes. Astin illustrated that the I-E-O model is an assessment tool that models the relationship between the students' input characteristics, educational environment, and student outcomes. The model explains that student success is a college outcome comprised of students' qualities, knowledge, skills and behaviours at graduation (outputs). These outputs are influenced by the attributes the students bring to college (inputs), such as demographic characteristics, socioeconomic background, social and prior academic experiences, and the educational environment (environment) consisting of the student's experience (involvement and integration) of educational programmes and activities, different cultures, college staff and students.

Astin's (1993) I-E-O model covers some aspects of Tinto's integration, Bean's attrition and Biggs' 3P models. Tinto (1975, 1988) postulated that students at the point of enrolment bring a variety of pre-college attributes and academic experiences, e.g. gender, ethnicity, and social and academic abilities that influence the students' educational development. Given the background characteristics, Tinto (1975, 1988) further argues that the student's social and academic integration into HE most directly affects whether students decide to stay and complete their studies. However, his research mainly focussed on the students' dropout behaviour (Tinto, 1975, 1988) and sought to highlight the complexity of students' integration and its impact on students' dropout. Astin (1993) concurred with Tinto's inclusion of student background characteristics and declared that educational outcomes must continually be assessed regarding students' input qualities. The assessment of inputs only is futile if information about students' educational environment and experiences is not added. Astin (1993, p.19) postulated that:

> Even if we have a good longitudinal input and students output data, our understanding of the educational process will still be limited if we lack information

> on the college environment. Thus, it is one thin[g] to know that your college overproduces or underproduces…but quite another to understand why.

Bean's (1980) attrition model incorporates three broad categories to test their impact on student persistence: background characteristics, organisational determinants, and intervention variables. While this model includes structural and intervention factors which correlate with the educational environment factors, the model also had external influences such as family commitment and opportunity to transfer, which are not under the control of the HEIs. However, Bean argued that these factors collectively influence students' decisions to drop out or persist to degree completion. On the contrary, Astin's model is particularly interested in learning about the environmental factors and experiences that can be controlled or changed and using such findings as preventative measures to improve the educational environment for more favourable student outcomes in the future.

The Biggs' 3P model (Biggs, 1987) addresses three components of students' learning process and factors that could affect their outcomes. Biggs developed three stages: (1) presage – aspects before the students enter the learning situation such as prior knowledge, abilities, personality and home background, plus situational factors that are mostly institutionally related, such as subject area, teaching methods and course structure, (2) process – complex learning processes such as motivation, strategic learning approaches, and (3) product – students' performance such as GPA, self-concept and goal setting. Biggs (1987) argues that the presage factors influence a student's approach to learning, i.e. surface or deep learning, and affect students' motives and task completion effectiveness, impacting students' outcomes. The Biggs' 3P model is similar to the I-E-O model. The presage factors relate to the input factors, and the product refers to the students' outcomes. However, while the situational factors in Biggs' 3P model bear a resemblance to the educational environment within the I-E-O model, Biggs' process factors of motivation and approach to learning are a product of the students' input characteristics, which ultimately determine the course and quality of learning that may take place. Simultaneously, the Biggs' 3P(1987) model may explain how the students' assumptions, motives, intentions and prior knowledge impact students' outcomes; however, it is not controlled by HEIs.

Astin's (1993) I-E-O framework is best suited for this research study. The model was specially developed for HE and is well utilised in education research examining the

factors influencing students' outcomes (Al-Sheeb et al., 2018; Callahan et al., 2017; Heaney & Fisher, 2011). The assessment model is flexible and allows for environmental factors influenced by HEIs, such as support programmes and financial aid. Moreover, controlling for the input factors can isolate the educational environment's impact on time to degree completion and vice versa. Therefore, the model is suitable for modelling students' success and understanding why some factors may improve, and others may prolong degree completion. Thus, the I-E-O model provides the optimal framework to guide the research on students' academic success and the relationship between financial aid and on-time degree completion.

3. ACADEMIC SUCCESS

All students who start their HE journey do so with the vision to achieve academic success that frequently is not reached, as observed from the high dropout rates of mainly Black SA students (DHET, 2015; M. Murray, 2014; Wangenge-Ouma, 2012). Improving graduation rates and on-time graduation are focal points for HEIs in SA (CHE, 2010). This pervasive problem has spurred much research, particularly investigations into the factors leading to or preventing academic success (Astin, 1993, 1999; Donhardt, 2013; Meeuwisse et al., 2017; Schreiber & Yu, 2016; Soria et al., 2014; Tinto, 1975).

4. UNDERSTANDING AND MEASURING STUDENTS ACADEMIC SUCCESS

Traditionally, HEIs use graduation rates as a yardstick to measure students' academic success. Still, these figures do not explain the impact of the underlying factors that influence students' ability to succeed on time. With the increased focus on increasing the speed at which students graduate, HEIs must understand how these factors improve or prevent students' success (CHE, 2010; DHET, 2013).

Astin's assessment model provides HEIs with a structured approach to model the relationship between input and environmental factors and academic success. Traditional research methods that measure cognitive factors to predict academic success, such as GPA, can be limited because non-cognitive abilities may play an equally important role in predicting on-time degree completion. However, Investigations that focus on cognitive skills only (academic behaviours, perseverance, mindsets, learning strategies, and social skills) (Kautz et al., 2014) are open to

reference bias because they are usually based on self-reports that can be misleading when comparing different groups of people. (Adebayo, 2008).

In attempts to develop a more holistic approach, research studies include not only students' outcomes but also students' development and integration into the university's social and academic environment, such as students engagement (Carini et al., 2006; Zumbrunn et al., 2014), and institutional culture (Lewin & Mawoyo, 2014) to determine which factors affect students academic success. Interdependent cognitive and non-cognitive skills interact to influence students' academic achievement (Garcia, 2014). Students' input factors are static because they bring these attributes to the education environment. However, HEIs can influence this environment by providing financial aid and support programmes to enhance students' cognitive and non-cognitive skills and, consequently, improve time to degree completion.

5. STUDENTS SUCCESS FACTORS

Improving graduation rates and on-time graduation are focal points for HEIs in SA(CHE, 2013). Therefore, studying the factors that may lead to academic success helps HEIs develop support programmes to assist students who require additional support. As mentioned above, Astin's (1993) I-E-O model provides HEIs with a tool to assess students' success by highlighting the interdependence between input characteristics, institutional environment and students' outcomes.

5.1. Students' Input Characteristics

Past research devoted considerable effort into searching for indicators that may affect time to degree completion and studied students' input characteristics such as gender, race, age and academic ability plus home language, school type, grade 12 GPA, and NBT performance measurements.

5.1.1. Students' Demographics

Students' demographics are often included in research to examine their association on time to degree completion, such as gender (Carpenter & Kunaka, 2018; Jansen & de Villiers, 2016), race (Schreiber & Yu, 2016) and age (Craft, 2019).

5.1.2. Gender

Various studies indicated that gender plays a part in academic success. DHET (2016a) disclosed that Black SA female participation increased steadily from 12.2 percent in 2003 to 19.5 percent in 2013, and rates for all racial groups grew from 16.6 percent in 2003 to 22.8 percent in 2013. Females also had lower dropout rates than males and, thus, a better chance of graduating on time for the same period.

Researchers in SA studied how gender affects student success for specific HE streams. Papageorgiou (2017) found no significant differences between gender and students' success in a first-year accounting course. A study by Jansen and De Villiers (2016) found a statistically significant relationship between gender and performance in a final-year undergraduate accounting course, with males performing notably better than females. While these studies investigate success for a specific year and programme of studies, the investigation into on-time graduation is sparse. CHE (2010) analysed the graduation rates for three SA universities and found that less than 40% of students qualify in the minimum time allowed for the three- and four-year undergraduate programmes. Bengesai and Paideya (2018) investigated the on-time graduation of engineering students at a SA university and found that males are more likely to graduate on time.

International studies on the influence of gender on students' success found similar results. Wohlgemuth et al.’s (2007) investigation into financial, educational, and environmental impacts on student retention and graduation at a US university revealed that females were more like to graduate, while differences in graduation rates declined over time. Dooley, Payne and Robb (2012) analysed student record data from four Canadian universities to investigate persistence and students’ success. Results indicated: (i) students enrolled in a commerce degree have a higher completion rate than students in other programmes (ii) females have higher graduation rates.

Ari, Atalay and Aljamhan (2010) investigated the impact of gender on academic success in Respiratory Therapy (RT) education. Tests of students’ performance in the NBRC examinations at Georgia State University revealed gender does not impact students' academic performance in RT education regarding entering or exiting GPA.

Letkiewics et al. (2014) investigated the factors that predict on-time graduation. They used the 2010 Ohio Student Financial Wellness Survey (SFWS) to examine the impact of sociological and economic factors on students' expected time to degree. The investigation uncovered that more male than female students takes more than four years to degree completion. In Thailand, Tentsho, McNeil and Tongkumchum (2019) at the Prince of Songkla University found that gender (females) was significantly associated with timely graduation. Goldrick-Rab *et al*. (2016) investigated the relationship between financial aid and time to degree completion for students at 13 universities across Wisconsin. They tested whether students' gender would reveal some variation in the financial aid effect on time to degree completion but could not detect any variations in outcome.

Many studies indicate the existence of gender differences in time to degree completion. Based on these studies' mixed findings and the fact that there is a concerted effort in SA to address gender inequalities in society, gender was identified as an explanatory variable to investigate for this research study.

5.1.3. Race

Students' involvement and integration into the social and academic life of HEIs are affected by the students' input characteristics, including whether the students are from a minority group or a different racial background. Education research in SA includes race as a critical variable for students' outcomes (USAf, 2015). Consequently, HEIs were tasked to redress the past inequalities and provide previously disadvantaged students, primarily Black SA students, with equitable opportunities for academic success (DHET, 2016b; USAf, 2015). DHET (2017) reports that from 2000 to 2014, first-time Black undergraduate students' success in public HEIs was lower than their White counterparts, and only a few achieved on-time graduation. DHET (2017) reported only a slight improvement for Black students from 9.3% to 12.3% among the 2015 to 2016 cohorts. Thus, this aspect remains a transformation issue for HEIs.

Zewotir et al. (2011) investigated the students' success in entry-level modules at the University of KwaZulu-Natal. They found that the failure rate for first-year African students was 1.99 times higher than for White students. A study at the University of the Western Cape (UWC) found that student engagement behaviours differ across

racial groups (Schreiber & Yu, 2016). The researchers used student engagement as a proxy for academic success and asserted that students' engagement patterns predict academic performance, influencing the time for degree completion. Using the 2013 SA Survey of Students Engagement (SASSE), the researchers tested the students' engagement in three areas: quantitative reasoning, effective teaching practices and a supportive environment. Results indicated that Coloured students both experienced the campus environment as less favourable and scored lower in all three areas than Black students. The overall findings indicated that White, Indian and Coloured students perceived campus as less supportive than their Black peers.

The demographic profile of HESA has changed progressively since democracy, and much of the targeted growth in Black students' representation has been achieved (USAf, 2015). However, low graduation and high throughput rates have overshadowed this growth and continue to reflect apartheid-era patterns concerning race (DHET, 2016b).

International studies found differential effects between students' input characteristics such as racial groups, ethnicity, minority status and completion time. Museus et al. (2012) investigation of the direct and indirect influence of racial representation, academic involvement and social involvement on Black, Latino, and White students' academic success found that Black students with higher representation levels were associated with higher academic performance levels and a greater likelihood of success. Social involvement was the most substantial positive independent variable of degree completion.

Another international study by Chen and DesJardins (2010) found that the amount and type of financial aid have differential effects on students' dropout risks across racial groups. They found a non-significant influence for unsubsidised loans and positive results for merit and need-based assistance on student retention. The study indicated that students from minority groups receiving higher state grants yielded lower dropout risks than their White counterparts. Another investigation by Gross et al. (2013) found that race and ethnicity moderated financial aid's effect on academic success, and state grants and loans were significantly related to African American or Black students' educational outcomes with a positive effect for state grants and an adverse effect for loans in lowering the odds of first stop-out and graduation for these students compared

to their White peers. Letkiewicz et al. (2014) found a variation in the effect of race on on-time graduation because Hispanic students were more likely to finish timeously, and Black students took longer when the personal financial variables were taken into account.

In reviewing international literature on ethnic diversity and race, there are factors associated with student academic success and degree completion time, especially in SA, where DHET sets the enrolment targets for HEIs for race and gender representation.

5.1.4. Age

SA and international literature found that age impacts university students' academic performance. HEIs are interested in understanding the students' age effect on academic success and completion time. Literature shows various age groupings in brackets such as 22 to 36 years (Hart et al., 2011), above or below the study sample's average age (Jansen & de Villiers, 2016), the age of students on enrolment (Shapiro et al., 2016) or at degree completion (Kaighobadi & Allen, 2008).

In SA, some studies found that younger students are more successful than older students and that more youthful students graduate within a specified period. Hart et al. (2011) investigated factors affecting first-year taxation students' academic performance at a HESA and discovered that age was a statistically significant factor that influenced students' academic performance, and that younger students performed better than older students. Jansen and de Villiers (2016) also discovered that younger accounting students outperformed older students at UWC. Papageorgiou (2017) investigated accounting students' profiles versus academic performance at a HESA but found no correlation between age and the students’ marks in first-year Accounting.

On a national level, Van Broekhuizen et al. (2016) investigated students' university success by age in the five years following their matriculation. There were higher completion rates for younger students than for older ones. This trend is concerning because SA has experienced increased enrollments by students aged 21 and older) (CHE, 2017).

Similarly, international research investigated the relationship between age and academic performance at HEIs. Kaighobadi and Allen (2008) examination of the academic success of Florida Atlantic University's undergraduate business students indicated that older students achieved a higher GPA than younger students. Sheard's (2009) similar study at a UK university revealed the same result. Donhardt (2013), investigating impediments to degree completion at a US university, found age to be insignificant.

Uyar and Güngörmüş (2011) investigated factors associated with students' academic performance in a financial accounting course at Istanbul's Vocational School of Fatih University and concluded that performance decreased as students' age increased and inferred this result might be due to the gap between high school graduation and university enrollment. In contrast, Oreški *et al.* (2016) investigated students' academic success in an introductory financial accounting course and found a positive connection between age and GPA that could indicate older students tend to focus more on GPA, thereby significantly prolonging completion.

Shapiro et al.(2016) investigated the duration for the associate degree and bachelor degree earners on a national level in the US. They found that students who enter University when younger than 20 years took on average 5.3 calendar years to graduate at public institutions, while students older than 20 years at enrollment took approximately 8.4 years.

The literature on the relationship between age and student academic success and degree completion is inconclusive. Most SA studies show that younger students graduate earlier than older students.

5.2. Academic Ability Measures

The HESA admission committee provides a critical advisory service regarding HEIs general admission requirements, with the matriculation certification providing the first measure of academic ability. Furthermore, HEIs faculties may have additional admission criteria for specific disciplines that are set for each course to ensure students have the proper entry-level knowledge and skills for degree completion.

5.2.1. Home Language

Home language (mother tongue or native language) is the primary medium the students use to communicate and learn at home. English is the medium of instruction for most HEIs locally and internationally – a high English competency level is considered a prerequisite for admission and impacts academic success.

The language challenges faced by the SA schooling system stem from the apartheid era (Mouton et al., 2012). In 1994 SA's democratic government adopted a multilingual language policy to recognise the 11 languages: English, Africans, Xhosa, Zulu, Ndebele, Swati, Tswana Sotho, Pedi, Venda, and Tsonga. English and Afrikaans remained the learning mediums, with instruction in the other languages as the home language from grades one to four.

Myburgh et al. (2014) investigated learners' teaching and learning experiences during non-home language instruction focusing on learners who were taught in English but whose home languages were Afrikaans, Zulu, Sotho and Tswana. While learners' initial responses indicated that they did not encounter difficulties, the study results revealed otherwise. The research indicates that active learning cannot occur if the instruction is the learners' second or third language which accounts for their low academic success and education's ineffectiveness.

Bokana and Tewari (2014) investigated the success determinants at the University of the Witwatersrand. They found that the NSC English score was a significant factor in academic success. Van Broekhuizen et al. (2016) found that the higher the students' grade 12 English first additional language result, the greater their chances of degree completion within six years.

Rossouw (2018) investigated the effect of language on the performance of accounting students who chose to receive instruction in their home language, Afrikaans or English, at a SA University. The researcher discovered no significant difference in performance between Afrikaans students who studied in Afrikaans versus those who studied in English. Further analysis of the home-language symbol obtained in the NSC versus progress mark indicated that students with an NSC mark above 80% performed better than those with a lower mark.

Mills et al. (2009) found that the language spoken at home by indigenous students in Australia was not associated with students' retention or academic performance. Another study in Malaysia investigating the influence of a second language on students learning process found that self-efficacy in using English as a second language affects the students' achievement, motivation and academic success (Rahman et al., 2010).

Sweden has a favourable home language policy whereby students are taught in the national language – Swedish – and the national minority languages (Salö et al., 2018). The Swedish Education Act provides concessions for mother-tongue instruction in non-national languages based on certain conditions.

Literature indicated that home language instruction affects students' academic outcomes and, in general accord, English Home Language students perform better in SA schools and universities.

5.2.2. School Type

Research on the influence of the type of school attended is scant. Studies concentrate on whether the school is classified as a government or non-government school (Birch & Miller, 2007), international (Baker & Kanan, 2005), or private school (Pianta & Ansari, 2018). Research classifying government (public) schools into other categories outside of SA was untraceable (Carpenter & Roos, 2020). The SA government divides public schools into five quintiles according to the relative wealth of their surrounding communities, with one being the most impoverished school and five the wealthiest (Dass & Rinquest, 2017; Ogbonnaya & Awuah, 2019; van Broekhuizen et al., 2016). The government highly subsidises the one to three quintiles' non-fee-paying schools, while fee-paying quintiles four and five schools receive lower government subsidies (Department of Education, 2007).

Van Broekhuizen *et al*. (2016) investigated students' university performance by school quintile and found that most students gaining access to HE come from quintile 4 and 5 schools. The grade 12 results between 2009 and 2014 reflect that about 12% of learners from quintiles 1 to 3 enrolled in undergraduate programmes. Their completion rates were only slightly less than students from wealthier schools, with 45% completing their degrees timeously.

Shamsoodien (2020) investigated whether a relationship between the school quintile attended and performance in the Corporate Governance 1 module exists. The study found a significantly positive relationship – students who attended higher school quintiles performed better in this module than those from lower quintiles.

Mabizela and George (2020) used the school quintile as a proxy for socioeconomic status to investigate how disparities in the education systems affected students' academic performance. They found that students from quintiles 4 and 5 schools had the highest pass rate and those from quintile 1 the lowest, indicating the latter students were less prepared and more likely to experience academic difficulties (Matarirano et al., 2020).

The influence of the school attended on students' academic success and degree completion time is inconsistent. In SA, the funding of HEIs and students is linked to the school quintiles, and disadvantaged non-fee-paying schools receive a higher proportion of public funding. Based on this investment, it is essential to investigate the association of the school type on students' academic performance.

5.2.3. Final Grade 12 Marks

The final grade 12 results are a vital entrance requirement for graduate studies. Researchers investigated whether matriculation marks are an independent variable of academic success and on-time degree completion.

Du Preez et al. (2008) investigated whether the students' grade 12 marks in mathematics are independent of their performance in the first-year calculus course at HEIs. After providing students with weak entry-level mathematics with developmental learning and additional tutor support, they found their academic performance improved substantially compared to students with higher grade 12 marks but no development learning interventions. Swart and Becker's (2014) study of the impact of NSC Mathematics and languages on undergraduate and postgraduate success at a SA HEI found a positive correlation between grade 12 mathematics and language marks and undergraduate results. They also found that these grade 12 results significantly impact postgraduate degree completion. Van Broekhuizen et al. (2016) found that higher performance in NSC Mathematics is associated with higher degree completion rates.

Jansen and de Villiers (2016) investigated the determinants of UWC accounting students' performance and found that students' grade 12 marks are statistically related to their final undergraduate accounting module performance. Matarirano et al. (2020) investigated the impact of matriculation scores on students' academic performance at SA's Walter Sisulu University. The accountancy grade 12 mark was the only statistically significant factor associated with academic success in the first-year accounting module. While there are many studies relating to accounting, most investigated how the NSC Accounting affects success in Accounting 1 modules at University. Research by Rossouw and Brink (2021) investigated the graduation rates for students with no prior accounting knowledge of accounting and found that a relatively small proportion of these students graduated on time.

A study by Van Rooy and Coetzee-van Rooy (2015) indicated that a grade 12 GPA above 65% is helpful in predicting academic success. Van Broekhuizen et al. (2016) found a positive relationship between grade 12 marks and university access and academic success but a weaker correlation between grade 12 marks and degree completion rates, with students taking longer than the prescribed time to degree completion. The difference was ascribed to a possible articulation gap between schools and HEIs.

Zwick and Sklar (2005) argue against the sole use of grade 12 GPA as an independent variable on degree completion because it leads to overprediction of students' academic success. The researchers studied the influence of both high school GPA and Scholastic Assessment Test (SAT) scores on academic achievement. The analysis indicated that the GPA significantly impacted graduation for the White/English group of students. In contrast, the combined effect of both scores had a statistically significant association with degree completion for White/English and Hispanic/English students.

A similar study by Hoffman and Lowitzki (2005) investigated the impact of several input characteristics on students' success for racial and religious groups. Students were divided into four groups according to ethnicity and first language (White/English vs Black/English, Hispanic/English vs Hispanic/Spanish. The investigation uncovered that high school GPA significantly influenced graduation timeframes for the White/English while the SAT had a positive effect on both White/English and Hispanic/English groups'

time to degree completion. When the influence of high school GPA and SAT scores were modelled separately, the prediction errors for academic success increased.

Vulperhorst *et al.* (2018) tested the predictive power of high school grades for university success by comparing three high school subjects' impact on academic achievement in a Netherlands liberal arts university. Results indicated mathematics had a stronger relationship with first- and final-year academic success than mother tongue or English.

International research revealed that performance in university access tests had a significant association with timely graduation. In SA, access to University is primarily based on grade 12 performance, and these marks significantly affect students' academic success and on-time degree completion. The NSC final subject score comprises the course mark plus the examination mark and is norm-referenced. Prince and Frith (2017) indicated that 'while a candidate may perform well compared to the norm, they may still fail to meet a particular standard in the domain being tested. Therefore, assessing the students' performance in the access tests provides HEIs with a gauge of students' proficiency levels in specific disciplines and their effect on timeous degree completion.

5.2.4. Students' Performance in the Access and Placement Tests

Research ascribed poor academic performance to a possible articulation gap between high school and university studies. Hence, assessing students prior learning and academic preparedness before admission to universities is essential to ensure appropriate placement and increase academic success (Ndebele et al., 2013). HEIs used the access tests as a diagnostic tool to enrol students in the most appropriate qualifications and modules, for example, the SAT in the United States (US) and the NBT in SA (CETAP, 2018; Zwick & Sklar, 2005). These results inform HEIs of the additional support required by students to aid academic success and improve time to degree completion, such as foundation, extended and augmentation courses (CETAP, 2018). The NBT estimated benchmark scores if students are prepared for university and categorised the results as basic, intermediate, and proficient. These descriptors indicate how HEIs should respond to candidates performing at these levels.

The NBT evaluates students' proficiency levels in the following key performance areas; Academic Literacy, Quantitative Literacy and Mathematics (MAT). Academic literacy

(AL) involves students' capacity to engage successfully with academic study in the medium of instruction, including learning, comprehension, application and making meaning from scholarly texts (Ndebele et al., 2013; Ogbonnaya & Awuah, 2019). Quantitative literacy (QL) involves students' ability to identify and solve problems in quantitative situations relevant to HE study, i.e., communicate information using necessary quantitative data verbally, graphically, in tabular or symbolic form and . is a vital characteristic for students' academic success (Allers et al., 2016). The NBT Mathematics (MAT) assessment assesses students' ability concerning several mathematical topics and is administered to those wishing to study courses demanding high mathematical competence.

Scholtz and Allen-Ile (2008) investigated whether the Standardised Assessment Test for Access and Placement (SATAP) is an independent variable of academic preparedness for first-year university students. The SATAP measures students' language ability and skill beyond the operational level of correct grammar usage, including critical thinking and problem-solving, thus, adequately predicting future academic success. The researchers concluded that these tests might provide insight into which students need additional support for degree completion.

Rankin et al. (2012) investigated the independent variables of academic performance evaluating NSC vs NBT outcomes. They assessed the relationship between students' performances in an economic test and the NSC and NBT and found that for those who achieved an NSC Maths mark between 60 and 69%, the NBT scores for AL and QL are better independent variables for future academic success than the NSC Maths results. The researchers asserted that for students who achieved NSC Maths scores close to the minimum requirement, the NBT scores carry more weight for gauging their potential.

Van Rooy and Coetzee-Van Rooy (2015) tested the correlation between the Test of Academic Literacy Levels (TALL) score, NBT score, NSC mark for home language and English as a first additional language with the first-year academic performance of first-time entering students at a SA university. NBT AL results correlated positively with TALL/TAG results, signifying that one of these tests is sufficient for assessment. This investigation indicated that attending university academic literacy support modules is

the most substantial independent variable of academic success for first and second years students.

Cliff (2014: p.322) assesses the students' entry-level reading abilities as reflected by the NBT AL score. Though the students appear to be ready to cope with the language of teaching and learning – based on their cognate school-leaving language examination results – many of them cannot do so according to their NBT AL results'. Students classified as 'basic' and 'intermediate' in the NBT tests will struggle with their studies in the absence of AL interventions because of difficulty in understanding the contextualised AL demands of reading and reasoning in HE (Cliff, 2015).

Mahlobo (2015) analysed whether NBT MAT results were a better independent variable of universities' students' performance in first-year mathematics than grade 12 results. However, neither proved to be informative independent variables.

Allers et al. (2016) investigated whether NBT performance indicators and grade 12 mathematics, physical science, life science and English are independent variables of success in physiology. The results indicated that excellent performance in NSC English, life sciences and the QL of the NBT were significant indicators of positive academic achievement, while mathematics and physical sciences were not.

Mutakwa and Mhakure (2019) looked for significant differences between students' performance in the NBT QL test scores and a QL intervention course and found a definite improvement for students with NBT QL performance scores in the lower proficiency bands.

Admissions that rely on grade 12 GPA only may either exclude students with academic potential or enrol insufficiently prepared ones. Rankin et al. (2012) found that the NBT scores were a better measure of academic ability and should be used in conjunction with or as an alternative to the NSC results. Mabizela and George (2020) investigated the NBT and NSC's prediction of first-year medical students' academic success and found that while NBT MAT was insignificant, the total NBT results had higher explanatory power than NSC results alone. Since the introduction of NBT, many studies have investigated how grade 12 results and university students' entry-level skills predict first-year progression and academic achievement, but very few examine their association with on-time completion. A drawback of both the NSC and NBT is that

they focus on current competencies rather than potential. Developing competencies for academic success is crucial, especially for students who perform within the NBT lower proficiency bands.

5.3. The Educational Environment

Many factors influence pupils' access to HE. However, upon access, the students' input attributes are unchanging. The students' transition and integration into HEIs' academic and social systems can enhance or hamper a student's persistence to degree completion. Astin (1993) emphasised that understanding the educational process and the factors influencing academic success will be limited unless HEIs have information on the students' studying environment. Astin (1999) hypothesises that students' outcomes are influenced by how they interact with HE's academic and social life during their enrolment. While the input characteristic represents the attributes students bring to HE, the environment describes their curricular and non-curricular experiences at the university. The educational environment should improve students' ability to succeed.

In SA, the secondary-tertiary articulation gap – the mismatch between the exit level of secondary education and the entry level of HE – negatively affects students' outcomes in HE (Cliff, 2015; Ndebele et al., 2013). CHE (2016a) states that after two decades of democracy in SA, students still arrive at HEIs with inadequate reading speeds, reading comprehension, numeracy levels and a limited ability to express themselves in writing. Consequently, HEIs implemented support programmes to assist students in completing degrees on time.

5.3.1. *Language of Instruction*

Researchers investigated elements of student's academic and social integration in higher education, such as the language of instruction (Civan & Coşkun, 2016), student's academic development and support (Jansen & de Villiers, 2016), and finances (Goldrick-Rab et al., 2016) to gain a better understanding of how these improve the educational environment and students' academic success.

The language of instruction is a critical educational environment factor that affects students' academic success and degree completion. HE students must engage in scholarly thought and academic writing, a difficult task when the instruction medium is

not their home language. However, prior research on the relationship between the language of instruction and students' academic success produced differing results.

In HESAs, the language of instruction and its impact on student success is a general concern. As mentioned before, SA has 11 official languages, but HEIs adopted English and Afrikaans as the instruction medium, which poses a barrier for many Black students. DHET (2016b) indicated that language of instruction overlooked Black students' language needs and acknowledged that it is a cause for other language speakers' self-silencing. DHET (2016b) recognised that the language barrier is a significant hurdle to academic success and instructed HEIs to develop African languages as an instruction medium.

The lack of written and verbal English proficiency hinders academic and social integration for both Black SA students (Lewin & Mawoyo, 2014) and White Afrikaans-speaking students (Baard et al., 2010). This fact reduces students' ability to interact with faculty staff and lecturers and to take valuable notes, thus, resulting in an ever-increasing workload (Dukhan et al., 2016; van Rooy & Coetzee-Van Rooy, 2015). HEIs sought to improve the quality of teaching by intensifying the support they provide to 'at-risk' students. They responded to students' development needs by introducing programmes that provide better learning opportunities, such as extended curriculum programmes, supplemental instruction, tutoring, support for writing, literacy and numeracy, and systems for early detection of struggling students(Lewin & Mawoyo, 2014).

Rossouw (2018) investigated the influence of the language of instruction on the Accounting performance of Afrikaans home language students at a SA university. One group elected Afrikaans as the language of instruction and the other as English. This analysis revealed that the academic achievement of students studying in their home language was marginally better than those who elected to be taught in English.

Ngcobo and Barnes (2020) investigated students' views at the UNISA who speak official languages other than English as the medium of instruction. Though the students stated that their language is as important as English, teaching in all 11 languages would be impractical.

Fook and Sidhu (2015) investigated the learning challenges faced by undergraduates, postgraduates and instructors in the School of Education at a university in the USA. The majority of participants revealed that most of their difficulties in HE were related to the language of instruction. Students stated they frequently used a dictionary to understand the meaning of the terms in the academic vocabulary in class. The participants said that English was either a second or a foreign language, and it was difficult to express themselves in the lecture. When they tried to participate, the other students or instructors did not always understand their contributions.

Another study by Civan and Coşkun (2016) investigated the relationship between the language of instruction and the academic success of students at a university in Istanbul that offered two degrees with identical curriculums – one in English and the other in Turkish. After analysing student records controlling for students' background characteristics, they found empirical evidence that teaching in a non-native language adversely affected students' academic success.

In contrast, Dafouz and Camacho-Miñano (2016) studied the impact of English as the medium of instruction on students' academic success in Financial Accounting 1 at a Spanish HEI. Although they taught one group in English and the other in Spanish, they found that the student's academic performance was similar, thus, concluding that using English as the teaching medium did not lower students' final educational outcomes.

The SA and international literature on the effect of language of instruction on students' academic success agreed that teaching in a non-native language impedes academic success and on-time degree completion. However, teaching in all traditional languages presents a more significant challenge for HEIs. HEIs respond to this conundrum by detecting students at risk at an early stage, usually based on the NBT results, to provide the necessary academic development and support to improve students' academic success and on-time degree completion.

5.3.2. *Academic Development and Support*

Access and success programmes in SA encompass interventions to support students' academic development, such as foundation educational programmes and other curriculum development programmes. These programmes include mentoring, counselling and career development.

Smith et al. (2014) assessed the effectiveness of the academic development programmes from 1999 to 2003 and found that these interventions did not improve the graduation rate relative to students in mainstream programmes.

Dukhan et al. (2016) investigated the relationship between first-year SA university students' notetaking practices and their grades. They found that the instruction medium affects the notetaking quality and academic performance. A series of workshops for English second language first-year students in 2010 and 2011, focusing on developing their abilities to read, write critically and build an argument, revealed that they performed better than their 2009 peers. The researchers concluded that students who initially enrolled for AL modules would have a better chance of academic success.

Jansen and de Villiers' (2016) investigation of the students' in Accounting 3 at UWC indicated no significant association between language and performance. This result was attributed to UWC's 'Academic Literacy for Commerce.' support module, which addresses first-year students' language challenges that seek to ensure their acquisition of the necessary language skills for Accounting 3 by year three.

Dijk, Vivian and Malan (2019) studied the development of AL skills at SA's Pretoria University through a scaffolding and embedded learning approach offered to first-year students enrolled in the Public Administration degree. They compared the initial AL results to those of the final assessment and found that this support programme positively impacted their academic performance.

At UCT, the standard BCom curriculum prescribes a three-year completion time (UCT, 2022). However, recognising that some students would not meet this criterion, UCT established the Academic Development Unit (ADU) to address the transition from secondary schooling to HE (UCT, 2018b). One of the support measures comprised a four-year extended curriculum programme that integrates foundational provisions into mainstream programmes (Ndebele et al., 2013). Also, the ADU introduced the Step Up: Personal Management module for first-year students that aims to improve students' critical thinking skills and enhance their self-worth in the HE environment (UCT, 2018b).

Hallet (2013) explored the development of AL literacy in a UK university. The research showed that support initiatives were based on students' needs and designed to

enhance the skills related to academic success. Students who accessed these services were ‘disempowered beneficiaries of learning experiences rather than independent partners in their own learning.

In Australia, Glew et al. (2019) compared the effect of embedded academic support by investigating students’ uptake of AL programmes with the Professional Academic Literacy support offered to nurse and midwifery students. The analysis revealed that the more frequent students’ engagement, the higher their GPA.

International studies on the effect of academic support services concluded that the earlier the access, the greater the students’ academic success chances. SA offers mixed results from such research – some show no benefits, while others positively affect students' social integration, academic success and on-time degree completion.

5.3.3. A Focus on Financial Aspects

HE’s students' involvement, and integration are crucial for degree completion; however, improving students’ success also depends on students’ financial situation. Financial aid is a critical educational environment variable that improves students’ chances of on-time degree completion. Many researchers stress the role finance plays in HE students’ success (Garibaldi et al., 2012; Triventi, 2014).

5.3.4. The Impact of Tuition Fees on Degree Completion

Though desirable, tuition-free education may adversely affect on-time degree completion because students who are unconcerned about the high cost of HE may take longer to complete degrees (Lang et al., 2009). While high tuition fees may hurt access to HE (Pennell & West, 2005), in certain instances, these improve on-time degree completion (Bruckmeier et al., 2015; Garibaldi et al., 2012).

5.3.4.1. The Effect of Raised Tuition Fees

Garibaldi et al. (2012) investigated the effect of raised tuition fees after the prescribed graduation period. Italy’s Bocconi University in Milan offered a four-year college degree, yet, when researchers found most students took longer to graduate, they investigated and tested the benefit of raising tuition fees after completing the stipulated timeframe. They discovered that students who expected an increase in tuition fees

after four years of study made a significant effort to finish their degree timeously. They concluded that such an increase reduced the probability of late graduation without adversely affecting dropout rates or students' performance (Garibaldi et al., 2012).

Bruckmeier et al. (2015) studied the impact of introducing tuition fees at previously fee-free institutions. Consequent to the German Federal Constitutional Court's 2005 ruling, seven out of 16 German states introduced tuition fees at public HEs. The researchers found that paying tuition fees did not significantly affect student enrolments but improved degree completion times.

5.3.4.2. *Cost-Sharing Model*

HE in SA, while not "free", is highly subsidised by the government (Bhorat & Pillay, 2017; Oketch, 2016) and functions on a cost-sharing model comprising mainly state subsidies and tuition fees (USAf, 2016; Wangenge-Ouma, 2012). This model operates from the premise that HEIs produce public goods that benefit the country and private goods that help individuals (USAf, 2016). HEIs use tuition fee increases as a lever to offset the decrease in state and other funding (Cloete, 2015; Lewin & Mawoyo, 2014; USAf, 2016; Wangenge-Ouma, 2012). Despite reduced funding, DHET (2013) encouraged HEIs to ensure tuition fees allow access to students from poor and middle-class families and improve their chances of timeous degree completion. However, research indicated that HE costs had risen steeply in recent decades (Boatman & Long, 2016; Cloete, 2016).

5.3.4.3. The Impact of Rising Costs of Education

In SA, students protested high tuition fees and lack of financial assistance as an impediment towards academic success (Dominguez-Whitehead, 2017; Wangenge-Ouma, 2012). Increases in both HE and living costs necessitate students without adequate financial aid to obtain part-time employment as an alternative to or stop out (Chen, 2012; DesJardins & McCall, 2010; Soria et al., 2014) – such part-time employment may prolong degree completion time. Dhunpath et al. (2017; p. 133) opine that such protests "point to the consequences of increasing costs of HE in the context of declining employment opportunities".

5.3.4.4. The Impact of Students' Term-Time Employment on On-Time Graduation

Students facing financial difficulties and their apportion of work and academic time were investigated by Beerkens et al. (2011) and Triventi (2014). Presumably, unemployed students will complete their degrees quicker than students who have to cope with both academia and work. However, research indicates that employment may promote academic success depending on why students elect to work and its extent (Beerkens et al., 2011; Choi, 2018).

Research on the effect of students' employment on degree completion highlighted the benefits of limited work hours. Dundes and Marx (2007) surveyed the academic performance of undergraduate students and found that the academic performance of students who worked was comparable to that of non-working students because a manageable work schedule may improve students' soft skills (time efficiency, problem-solving and personal responsibility). These researchers found no meaningful differences in the GPA of students working less than 15 hours compared to those working longer hours. However, they then divided working students as follows; (1) those who worked up to 10 hours, (2) those who worked 10 to 19 hours and (3) those who worked more than 20 hours weekly; group (1)'s academic performance surpassed that of groups (2) and (3).

Research by Wenz and Yu (2010), Beerkens et al. (2011) and Darolia (2014) reiterated the above findings. Wenz and Yu (2010) discovered that students working limited hours earned higher GPA scores than those working excessively. Beerkens et al. (2011) observed little effect on academic progression for students working less than 25 hours weekly. Darolia (2014) found a positive correlation between students' academic grades and working up to five hours. Triventi (2014) found a negative association between academic progression and financially vulnerable students who worked up to 35.4 hours weekly (high-intensity). Thus, while working limited hours may improve academic progression, excessive working negates it.

The effect of work on academic progression may not depend upon the hours worked but on why students elect to work (Triventi, 2014). In SA, students from low-socioeconomic groups who experience food and housing insecurity (Broton & Goldrick-Rab, 2017; Dominguez-Whitehead, 2015, 2017) may increase their work hours, thus,

impairing academic success. Impoverished students who receive financial assistance sometimes redirect some of it to their families because family problems deter academic success (Dhunpath et al., 2017).

Researchers established a relationship between high tuition fees and students' employment. Triventi (2014) found a positive correlation between high tuition fees and students simultaneously studying and working. Neill (2015)(2015) found disparate responses to high tuition fees were dependent upon students' parental education and living arrangements. Canadian researchers indicated a nonlinear relationship between high tuition fees and students' employment and concluded that the former increased the latter.

While there is a lack of clarity on how precisely financial aid increases academic achievement, need-based financial aid has increased substantially in the last decade (Bhorat & Pillay, 2017). An indirect effect of such monetary assistance may enable high-intensity workers to lower their hours of work, thus improving their academic performance and throughput time.

5.3.4.5. The Influence of Financial Aid on On-Time Graduation

Financial aid comprises monetary assistance in the form of grants, scholarships, loans from HEIs, banks or philanthropic organisations and family contributions that enable students to pay for HE (Herzog, 2015; Sigal Alon, 2006). By reducing the cost of HE for students, such aid promotes academic success (Dwyer et al., 2012; Dynarski, 2003; Scott-Clayton, 2015). Students receive financial aid based on various conditions (DesJardins & McCall, 2010; Herzog, 2015). Merit-based financial aid (Chen & DesJardins, 2010; Cohodes & Goodman, 2014; Sjoquist & Winters, 2015) is awarded according to selected talents and interests (e.g. academic achievement and athletics). Financial aid policies also target financially needy students (Stater, 2009) to enable their academic success (Bhorat & Pillay, 2017; Bird & Castleman, 2016; DesJardins & McCall, 2010). Adequate financial resources are a prerequisite for a student's academic success (Jones et al., 2008) and, hence, vital for economically disadvantaged students.

In SA, NSFAS is a central public funding vehicle that manages and directs financial aid to students who cannot afford HE (Bhorat & Pillay, 2017; CHE, 2016a). NSFAS

provides eligible students with a loan based on their financial needs. As an incentive, NSFAS converts up to 40% of the loan to a bursary if the recipient achieves academic success (Bhorat & Pillay, 2017). However, not all financially needy students are eligible in terms of the NSFAS criteria, most of whom are from middle-income households (Garrod & Wildschut, 2020) – HESAs provide these 'missing middle' students with gap funding.

Research suggests that NSFAS funding positively affects students' access and academic success. However, literature on its impact on degree completion time is scarce (Bhorat & Pillay, 2017; de Villiers et al., 2013; Ndebele et al., 2013). De Villiers *et al*. (2013) investigated the above factors for the 2000 to 2004 NSFAS cohorts. These students outperformed non-NSFAS ones within the observed period, thus, indicating that most non-funded students took longer than the prescribed degree completion period.In a proposal for undergraduate reform, Ndebele et al. (2013) stated that despite the massive investment, research on the graduation rates of NSFAS recipients is lacking. They further asserted that adequate financial assistance is crucial for HE success. DHET (2016a) indicated that increased NSFAS funding aims to decrease dropouts and improve graduation rates.

A study by Bhorat and Pillay (2017) investigated the performance of NSFAS beneficiaries between 2000 to 2012 by demographics and subject pass rates. Using the subject pass rate as a performance indicator, researchers found a positive relationship between the award's size and subject pass rates. This relationship suggests that higher NSFAS awards might enable HEI students to perform better. However, researchers did not compare the NSFAS data with the HE Management Information System (HEMIS) data to examine the dropout or graduation rates (Bhorat & Pillay, 2017) – an essential link for investigating the relationship between financial aid and dropouts and degree completion.

CHE (2016b, p. 29) asserted that the most complex group is the 'missing middle.' These students are not eligible for NSFAS funding or bank loans. At UCT, students whose gross family income is between R350 000 and R600 000 per annum may apply for gap funding (UCT, 2022). This assistance is a need-based grant on a sliding scale and in the form of a non-repayable course fee bursary or loan offer underwritten by

UCT. Based upon Garrod and Wildschut's (2020) estimated size of the 'missing middle' group, the cost of including them in the NSFAS bursary scheme would be substantial.

International studies investigated the differential effect of financial aid on students' persistence and degree completion time. Chen and DesJardins (2010) investigated the impact of financial assistance on racial and ethnic groups according to the type and amount of financial aid received. The researchers analysed data from the Beginning Postsecondary Students (BPS) survey and the US National Center for Education Statistics (NCES) because it contains students' enrolment data and the type and amount of financial aid received. They found that factors such as age, family income, parental education and financial assistance influenced students' dropout behaviours. Students from disparate racial/ethnic backgrounds responded differently to changes to financial aid. Moreover, the dropout probabilities for low-income students and those from minority subgroups decreased when substantial financial aid was awarded. Substantial merit and need-based aid improved minority group students' determination to complete degrees and lowered the dropout risk. (Merit aid generally does not cover total tuition fees but may increase access and reduce the potential need to work while in University (Cohodes & Goodman, 2014)). Sjoquist and Winters (2015) examined the effects of this specific funding on degree completion within the US. They identified 25 states that implemented a merit-based student aid programme between 1991 and 2004. They compared college attendance and degree completion of students receiving such aid upon graduating from high school against that of students who self-pay. After controlling for sex, race, ethnicity, high school attended and SAT scores, the researchers found no significant difference in degree completion between pre-and post-merit award recipient groups. The results implied that merit aid had no meaningful effect on college attendance or degree completion. The researchers further investigated its impact on degree completion in relation to demographic subgroups and high schools attended and found a positive effect on the probability of degree completion for Hispanic students from less affluent high schools (Sjoquist & Winters, 2015) 2015).

Hossler and Chen (2017) investigated the effects of financial aid on college success for non-traditional students and found that their success was influenced by factors such as gender, race, academic integration and finances. The analysis revealed that

financial assistance reduced the dropout risks but did not improve timely degree completion.

One can draw similarities between the non-traditional students, low-income and minority groups within the US and Black SA students concerning low graduation rates. Therefore, one can imply that more significant financial assistance alongside affordable tuition for disadvantaged groups should improve on-time graduation. The high tuition fees are problematic for many parents and students, and low-income households may need financial assistance for HE access and success. Literature indicates that all forms of financial aid improve academic success and degree completion time, but high-intensity student employment negatively affects students' academic progress.

6. CONCLUSION

DHET (2016b; p. 17) asserted that:

> An effective and efficient system retains the students it admits and enables as many students as possible to complete their studies in regulation time or as close to it as possible, obviously without compromising quality'.

Thus, HEIs should facilitate improved access to develop support services and a more welcoming and inclusive environment to ensure student retention and success among an increasingly diverse student population.

This review addressed the importance of understanding what affects students' academic success, emphasising on-time degree completion. Insights on this topic are vital because they will help identify students who require additional help and assist HEIs in devising appropriate support strategies.

Using Astin's Input-Environment-Outcome (I-E-O) model to guide the literature review, it was clear that various students' input and educational and environmental factors affect time to degree completion. Once a student enrols in university, the input characteristics are static, and HEIs are challenged to improve students' social and academic integration in the educational environment for academic success and

timeous degree completion. However, HEIs can only influence those areas that are within their sphere of influence.

The literature review revealed the interdependence between student input characteristics and environmental factors on student outcomes. Various aspects were identified regarding their prominence upon student academic success and time to degree completion. These factors include student demographics (gender, race, age, home language, school type) and students' academic abilities measured by either NSC/grade 12 marks or NBTs. The environmental factors identified include the language of instruction, academic development and support and financial aid. Financial aid lowers tuition costs, and reviewed literature indicates that all forms of financial assistance improve academic success and degree completion time. In SA, NSFAS provides financial aid to eligible students, thus, leaving numerous students who still require aid with tuition costs. UCT provides GAP Aid to enable academic success and improve degree completion time for such students.

The next chapter provides the research design and methodology employed to analyse the relationship between student input characteristics and environmental factors on time to graduation for UCT students studying towards the BCom (CA) degree from 2013 to 2018.

CHAPTER 3. METHODOLOGY

This research study investigates the relationship between financial aid received and on-time graduation for students studying towards a BCom (CA) at UCT from 2013 to 2018. The secondary objective is to investigate such a relationship for students aggregated by selected variables identified in the reviewed literature.

1. RESEARCH SETTING

UCT's Faculty of Commerce is the site of this research investigation. The faculty offers two undergraduate degrees, and the programmes are divided into various streams to accommodate the interest of the diverse student body (UCT, 2022). This research focuses on the BCom (CA) Stream from 2013 to 2018 and includes the three-year BCom (CB001ACC04) and four-year BCom Academic Development (AD) qualification (CB011ACC04).

These programmes were chosen because they are designed for students interested in qualifying as Chartered Accountants. The researcher selected the AD programme because admission is limited to SA and permanent residence equity candidates. Most importantly, this is a four-year programme designed to assist students who have been previously disadvantaged by the inequalities in SA's educational provision. Within this programme, students' progress is monitored regularly. The AD office helps students to develop solutions for their day-to-day social and academic concerns. The Personal Management module for first-year students aims to improve students' critical thinking skills and enhance their self-worth in the HE environment (UCT, 2018b). Specific support exists for various additional interventions at varying levels and courses in this degree that provides students with a comprehensive range of educational and life skills.

2. ETHICS CLEARANCE

UCT's Faculty of Commerce required the researcher to obtain ethics clearance before commencing data collection because institutional unit data uses human subjects as data sources. Such clearance required the researcher to ensure no discrimination

against participating individuals or between participants based on gender, race, age, religion, income or any similar classification. The researcher also ensured the anonymity and confidentiality of all collected data.

3. DATA COLLECTION

After receiving ethics clearance (Appendix 1 below), the researcher requested secondary data from UCT's Institutional Planning Department (IPD) for students enrolled in the CB001ACC04 and CB011ACC04 programmes from 2013 to 2016. The data contains students' progression from enrolment until graduation, the observed period of six years (2013 through to the end of 2018).

4. QUANTITATIVE DATA ANALYSIS

Event History Analysis (EHA) was selected to investigate the duration from enrollment (becoming at risk) to graduation (the event of interest) for students studying towards a BCom (CA) from 2013 to 2018. According to Teckle and Vermunt (2012), a research analysis method calls for event-history analysis if the research question is centred on whether and, if so, when events occur.' The statistical package Stata (StataCorp., 2021) was selected for the EHA regression analysis.

4.1. Event History Analysis

EHA is a term used to describe statistical methods designed to explain or predict why some study participants are at a higher risk of experiencing an event of interest than others. EHA has its roots in the bio-medical sphere and is also known as duration analysis (Arendt, 2013), survival analysis (Murray, 2014)and hazard modelling (Kim et al., 2018). Lately, researchers have used EHA to investigate students' persistence and dropout behaviour (Gross et al., 2013; Hossler & Chen, 2017; Yue & Fu, 2017).

The benefit of using EHA over other regression models (Tekle & Vermunt, 2012) is that such models are not suitable for dealing with censoring and time-varying covariates.

Censoring means that researchers have partial information about the participants' event time, either because the study ends at that particular point or the participants were lost for some reason. Left censoring arises when the individual is exposed to the risk of experiencing the event before the observation period, which was not applicable

in this research study because all students first needed to enrol. Right censoring occurs when the participant does not experience the event within the selected period or was lost during the study period, i.e., if students dropped out before graduation or were still in the system during the sample's final year. With EHA models, these censored cases remain in the data set for analysis purposes to prevent biases or loss of precision.

Time-varying covariates are variables that may change their values during the observed period, such as age, employment and education level. Other statistical methods do not incorporate variables that change values over time, while EHA models consider both time-constant and time-varying explanatory variables.

EHA consists of two distinct models. In the continuous-time model, the event time is a continuous positive value, and in the discrete-time model, time is measured in a predetermined set of values, e.g. months or years. The researcher found that the discrete-time model offers the most promise for exploring educational transitions because graduation timing was measured discretely in academic years. If graduation occurred on any day of the year, the continuous-time model would have been more appropriate. Also, the discrete-time model affords unbiased handling of tied events. A tied event occurs when many students experience the same event within an observed period; for example, for this study when more than one student graduated within the same year. Teckle and Vermunt (2012) recommend that when there are many tied events within the data, the discrete-time model involves using a logistic regression model for a person-period dataset and, thus, is a more appropriate analysis model.

4.2. The person-period dataset

The data must be structured as a sequence of binary responses generated for each year (Mills, 2012a; Steele, 2005). The data set received from IPD consisted of enrolment records for 2013 to 2016 for students who then graduated or dropped out at any time until the end of 2018. The dataset was structured with one record per student, i.e., wideformat (Table 1 below). Before fitting the discrete-time model, the researcher restructured the data into a person-period format with one student record per year "at-risk" of graduating, i.e., the long format (Table 2 below). An example of three students' cases was restructured from 1 record per student into 11 person-period records in the tables below. Participant 1 graduated within three years, thus having three records in

the person-period dataset. Participant 3, who enrolled in 2015, and had not graduated at the end of 2018, has four records in the person-period dataset.

Table 1: Example - Student record dataset – wide format

Student	Year of	Gender	Race	AS 2013	AS 2014	AS 2015	AS 2016	AS 2017	AS 2018
1	2013	F	White	Enrol	Cont	Grad			
2	2014	M	Black		Enrol	Cont	Cont	Grad	
3	2015	F	Coloured			Enrol	Cont	Cont	Cont

Key:

AS= Academic Standing

Enrol = year in which the student enrols

Cont = year in which the student continues to the following year

Grad = year in which the student graduates.

Table 2: Example - Person-period dataset – long format

Student	Year of enrolment	Gender	Race	Interval	Academic Standing
1	2013	F	White	2013	Enrol
1	2013	F	White	2014	Cont
1	2013	F	White	2015	Grad
2	2014	M	Black	2014	Enrol
2	2014	M	Black	2015	Cont
2	2014	M	Black	2016	Cont
2	2014	M	Black	2017	Grad
3	2015	F	Coloured	2015	Enrol
3	2015	F	Coloured	2016	Cont
3	2015	F	Coloured	2017	Cont
3	2015	F	Coloured	2018	Cont

4.3. The Sample

Secondary data was received from IPD for 1 120 students enrolled from 2013 to 2016 and tracked until the end of 2018. This dataset was further refined to determine the effective sample size for analysis.

As this research's interest pertains to SA students, the first step in refining the data was to remove the 256 records labelled “International/Other”. The academic standing for 2013 to 2018 was used to determine academic progress and graduation. One record with no academic standing information for the review period was excluded from the dataset. Further, based on variables of interest, the researcher excluded records that had incomplete information for School Quintile (14), NBT Scores (5) and NSC Mathematics and English (2), resulting in the final data set of 842 complete cases (Table 3 below). Next, the data was restructured from a person-oriented format into a person-period format described above.

Table 3: The Sample

Dataset	Count
Data from IPD - number of student records	1120
Less: Student records	**276**
Erroneous record - no information	1
Incomplete information – NSC Mathematics and English	2
Incomplete/No information - NBT Scores	5
Incomplete/No information - School Quintile	14
Demographic status "International/other."	256
Complete cases - Dataset (Sample)	**842**

4.4. Research Variables

The significant variables were selected based on the literature review and secondary data received from UCT BCom students. The outlay of the section follows the I-E-O model described above.

1. Student Input Characteristics

1.1. Gender

Local and international studies indicate gender differences in academic achievement and degree completion, with males performing better than females. There is a concerted effort in SA to address societal gender inequalities. Thus, gender was identified as a significant independent variable for research purposes. Gender is a categorical variable coded as Female = 0 and Male = 1

1.2. Race

Ethnic diversity internationally and race in the SA context are associated with student academic success and degree completion. As mentioned above, in SA, DHET sets the enrolment targets for HEIs with race and gender representation criteria (DHET, 2014). Also, HEIs were tasked to redress past inequalities and provide previously disadvantaged SA students with equitable opportunities to achieve academic success (DHET, 2016b). After removing the student population group indicated as 'international/other,' the students' race was coded as a categorical variable defined as follows: White = 0, Black = 1, Coloured = 2 and Indian/Asian = 3.

1.3. Age

International studies indicate that older students outperform their younger counterparts. This outcome contrasts with SA studies in which younger students graduate earlier than older students. This deduction is concerning because SA has a significant increase in mature-age student enrollments (21 and older) (CHE, 2017). The average age of sample participants was 19 years at enrolment. Age was coded as a categorical variable and defined as older students (> 19 years) = 0 and younger students (≤ 19 years) = 1.

2. Academic Ability Measures

2.1. Home Language

Reviewed literature indicated that English Home Language students perform better in school and HEIs. Such students achieve higher NSC English grade 12 marks, thus, indicating the impact of students' home language. Therefore, 'Home Language' was not selected as a variable for this research. Instead, the NSC English marks were used as an indication of students' language proficiency.

2.2. School Type

The classification of SA schools is unique, with non-fee paying 'disadvantaged' schools receiving more public funding (Department of Education, 2007), thus validating an investigation of the relationship between school type and students' academic success and degree completion time. Thus, the school quintile was specified as a categorical variable and coded according to classification: fee-paying schools = 0 and fee-free schools = 1.

2.3. Grade 12 Final Marks

In SA, access to HEIs is based on students' grade 12 performance. It is reasonable to expect grade 12 marks to significantly impact students' academic success and completion time. The NSC English, Mathematics and Accounting results were used as academic ability variables. While NSC English and Mathematics were specified as continuous variables – using the continuous grade 12 mark. Due to some students not taking Accounting in high school, NSC Accounting was quantified as a categorical variable indicated as zero (0) for students without NSC Accounting and one (1) for those with NSC Accounting.

2.4. Student Performance in the Access and Placement Tests

Assessing the student's performance in the access and placements tests provides HEIs with a gauge of the student's proficiency levels in specific study fields. While students may have a high NSC score, they may fail to meet the set standard in the NBT domains. The NBT scores provide HEIs with additional information regarding the support required for academic success and timeous degree completion, and, thus, students' NBT scores were identified as continuous variables.

3. Environmental Variables

3.1. Language of Instruction

UCT's instruction medium is English. Limited written and verbal English proficiency hinders academic/social integration for most Black SA students (Lewin & Mawoyo, 2014). The NBT tests students' capacity to engage successfully with academic study (learning, comprehension, application and synthesis of new knowledge, in the instruction medium and is considered part of the NSC English mark. The instruction medium was not identified as a separate variable for this study.

3.2. Academic Development and Support

International studies on the effect of academic support concluded that students receiving early access to such services improve their chances of academic success. In SA, research on this subject is mixed: some show no effect on graduation rates, while others indicate positive effects on students' academic/social integration, academic success and degree completion time. Enrollment in UCT's Step Up students'

support programmes was specified as a categorical variable indicated as one (1) if the student had enrolled and zero (0) if not.

3.3. Financial Assistance

High fees necessitate many parents and students from predominantly low-income households to acquire financial assistance to access and succeed in HE. Reviewed literature indicates that all financial assistance improves students' academic success and time to degree completion. The following two financial assistance variables were identified for this research: Financial Aid (FIN Aid) and GAP Aid (GAP Aid). Fin ancialAid refers to the total NSFAS bursary allocation, and GAP Aid refers to the portion of financial assistance given when students do not meet NSFAS eligibility criteria but require financial assistance to complete payment pay fill the gap between what they can afford to pay for tuition and the actual cost of tuition. These variables were coded as 1 = if received and 0 = if not.

4. Output Variable

The dependent variable was defined as 'on-time graduation', measured as a dichotomous variable indicating whether a student graduated within the prescribed period in the observed year. The variable was coded as 1 for when the student graduated on time or 0 if not.

5. The Discrete-Time Model

The discrete-time model is the most prominent EHA method whereby event data is grouped into discrete time intervals (Mills, 2012a). The model can be estimated using a logistic regression procedure for a person-period dataset using a standard maximum likelihood method. The dependent variable in the regression simulates the risk that an event occurs conditionally on survival and covariates to some time – the model is composed of two parts: the survivor and hazard functions. The survivor function models the probability that no event has occurred before the time interval observed, i.e., the students who have not yet experienced graduation are said to have "survived" up to that point. The hazard function aims to quantify the probability that graduation (the event) will occur in the year (defined interval), conditional that the student survived up to that time interval. The baseline hazard function can be interpreted as the function for the participant(s) whose independent variables are equal to zero and, in EHA, can

vary across individuals and can be different at each point in time. Thus, unlike when time is measured continuously and has only one intercept, the likelihood of graduating can differ each year. The hazard rate is also known as the instantaneous risk, i.e., the risk of graduating in that year.

Tekle and Vermunt (2012, p. 283) expressed that:

> Hazard functions are the most useful tools in describing patterns of event occurrence as they are sensitive to the unique risk associated with each period while the survivor functions accumulate information across periods. Thus, by examining the variation over time in the magnitude of the hazard function, we identify when events are likely, or unlikely to occur.

Unlike linear regression, the discrete hazard profile is a set of conditional probabilities bounded by 0 and 1 (Allison, 1982; Steele, 2005; Willett & Singer, 1991). The transformation from probability to odds is necessary to prevent the derivation of fitted values outside of this boundary. The log odds of event occurrence in any period are derived from the probabilities of the hazard function, odds = hazard / (1- hazard), shown in the following equation (Willett & Singer, 1993):

$$\text{logit } h_{ij} = \log_e (h_{ij}/1\text{-}h_{ij}) \quad (1)$$

The following logit model was specified from equation (1) to investigate the effects of independent variables on time to graduation. In equation (2), β_p is held constant, assuming the independent variable's effect is constant over time.

$$\text{logit } h_{ij} = \log_e(h_{ij}/1\text{-}h_{ij}) = \alpha + \beta_1 X_{1ij} + \ldots + \beta_p X_{pij} \quad (2)$$

With EHA, the effect of the independent variables may vary over time. Thus, equation (2) was extended from a time-constant logit model to a discrete-time logit model that allows the independent variable's effects to differ from period to period. Therefore, a set of time dummy variables was required. Let D_1 to D_6 be a series of time dummy variables representing the six years in the sample. They estimate the baseline logit hazard function for each academic year. As no student could graduate before year three (3), the starting point for the analysis is year one to three combined, indicated as duration one (dur1). D_4 to D_6 indicated the periods for years four to six, respectively.

In equation (2), β_p represents the unique effect of X_{pij} where ‘p’ indicates the *p*th independent variable, ‘i' indicates the *i*th individual, and ‘j’ indicates the *j*th period.

The logit coefficients βs are interpreted in terms of their relationship to the log odds of event occurrence. The logit coefficients represent the baseline function changes (magnitude) associated with the independent variable's values, shifting the hazard curve up or down. An exp(β) greater than one indicates a positive effect on the independent variable, and an exp(β) less than one indicates a negative effect.

$$\text{logit } h_{ij} = [\alpha_1 \text{dur1} + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}] + [\beta_1 X_{1ij} + \beta_2 X_{2ij} + \ldots + \beta_p X_{pij}] \quad (3)$$

From equation (3), a series of discrete-time models were estimated. The first model (A) generates the baseline model against which subsequent models with independent variables are compared.

Model A: $\text{logit } h_{ij} = [\alpha_1 \text{dur1} + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}]$

5.1. Model: Financial Assistance and On-time Graduation

The next model evaluates the effect of financial assistance on on-time degree completion.

Model B: $\text{logit } h_{ij} = [\alpha_1 \text{dur1}_i + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}] + \beta_1 X_{1ij} + \beta_2 X_{2ij}$ (FIN Aid and GAP Aid)

5.2. Model: Input and Environmental Variables and On-time Graduation

Model C: $\text{logit } h_{ij} = [\alpha_1 \text{dur1}_i + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}] + \beta_1 X_{1ij}$ (input characteristics) + $\beta_2 X_{2ij}$ (environmental factors). Input characteristics and environmental factors in this equation are used as composite placeholders for the related individual variables.

6. Implicit Assumptions of the Discrete-Time Model

When conducting logistic regression, it is essential to ensure that the relevant assumptions are met. The basic assumptions of the EHA discrete-time logit model are described below.

6.1. Censoring is Non-informative

The discrete-time EHA model assumes that censoring is non-informative, which means that censored individuals had the same probability of experiencing a subsequent event as individuals who remained in the study (Steele, 2005). Censoring in this study is non-informative. For the censored records, the dataset contains partial information insofar

as it is not known whether the students eventually graduated or not. All that is known is that they did not graduate in the observed sample period.

6.2. The Observations are Independent

The discrete-time model further assumes that events and censoring occur at the endpoint of the interval and that events are independent of each other (Mills, 2012c). Graduation and censoring happen at the end of the time interval (year), meaning that all students who entered the time interval (enrol) can graduate throughout the interval. Also, students in this study either graduate or not. These two events are independent. A residual time series plot is observed to check whether a random pattern exists.

6.3. Absence of Multicollinearity

Multicollinearity exists when an independent variable in a regression model is significantly correlated with another independent variable. A correlation among independent variables is problematic because it undermines its statistical significance (Shrestha, 2020). Multicollinearity can be detected using various methods. A scatterplot can be used to graphically observe the relationship between variables but does not provide the extent of the correlation. Pearson's correlation coefficient can test the magnitude of the correlation and the direction of the relationship. Pearson's correlation coefficient range from +1 to -1. A perfect positive relationship is indicated as +1, a perfect negative relationship is shown as -1, and a 0 indicates no relationship exists.

The Variance Inflation Factors (VIF) can measure the inflation of the variance of the estimated regression coefficient if the independent variables are correlated. Shrestha (2020) indicated that a VIF value greater than 10 indicates multicollinearity. If multicollinearity is discovered, one can either remove one of the independent variables or create a new variable that combines the two highly intercorrelated variables.

6.4. The Linearity Assumption

The discrete-time logit model is a linear regression model that assumes that the logit hazard's vertical displacements are linear per unit difference in each independent variable (Singer & Willett, 1993). Linearity can be tested graphically by creating scatter plots or regression plots by plotting the predictors against the probability - no linearity is present if the relationship appears like a curve, or statistically, whereby the

assumption can be tested by adding a nonlinear independent variable specification to the hazard model. The assumption is met if this addition does not improve the model fit (Singer & Willett, 1993).

6.5. Influential Observations

Influential observations are the data that appear inconsistent with other data observations and may influence the statistical analysis and inferences. It is crucial to assess the presence of influential observations to assess whether their removal results in a substantive increase or decrease in the relative hazard. This result can be tested by evaluating the log-likelihood, i.e., if it is the same with or without the observation in question, then the observation does not influence the regression model (Hao et al., 2014).

6.6. The Proportionality Assumption

The discrete-time models also assume that the covariates have identical effects in every time interval. A graphical method can be used to verify this assumption. When plotted, this assumption is met if the logit-hazard profiles are approximately parallel (Singer & Willett, 1993). Alternatively, one can relax this assumption by including an interaction term between time and the covariate. The interaction term permits the covariate's effect to depend on time rather than being constant over all the periods, and then compares the deviance statistics between the models (Tekle & Vermunt, 2012).

6.7. The Assumption of No Unobserved Heterogeneity

A central assumption of the discrete-time model is that all variation in hazard profiles across individuals is assumed to depend solely on observed variation in the independent variables. However, not all independent variables that influence the dependent variable are included in the regression model, implying that unobserved heterogeneity may exist. Due to these unobserved student-specific risk factors, some students may be more likely to graduate on time than others. Random effects are included in the model to account for this unobserved heterogeneity. In EHA, these random effects are called frailties and describe the excess risk for distinct subgroups. Frailty is an unobserved individual random effect that acts multiplicatively on the hazard (Mills, 2012b). The estimated spread of this random effect is an indication of the extent of unobserved heterogeneity. However, including frailty in the model is not

required when there is only one event of interest, i.e., one graduation per student (Hardy et al., 2012).

4.5. The Analysis

The analysis starts with the sample's descriptive statistics with student enrollment and graduation patterns from 2013 to 2018. Before analysing the data to answer the research questions, the following diagnostics must be performed to validate the model's adequacy:

The researcher suspected that the NSC marks might be significantly correlated with the NBT scores; thus, assessing this correlation is essential to decide the academic ability variables to include in the model.

Akaike information criterion (AIC) assesses the model's goodness-of-fit and determines whether some independent variables can be removed. The lower the AIC, the better the fit. Another method to test the goodness-of-fit is the log-likelihood ratio (LR) test. The LR follows a chi-square distribution with degrees of freedom equal to the number of parameters. The closer it is to zero, the better the fit.

The researcher checked for influential observations with the likelihood deviance test. This statistic indicated how much each coefficient would change if this observation were removed from the regression. Identifying outliers with standardised Pearson residuals larger than 3 in absolute values (Imon & Hadi, 2008) and average leverage scores as high values, e.g. two or three times the average score, will pull the regression line towards it (Dunn, 2021).

Lastly, assesses whether the model adheres to or violates the implicit assumptions described above. The analysis starts by assessing the baseline model, after which the baseline model is adjusted by adding the selected input and environmental variables.

1. The Baseline Model

The baseline hazard function for the BCom programmes in the study was calculated for when on-time graduation depends on time only.

Model A: $\text{logit } h_{ij} = [\alpha_1 \, dur1_i + \alpha_4 \, D_{4i} + \alpha_5 \, D_{5i} + \alpha_6 \, D_{6i}]$

2. The Baseline Model Adjusted for Financial Assistance Variables

Next, the odds ratios and LR were calculated to determine the model's significance when adjusted for financial assistance.

Model B: logit $h_{ij} = [\alpha_1 dur1_{i+} \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}] + \beta_1 FIN\ Aid_{ij} + \beta_2 GAP\ Aid_{ij}$

After that, determine the hazard functions and display the study's financial aid and GAP Aid variables graphically.

3. The Baseline Model Adjusted for Selected Input and Environmental Variables

The analysis models the combined effect of the input characteristics and the environmental factors on on-time graduation.

Model C: logit $h_{ij} = [\alpha_1 dur1_{i+} \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i}] + \beta_1 X_{1ij}$ (input characteristics) + $\beta_2 X_{2ij}$ (environmental factors)

The final assessment evaluates and compares the effect of financial aid on on-time graduation for students in different groups (race and gender) by comparing their adjusted odds ratios after assessing their multicollinearity within the model.

This chapter outlined the methodology employed to analyse the data. EHA was selected, more specifically, the discrete-time logit model, to investigate financial aid's effect on on-time graduation. The model was then adjusted to include selected input and environmental factors to ascertain their combined effect on time to degree completion. Following Astin's I-E-O model, the next chapter will provide the results after testing the model's assumptions.

CHAPTER 4. RESULTS

This chapter summarises the results obtained from the discrete-time EHA in Stata (StataCorp., 2021). First, it presents the sample descriptive statistics. The model diagnostics and assumption testing were followed by the EHA results. The outlay of the EHA results first presents the baseline model, then the EHA analysis, focusing on the financial assistance variables, followed by the I-E-O Model, which investigates the effect of the combined input and environmental variables on on-time graduation. The descriptive statistics display the students' status, i.e., graduated, left the programme or still enrolled in the observed period, aggregated by whether or not the student graduated on time. In comparison, the EHA model will provide statistics for on-time graduation only per selected independent variable.

1. DESCRIPTIVE STATISTICS

The sample consists of 842 student records resulting in a 2909 person-period dataset. The 842 records contained 549 students enrolled in CB001ACC04 and 293 students enrolled in CB011ACC04. At the end of the observed period, 65.32 % (550) graduated, 16.27% (137) left the programmes during the observed period, and 18.41% (155) students were still enrolled at the end of 2018. Within the observed period, 361 (43%) students in the sample graduated on time (Table 4 below).

Table 4: Sample by Specialisation and Status

Specialisation	Graduation	Left Programme	Still Enrolled	Total
CB001ACC04	**367**	**88**	**94**	**549**
	67%	64%	61%	*65%*
CB011ACC04	**183**	**49**	**61**	**293**
	33%	36%	39%	35%
Total	**550**	**137**	**155**	**842**
Variable	**Graduation**	**Left Programme**	**Still Enrolled**	**Total**
On-time Graduation				
Not on-time	**189**	**137**	**155**	**481**
	34%	*100%*	*100%*	*57%*
On-time	**361**	**0**	**0**	**361**
	25%	*0%*	*0%*	*43%*
Total	**550**	**137**	**155**	**842**

1.1. Student Input Characteristics

Gender: The dataset (Table 5 below) comprised 479 (57%) females and 363 (43%) male participants. Of 361 students who graduated timeously, 224 (62%) were females and 167 (38%) males.

Race: Among the students in the data set, 126 (15%) are self-reported as White students, 445 (53%) Black students, 184 (22%) Coloured students, and the remaining 87 (10%) comprise Indian and Asian students. 361 students (65.6%) out of 550 students graduated on time, consisting of 70 (19.39%) White, 182 (50.42%) Black, 76 (21.05%) Coloured and 33 (9.14%) Indian/Asian students (Table 5).

Age: At the time of enrolment, the average age of students was 19 years, of which 64 (8%) were older than 19 years of age, and 778 (92%) were less than or equal to 19 years. The analysis of on-time graduation revealed that 17 (5%) of older students and 344 (95%) of younger students graduated within the observed period (Table 5).

Table 5: Student Input Characteristics

Variable	Graduation	Left Programme	Still Enrolled	Total	Not On-time Graduation	On-time Graduation	Total
Gender							
Female	**329**	**67**	**83**	**479**	**255**	**224**	**479**
	60%	*49%*	*54%*	*57%*	*53%*	*62%*	**57%**
Male	**221**	**70**	**72**	**363**	**226**	**137**	**363**
	40%	*51%*	*46%*	***43%***	**47%**	**38%**	**43%**
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65%	*16%*	*18%*	***100%***	*57.13%*	*42.87%*	***100%***
Variable	Graduation	Left Programme	Still Enrolled	Total	Not on-time Graduation	On-time Graduation	Total
Race							
White	**100**	**13**	**13**	**126**	**56**	**70**	**126**
	18%	*9%*	*8%*	*15%*	*12%*	*19%*	***15%***
Black	**274**	**75**	**96**	**445**	**263**	**182**	**445**
	50%	*55%*	*62%*	***53%***	*55%*	*50%*	***53%***
Coloured	**115**	**35**	**34**	**184**	**108**	**76**	**184**
	21%	*26%*	*22%*	***22%***	*22%*	*21%*	***22%***
Indian/Asian	**61**	**14**	**12**	**87**	**54**	**33**	**87**
	11%	*10%*	*8%*	***10%***	*11%*	*9%*	***10%***
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65%	*16%*	*18%*	**100%**	*57%*	*43%*	**100%**
Variable	Graduation	Left Programme	Still Enrolled	Total	Not on-time Graduation	On-time Graduation	Total
Age Group							
Older students	**32**	**11**	**21**	**64**	**47**	**17**	**64**
	6%	*8%*	*14%*	***8%***	10%	5%	**8%**
Younger Students	**518**	**126**	**134**	**778**	**434**	**344**	**778**
	94%	*92%*	*86%*	***92%***	90%	95%	**92%**
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65.32%	*16.27%*	*18.41%*	***100%***	57.13	42.87	**100**

1.2. Academic Ability Measures

School type: Of the 842 students in the sample (Table 6 below), 757 (90 %) came from fee-paying schools. Only 33 (9%) of students from fee-free schools graduated timeously.

Table 6: School Type by Status

Variable	Graduation	Left Programme	Still Enrolled	Total	Not On-time Graduation	On-time Graduation	Total
School Type							
Fee-paying	**507**	**114**	**136**	**757**	**429**	**328**	**757**
	92%	*83%*	*88%*	*90%*	89%	91%	90%
Fee-free	**43**	**23**	**19**	**85**	**52**	**33**	**85**
	8%	*17%*	*12%*	*10%*	*11%*	*9%*	*10%*
Total	**550**	**137**	**155**	**842**	**481**	**391**	**842**
	65%	16%	18%	100%	*57%*	*43%*	*100%*

Grade 12 final marks: The NSC Accounting variable was assessed as a categorical variable indicating whether a student had NSC Accounting or not. Of the 842 students in the sample, 112 (13%) enrolled without NSC Accounting and 730 (87%) with NSC Accounting, of which 489 (89%) students graduated within the observed period, and 325 (90%) graduated timeously (Table 7 below).

Table 7: NSC Accounting by Status**Variable**	**Graduation**	**Left Programme**	**Still Enrolled**	**Total**	**Not On-time Graduation**	**On-time Graduation**	**Total**
NSC Accounting							
Without NSC ACC	**61**	**29**	**22**	**112**	**76**	**36**	**112**
	11%	*21%*	*14%*	*13%*	*16%*	*10%*	*13%*
With NSC ACC	**489**	**108**	**133**	**730**	**405**	**325**	**730**
	89%	*79%*	*86%*	*87%*	*84%*	*90%*	*84%*
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65%	16%	18%	100%	*57%*	*43%*	*100%*

The Mathematics and English NSC marks were assessed using the continuous NSC results. Students who graduated within the observed period had a mean value for NSC Mathematics of 78.04%. For those who timeously graduated, the mean value indicated a slightly higher value of 78.93% (Table 8 below).

Table 8: NSC Mathematics by Status

Variable	Status	N	mean	p50	sd	iqr
NSC Mathematics	Graduated	550	78.04	78	8.63	12
	Left Programme	137	74.50	73	8.13	10
	Still Enrolled	155	73.23	72	8.14	11
Total		**842**	**76.58**	**76**	**8.70**	**13**

ONTIMEGraduation		N	mean	p50	sd	iqr
NSC Mathematics						
0	Not On-time Graduation	481	74.82	**74**	8.37	**11**
1	On-time Graduation	361	78.93	**80**	8.58	**13**
Total		**842**	**76.58**	**76**	**8.70**	**13**

Key: iqr = inter quintile range p50 = 50th percentile sd = standard deviation

Students who graduated within the observed period had a mean value for NSC English of 75.44%. In comparison, the mean value for those who graduated timeously indicated a slightly higher value of 75.87% (Table 9 below).

Table 9: Summary of NSC English by Status

Variable	Status	N	mean	p50	sd	iqr
NSC English	Graduated	550	75.44	75	7.30	11
	Left Programme	137	74.80	75	6.46	10
	Still Enrolled	155	73.59	73	6.94	10
	Total	**842**	**75.00**	**75**	**7.13**	**10**

Variable		N	mean	p50	sd	iqr
NSC English						
0	Not On-time Graduation	481	74.35	**74**	6.96	**11**
1	On-time Graduation	361	75.87	**76**	7.27	**11**
Total		**842**	**75.00**	**75**	**7.13**	**10**

Key: iqr = inter quintile range p50 = 50th percentile sd = standard deviation

Student performance in the NBTs: The students' actual scores in the NBT test were used for analysis, and the mean values obtained for graduating students were 68% for AL, 65.26% for QL and 56.45% for MAT rounded. Those who graduated timeously within the observed period indicated a similar mean value of 68.18% for AL, 65.28% for QL and 57.2% for MAT rounded (Table 10 below).

Table 10: Student Performance in the NBT by Status

Variable	Status	N	mean	p50	sd	iqr
NBT AL Score	Graduated	550	68.01	69	9.33	13
	Left Programme	137	65.91	67	9.98	15
	Still Enrolled	155	65.22	66	10.17	15
Total		**842**	**67.15**	**68**	**9.66**	**13**
Variable	Status	N	mean	p50	sd	iqr
NBT AL Score						
0	Not On-time Graduation	481	66.39	67	9.76	14
1	On-time Graduation	361	68.18	69	9.44	13
Total		**842**	**67.15**	**68**	**9.66**	**13**

Variable	Status	N	mean	p50	sd	iqr
NBT QL Score	Graduated	550	65.26	65	12.00	16
	Left Programme	137	61.78	61	12.91	16
	Still Enrolled	0	-	0	-	0
Total		**842**	**63.95**	**64**	**12.38**	**16**

Variable	Status	N	mean	p50	sd	iqr
NBT QL Score						
0	Not On-time Graduation	481	62.94	62	12.58	17
1	On-time Graduation	361	65.28	65	11.98	16
Total		**842**	**63.95**	**64**	**12.38**	**16**

Variable	Status	N	mean	p50	sd	iqr
NBT MAT Score	Graduated	550	56.45	54	15.03	20
	Left Programme	137	52.98	52	13.46	17
	Still Enrolled	155	53.28	52	13.25	17
Total		**842**	**55.30**	**53**	**14.54**	**20**

Variable	Status	N	mean	p50	sd	iqr
NBT MAT Score						
0	Not On-time Graduation	481	53.80	52	13.92	18
1	On-time Graduation	361	57.30	55	15.11	21
Total		**842**	**55.30**	**53**	**14.54**	**20**

Key: iqr = inter quintile range p50 = 50th percentile sd = standard deviation

1.3. Environmental Variables

Enrollment in the Step Up course was selected as an environmental variable to indicate UCT's developmental support to students. Of the 842 students in the sample, 307 (36.46%) students were enrolled in the Step Up module (Table 11 below), of whom 156 (90%) graduated timeously.

Table 11: Step Up by Status

Variable	Graduation	Left Programme	Still Enrolled	Total	Not On-time Graduation	On-time Graduation	Total
Step Up							
Not Enrolled	**358**	**85**	**92**	**535**	**330**	**205**	**535**
	65%	*62%*	*59%*	*64%*	*69%*	*10%*	*64%*
Enrolled	**192**	**52**	**63**	**307**	**151**	**156**	**307**
	35%	*38%*	*41%*	*36%*	*31%*	*90%*	*36%*
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65%	16%	18%	100%	*57%*	*43%*	*100%*

Financial assistance: Two separate financial assistance variables were identified. For the descriptive analysis, FIN Aid and GAP Aid were combined as Financial Assistance (Table 12 below) to indicate whether a student received either of these. The analysis revealed that 253 (30%) students received financial assistance, and 589 (70%) students did not. Further analysis indicated that 140 (25%) of students who received financial assistance graduated, and 77 (21%) graduated timeously within the observed period.

Table 12: Financial Assistance

Variable	Graduation	Left Programme	Still Enrolled	Total	Not On-time Graduation	On-time Graduation	Total
Financial Assistance (FIN Aid and GAP Aid)							
No Financial Assistance	**410**	**91**	**88**	**589**	**305**	**284**	**589**
	75%	*66%*	*57%*	*70%*	*63%*	*79%*	*70%*
With Financial Assistance	**140**	**46**	**67**	**253**	**176**	**77**	**253**
	25%	*34%*	*43%*	*30%*	*37%*	*21%*	*30%*
Total	**550**	**137**	**155**	**842**	**481**	**361**	**842**
	65%	16%	18%	100%	*57%*	*43%*	*100%*

After completing the descriptive statistics, the dataset was restructured from the 842-person dataset to the person-period dataset resulting in 2909 data points for further analysis of the EHA models.

2. MODEL DIAGNOSTICS AND ASSUMPTIONS TESTING

2.1. Goodness-of-fit

In total, the researcher analysed six models and used AIC and BIC statistics to select the best model to assess the independent variables' relationship to timeous graduation. Model A is the baseline model that measures students' on-time graduation when the success depends on time only. Model B adjusted Model A by adding the financial factors. Model C included the selected input and environmental factors and was analysed as four different models to find the model with the best goodness-of-fit (Table 13 below). Model C (1) includes all the selected variables but excludes three cases with missing values. Model C (2) includes all the selected variables but excludes 41 cases with standardised Pearson residuals larger than three. Model C (3) includes the selected variables but excludes 37 cases with leverage values larger than three times the average leverage value. Model C (4) includes the selected input and environmental variables but replaces NBT Scores with NBT categories – excluding three cases with missing values.

Model C (2) had the lowest AIC and BIC statistics with reasonable goodness-of-fit based on the Hosmer-Lemeshow test ($\chi^2(8)=9.25$, p = 0.3220) and was selected as the final model for analysis. This model includes the selected input characteristics and environmental factors while excluding 41 cases with standardised Pearson residuals larger than 3 (Imon & Hadi, 2008).

Table 13: Goodness of Fit Statistics

Statistics	Model A	Model B	Model C (1)	Model C (2)	Model C (3)	Model C (4)
N - Number of observation	2909	2906	2906	**2868**	2875	2906
Ll – Log Likelihood	- 1 022.8807	- 1 014.3531	- 959.97923	**- 864.6838**	- 943.8695	-961.6829
χ2 - Chi-square	1084.1192	1072.5517	1006.8381	**953.18325**	996.17439	1008.5462
P - Probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
K – Number of variables	4	6	23	**23**	23	28
aic	2053.7614	2040.7061	1957.9585	**1767.3675**	1925.7391	1965.3658
bic	2077.6637	2076.5533	2071.4746	**1880.6335**	2039.0514	2090.831

Key:

Model A Baseline model

Model B Baseline + financial factors – excluding three cases with missing values.

Model C (1) Final model with input characteristics + environmental factors – excluding three cases with missing values.

Model C (2) Final model with input characteristics + environmental factors - excluding 41 cases with standardised Pearson residuals larger than three.

Model C (3) Final model with input characteristics + environmental factors - excluding cases with leverage values larger than three times the average leverage.

Model C (4) Input characteristics + environmental factors; replaces NBT Scores with NBT categories – excluding three cases with missing values.

2.2. Testing The Assumptions

2.2.1. Censoring is Non-Informative

Censoring in this study is non-informative. There is no statistical method to test this assumption. However, for the censored records, the dataset contains partial information insofar as it is not known whether the students eventually graduated or not, only that they did not graduate in the sample's observed period.

2.2.2. Observations are independent

Students in this study either graduate or not. The standardised Pearson residuals plotted against the predicted probability of timeous graduation did not show residuals that were greater than the absolute value of two. Observing the pattern of the dots, when the Pearson residuals were plotted against the time, the pattern suggested no issues of dependence between the observations. See the scatterplot (Figure 2) in Appendix 2 below.

2.2.3. Absence of Multicollinearity

The collinearity diagnostics revealed no serious collinearity between the selected independent variables with a model mean VIF of 1.87. Since the researcher suspected that the final grade 12 marks might significantly correlate with the NBT scores, a separate diagnostic was performed to test this assumption. The results indicated no collinearity with a mean VIF of 1.76; thus, both NSC and NBT scores were included in the model. This approach was confirmed by Carpenter and Roos (2021). See Table 17 and the scatterplot (Figure 1) in Appendix 2 below.

2.2.4. The Linearity Assumption

Of the six models (Table 13 below), the linearity assumptions were tested for Model B as the baseline model with the financial variables and Model C (2) as the final best-fit model only. The researcher inspected each independent variable's scatterplots and regression plots against the predicted probability (see Figure 4 in Appendix 2). For Model B, the predicted probability of both values of the independent variables was similar in spread to conclude that the assumption of linearity was not violated.

For Model C (2), a visual inspection of the scatterplots (Figure 4 in Appendix 2) revealed no violation of the assumption of linearity. Moreover, the researcher performed a statistical evaluation by adding a nonlinear independent variable specification to this model. However, this addition did not improve the model, as can be seen when comparing the BIC values of the two models. The BIC for the model with the nonlinear variable was 1899.208, and the BIC for Model C (2) was 1880.634, a difference of 18.574 in BIC; thus, the researcher concluded that the linearity assumption was not seriously violated.

2.2.5. Influential observations

Influential observations were assessed by plotting the leverage values against the predicted probability of on-time graduation, checking whether any leverage values are greater or equal to three times the average leverage values. Model C (1) was first executed, then Model C (3) without the observations with large leverage values to investigate whether they influenced the model (Table 13 below). The results reflected that the model without the observations with significant leverage scores had the lowest log-likelihood, suggesting influential observations. Thus, the large leverage values were excluded for better model specification.

2.2.6. The Proportionality Assumption

An interaction term between the independent variables and the time periods was included in the models. The proportionality assumption was evaluated by comparing the deviance statistic between the models with and without interaction terms (Tekle & Vermunt, 2012). The deviance statistics (Table 18 in Appendix 2) of the two models did not differ markedly – the difference of 18.574 in BIC provided strong support for the original Model (2) (without the interaction terms). Therefore, the researcher concluded that the assumption of proportionality was not seriously violated.

2.2.7. The assumption of No-Unobserved Heterogeneity

The researcher first fitted the model for Model B and then compared it to the baseline Model A. The LR test was used to evaluate whether frailty is present in the model ($\chi^2(1) = 000012$, p=0.498594). The test is not statistically significant because the p-value is relatively large compared to a threshold of 0.05. The researcher concluded that there is no evidence of unobserved heterogeneity in this model.

The researcher attempted to evaluate the assumption of no unobserved heterogeneity for Model C (2), but it would not converge. According to Jenkins (2005), this practice is not uncommon for frailty models. However, as per Hardy et al. (2012), a frailty model is not required when there is only one event of interest, i.e., one graduation per student.

3. RESULTS FROM THE DISCRETE-TIME EVENT HISTORY ANALYSIS

Logit regressions were performed to assess students' likelihood of on-time graduation within the observed period. The results include odds ratios (OR) where OR greater/less

than one is associated with a higher/lower likelihood that the student will graduate timeously.

3.1. The Baseline Model

For the discrete-time EHA, the 842 student records were restructured into a person-period format, totalling 2909 person-period records. In this framework, a student is at risk of graduating on time when enrolled within each period until graduation. The record in the latter periods is discarded because, after graduation, all data points for the remaining observed time will be missing. The model starts with estimating the baseline function when on-time graduation depends on time only. Students could not graduate before year three; thus, the starting point for the analysis is years one to three combined, indicated as duration one (dur1), with d4 to d6 indicating periods for years four to six.

The baseline model is significant with a Wald chi-square of 1084 ($p < 0.001$). The likelihood of graduating on time is unfavourable for all years, with the highest odds for on-time graduation in year five by a factor of 0.32 (Table 14 below). The baseline model describes the cohort's hazard profile over six years. The estimates' pattern suggests the likelihood of graduation increasing with time up to year five and then decreasing.

Table 14: The Baseline Model (A)

				Number of obs	=	2 909
				Wald chi2(4)	=	1 084
Log likelihood = -1022.8807				Prob > chi2	=	0.0000
Y	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dur1	0.0618	0.0069	-25.06	p < 0.001	0.0497	0.0768
d4	0.2097	0.0213	-15.36	p < 0.001	0.1718	0.2559
d5	0.3152	0.0336	-10.84	p < 0.001	0.2558	0.3884
d6	0.1826	0.0306	-10.13	p < 0.001	0.1314	0.2537

3.2. Focus on Financial Assistance

The study investigates the possible association between financial assistance and timeous graduation within the observed period. The analysis revealed that from the 550 students who graduated, 65.6% (361 students) graduated timeously, 110 (30.47%) of whom received financial aid. The Pearson chi-square test of independence was used to evaluate the association between the two categorical variables. In addition, the researcher employed Cramér's V test statistic (ranging between zero and one) to assess the association's magnitude, with a result close to zero indicating a small effect and a value close to one representing a more significant effect.

The results of the Pearson chi-square test suggested an association between the on-time graduation indicator and financial aid indicator ($\chi^2(1) = 18.1118$, $p < 0.000$; Fisher's exact $p < 0.000$). The test was significant at the 0.05 threshold, and the researcher concluded a difference in timeous graduation between students who received financial aid and those who self-pay. Though a higher proportion of students without financial aid graduated timeously than students with it, the magnitude of association is small as measured by Cramér's V (-0.1467) effect size.

For a closer inspection of the financial aid variables, the effect of the two aid variables was added to the EHA baseline model to investigate their respective influence on timeous graduation (Table 15 below). The regression model improved from the baseline model and was statistically significant with a Wald chi-square (6) of 1072.55 and $p < 0.001$. In addition, the financial aid variable indicated a decreasing likelihood with a predicted OR of 0.577, indicating that when all other factors are held constant,

financial aided students are less likely to graduate timeously than non-financially aided students, with a factor of 0.577. While GAP Aid indicated a decreasing association with timeous graduation, the analysis showed it was not statistically significant in this model.

Table 15: Financial Assistance Model (B)

					Number of obs =	2 906
					Wald chi2(6) =	1072.55
Log likelihood = -1014.3531					Prob > chi2 =	0.0000
Y	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dur1	0.0687	0.0078	-23.57	p<0.001	0.0550	0.0859
d4	0.2427	0.0261	-13.19	p<0.001	0.1966	0.2995
d5	0.3768	0.0432	-8.51	p<0.001	0.3009	0.4718
d6	0.2281	0.0403	-8.37	p<0.001	0.1614	0.3224
FinAid	0.5771	0.0845	-3.76	p<0.001	0.4331	0.7688
GAPAid	0.6950	0.1712	-1.48	0.140	0.4288	1.1263

The graphical presentation of the hazard estimates indicates that financially aided students take longer to graduate than non-financially aided students. This effect is indicated by the vertical shift of the hazard function for Fin Aid and GAP Aid.

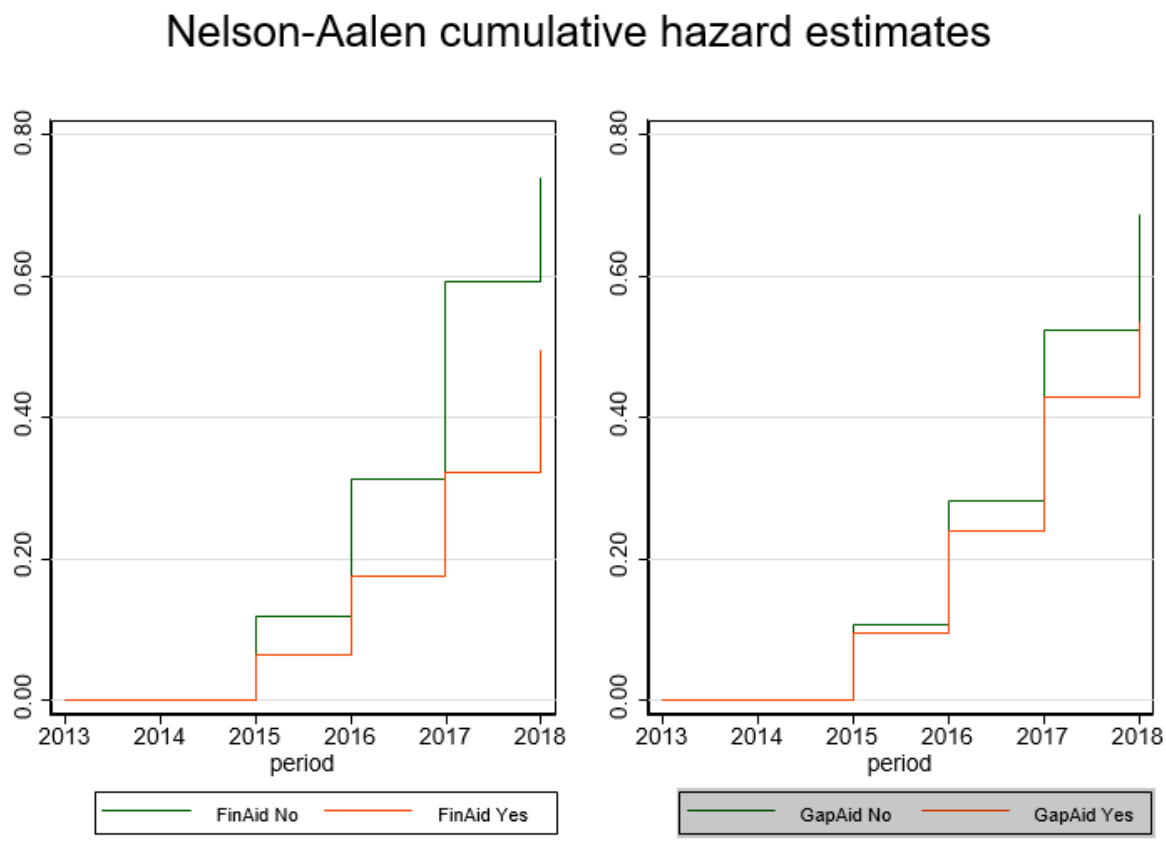

Figure 1: The Hazard Curves

3.3. Significance of Selected Input and Environmental Variables on On-time Graduation

The research purports a second hypothesis that there would be no significant difference between financially aided and self-pay students in timeous graduation aggregated by selected input and environmental factors. Therefore, the effect of the selected variables will be assessed following the I-E-O model. The analysis of each variable will include the cross-tabulation results for categorical variables only and the regression results from Model C (2) selected above.

Table 16 below presents the regression analysis results and reflects that Model C (2) is statistically significant with a Wald chi-square of 953.18 ($p < 0.001$). Most of the model's variables hold significance at the threshold value of 0.05, with the exceptions being individually presented and discussed below. The time dummy variables hold statistical significance with $p < 0.001$ but are still similar to the baseline model.

Table 16: Statistics for Selected Input and Environmental Variables

				Number of obs	=	2868
				Wald chi2(19)	=	953.18
Log likelihood = -864.68375				Prob > chi2	=	p < 0 .001
Y	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dur1	0.0000034	0.0000039	-11.09	p < 0.001	0.0000004	0.0000315
d4	0.0000161	0.0000180	-9.90	p < 0.001	0.0000018	0.0001436
d5	0.0000301	0.0000331	-9.45	p < 0.001	0.0000035	0.0002605
d6	0.0000144	0.0000160	-10.05	p < 0.001	0.0000016	0.0001268
Male	0.7266798	0.1033972	-2.24	0.025	0.5498295	0.9604132
EthnicGroup						
Black	0.4949859	0.1024040	-3.40	0.001	0.3299848	0.7424918
Coloured	0.6633170	0.1449360	-1.88	0.060	0.4322469	1.0179120
Indian/Asian(Chinese)	0.3899072	0.1039353	-3.53	p < 0.001	0.2312392	0.6574476
AGECat						
Younger student	2.8654380	0.9484968	3.18	0.001	1.4977260	5.4821340
1.FeeFreeSchools	0.8517495	0.2250496	-0.61	0.544	0.5074662	1.4296070
FIN Aid	0.5816605	0.1026320	-3.07	0.002	0.4116025	0.8219799
GAP Aid	0.6097548	0.1812149	-1.66	0.096	0.3405525	1.0917580
StepUP	2.1252580	0.3378195	4.74	p < 0.001	1.5563570	2.9021110
1.NSCACC	1.9542810	0.4534041	2.89	0.004	1.2402330	3.0794310
EngGrd12FinRslt	1.0139040	0.0098898	1.42	0.157	0.9947041	1.0334740
MathGrd12FinRslt	1.0948100	0.0120448	8.23	p < 0.001	1.0714550	1.1186740
NBTALScore	1.0226820	0.0089173	2.57	0.010	1.0053530	1.0403100
NBTQLScore	1.0082550	0.0078969	1.05	0.294	0.9928958	1.0238520
NBTMathScore	0.9689615	0.0065554	-4.66	p < 0.001	0.9561980	0.9818953

3.3.1. Input Variables

Gender: 46.76% of the timeously graduating students are women. The cross-tabulation between gender and on-time graduation indicated a significant association between the variables based on Pearson's chi-square test ($\chi^2(1) = 6.8645$, p=0.009; Fisher's exact p = 0.009), showing that more women (59.82%) than men (40.18%) graduated timeously.

The regression results indicated that male students differ significantly from female students and are less likely than females to graduate timeously by a factor of 0.73 (p = 0.025), all else being equal.

Race –The cross-tabulation between the race groups and on-time graduation indicated a significant association that a larger proportion of White students (55.56%) students graduated timeously compared to Black (40.9%), Coloured (41.3%) and Indian/Asian (37.93%); ($\chi^2(3)$ = 10.353, p=0.018; Fisher's exact p = 0.019).

For the regression analysis, the White student group was indicated as the reference group. The results revealed that in comparison, Black students (OR=0.495, p=0.001), Indian/Asian students (OR=0.39, p<0.001), and Coloured students (OR=0.663, p=0.060) race groups are less likely to graduate timeously, with predicted OR's less than 1, *ceteris paribus*.

Age: The average enrolment age of the sample students was 19 years. Students older than 19 years were the reference group in the analysis. The results of the Pearson chi-square test indicated a significant association between age and on-time graduation ($\chi^2(1) = 7.5245$, p=0.006; Fisher's exact p = 0.006) such that a larger proportion of younger (44.22%) students graduated timeously compared to older (26.56%) students.

The regression analysis revealed that with all other factors held constant, being 19 years or younger at enrollment strongly positively affected the likelihood of on-time graduation with a predicted OR of 2.9 (p=0.001) relative to older students.

School Type: The school quintile was also grouped according to the classification of fee-free and fee-paying schools. 328 (90.86%) of students who graduated timeously came from fee-paying schools, and 33 (9.14%) from fee-free schools. The cross-tabulation between school type and on-time graduation indicated no significant association between the variables based on the Pearson chi-square test ($\chi^2(1) = 0.6333$, p=0.426; Fisher's exact p = 0.0.488).

The regression analysis revealed that even though the fee-free schools showed decreased odds for on-time graduation by a factor of 0.85, the results are not statistically significant compared to fee-paying schools, with p-values higher than 0.05 (p = .544). To further investigate this result, the analysis was repeated with the actual school quintile ranking, and the outcome was similar for all school types as for the categorical variable.

Final Grade 12 Marks: Of the 842 sample students, 730 had NSC Accounting. The cross-tabulation between NSC Accounting and on-time graduation indicated a significant association between the variables based on the Pearson chi-square test ($\chi^2(1) = 6.0741$, p=0.014; Fisher's exact p = 0.014). There was a more significant proportion of timeously graduating students with NSC Accounting 325 (90.03%) compared to 36 (9.97%) without NSC Accounting.

The regression results indicated that NSC Accounting was statistically significant with an OR of 1.95 (p<0.001), indicating that when all other factors are held constant, a student with NSC Accounting has a 1.95 increased likelihood of graduating timeously than similar students without NSC Accounting.

NSC English was not associated with on-time graduation. The analysis indicated an optimistic likelihood of 1.013 (p=0.157) but was not statistically significant in the model.

The NSC Mathematics indicated a significant association with on-time graduation with an OR of 1.095 (p<0.001). This OR indicates that for a one-unit increase in the NSC Mathematics results, the likelihood of on-time graduation increases by a factor of 1.09, *ceteris paribus.*

Students' performance in the NBTs: Assessment of NBT scores indicated intriguing results. First, the AL indicated a significant association with on-time graduation with an OR of 1.023 (p=0.010). AL is associated with an increased likelihood of timeous graduation with all else constant. Notably, all student's AL scores in this model were graded proficient per the NBT performance bands. QL (p=0.294), at the threshold value of 0.05, was not significantly associated with on-time graduation. The NBT MAT assessment indicated a significant negative association with on-time graduation with an OR less than 1 of 0.97 (p<0.001), indicating that for every one-unit increase in MAT results, the likelihood of on-time graduation decreases with a factor of 0.97.

3.3.2. Environmental Variables

Step Up: 192 **(**62.32%) of 550 students who graduated were enrolled in the Step Up programme. The cross-tabulation between Step Up and on-time graduation indicated a significant association between the variables based on Pearson's chi-square test ($\chi^2(1) = 12.4375$, p=0.00; Fisher's exact p = 0.001), with 156 (43.21%) of these graduating timeously.

The regression results revealed that being part of Step-Up is strongly and positively associated with on-time graduation with a predicted OR of 2.13 (p<0.001). These statistics indicate that Step-Up students are more likely to graduate timeously than those who are not by a factor of 2.13.

Analysis focusing on FIN Aid and GAP Aid variables revealed that of the 550 graduates, 361 (65.6%) graduated on time, of whom 36 **(**9.97%) received GAP Aid, and 77 (21.33%) received Fin Aid.

GAP Aid: 36 **(**9.97%) of 361 timeously graduating students received GAP Aid. The cross-tabulation between GAP Aid and on-time graduation indicated no significant association between the variables based on the Pearson chi-square test ($\chi^2(1) = 0.0392$, p=0.843; Fisher's exact p = 0.907).

The statistical results for GAP Aid in Model C (2) hold from the individual assessment in Model B. The GAP Aid variable is not statistically significant at the threshold value of 0.05 with an OR of 0.61 (p= 0.096).

FIN Aid: The analysis revealed that of 361 timeously graduating students, 77 (21.33%) received Fin-Aid. The results of the Pearson chi-square test suggested an association between on-time graduation and the financial aid indicators ($\chi^2(1) = 15.9172$, p < 0.001; Fisher's exact p < 0.001). Although a higher proportion of students without financial aid graduated timeously than those with financial aid, the association is small when measured by the Cramér's V (-0.1647) effect size.

As the above was significant at the 0.05 threshold, the researcher rejected the null hypothesis favouring the alternative that there is a significant difference in on-time graduation between students who receive financial aid and those who self-pay.

The statistical results for financial aid in Model C (2) hold from the individual assessment in Model B and are statistically significant with an OR of 0.58 (p=0.002), indicating that with all other factors constant, financially aided students are less likely to graduate timeously than self-pay students by a factor of 0.58.

A comparison between Model B and Model C (2) assessed the effect of financial aid on on-time graduation. This analysis in Model B, together with the cross-tabulation, revealed an association between on-time graduation and financial aid indicators ($\chi^2(1)$

= 18.1118, p < 0.000; Fisher's exact p < 0.000;) with Cramér's V (-0.1467). Model C (2) assesses the combined effect of the selected input and environmental factors on on-time graduation, and the cross-tabulation revealed a significant association between financial aid and on-time graduation ($\chi^2(1) = 15.9172$, p < 0.001; Fisher's exact p < 0.001) with Cramér's V (-0.1647). While both models indicated a significant effect, the magnitude of the association was small.

The regression in Model B improved from the baseline Model A and was statistically significant with a Wald chi-square (6) of 1072.55 and p < 0.001, an OR of 0.577. Similarly, the regression in Model C (2) improved from Model B and was statistically significant with a Wald chi-square (19) of 953.18 and p < 0.001, an OR of 0.581. The results indicated that the FIN Aid variable had a decreasing association with on-time graduation and the GAP Aid variable was not statistically significant in this model.

After assessing the overall outcome of the analysis, the researcher rejects the null hypothesis favouring the alternative that there would be a significant difference between students who received financial assistance and those who self-pay in on-time graduation aggregated by selected input and environmental factors.

In conclusion, this chapter assessed the research results in terms of the EHA regression analysis. First, the baseline logit hazard Model A revealed a decreasing OR, revealing that no student would have graduated in the prescribed period when on-time graduation depends on time only. Then, Model A was compared with Model B when the baseline regression analysis included the financial assistance variables. This analysis indicated that receiving financial assistance is associated with a lower likelihood of on-time graduation. Finally, the baseline model was compared to Model C (2), which included the financial assistance variables and the selected input and environmental variables. Following the I-E-O model, the results indicated that model C (2) was statistically significant. Also, the financial assistance variables hold little or no change compared to the statistical tests in Model B. Chapter 5 discusses these findings considering prior research.

CHAPTER 5. DISCUSSION

The discussion of the results of the selected research variables will follow the I-E-O model sequence structure, namely: students' input characteristics, students' academic ability variables, environment variables and discussion of the results in terms of the research questions.

1. STUDENT INPUT CHARACTERISTICS ASSOCIATED WITH ON-TIME GRADUATION.

The variables of gender, race and age indicated a statistically significant association with on-time graduation based on the research results.

Gender: While gender representation in international studies is more balanced, in SA, HEIs experienced significantly more female student enrolments (DHET, 2016b). The findings are consistent with international research that found higher on-time graduation rates for female students (Letkiewicz et al., 2014; Tentsho et al., 2019). Similarly, in SA, females had the best chance of graduating timeously (DHET, 2016b). The research results agree that a more significant proportion of female students graduated timeously, but this may result from the Commerce Degree (Dooley et al., 2012) because Bengesai and Paideya (2018) found that male engineering students have better odds of graduating timeously than females.

Increased female students' enrollments are gratifying. However, the cause for low male enrollments, together with their lower on-time graduation rates, should be analysed to help HEIs develop a more nuanced approach to improving these figures.

Race: The demographic profile of HESA has changed progressively since democracy, with much of the targeted growth in Black students' representation being achieved (USAf, 2015). This change is reflected in the sample's representation of 85% of Black SA students. Museus, Jayakumar and Robinson (2012) reasoned that higher representation levels were associated with higher academic performance levels and a greater likelihood of academic success. The results of this research challenge this outcome because in this study, Black SA students had a more significant representation, but their likelihood of graduating on time was below that of White students. A possible reason is that African Americans and other Black students in

international studies (Sigal Alon, 2006) are related to minority groups that have lower representation than in SA. In contrast, in SA's HEIs, Black SA students comprised the population group with the most significant increased representation.

This research agrees with some SA studies that the likelihood of timeous graduation for SA Black, Coloured and Asian/ Indian race groups is lower than for White students (DHET, 2017; Zewotir et al., 2011). HEIs in SA report a variation in on-time graduation rates, and White students enrolled at historically Black HEIs may have different results based on how they experience the educational environment (Schreiber & Yu, 2016).

Age: This research found that age has a significant association with on-time graduation, with younger students being 2.9 times more likely to graduate timeously than older students. This finding contrasts international studies showing that mature students achieved greater success than younger ones (Kaighobadi & Allen, 2008; Sheard, 2009), and also, students' age does not affect degree completion (Donhardt, 2013). The negative association between age and on-time graduation may result from the gap between high school graduation and university enrollment (Uyar & Güngörmüş, 2011).

In SA, younger students are more successful, and many graduate timeously (van Broekhuizen et al., 2016). Both This Hart et al. (2011) and Jansen and de Villiers (2016) found that younger students outperformed their older counterparts and had higher completion rates. Students may enter university older than 19 years because of a late start at primary school or repeating grades during high school. Another cause for this negative association between older students and on-time graduation may be because older students have other time commitments preventing them from studying, such as children and spouses and engaging in high-intensity work to support their families (Triventi, 2014).

SA has many older student enrollments (CHE, 2017). Thus, HEIs should investigate the negative association between age and on-time graduation in order to provide appropriate support for older students to graduate on time.

2. STUDENT ACADEMIC ABILITIES AND ON-TIME GRADUATION

School type: SA has a unique quintile school classification – the most impoverished schools are classified as quintile one, and the wealthiest schools as quintile five. Prior research found that students from higher quintiles achieved academic success at HEIs, and most graduated timeously on time, compared to lower quintiles (Mabizela & George, 2020; Shamsoodien, 2020).

This research did not find a significant difference between the school attended and on-time graduation. The findings suggest that the government's higher investment in fee-free schools better prepares students for HE. The results attest to UCT's support efforts to enhance on-time graduation, such as tutoring, mentoring and student wellness. However, cognizance must be taken that 90% of the sample students attended fee-paying schools.

Final grade 12 marks: Proficiency in the English language is critical for academic success because HEIs mainly use English as the instruction medium. However, this research found no significant relationship between NSC English scores and on-time graduation *ceterus paribus*. This finding may be attributable to the sample students achieving relatively high NSC Mathematics and English results.

International (Dafouz & Camacho-Miñano, 2016; Fook & Sidhu, 2015) and local studies (Ngcobo & Barnes, 2020; Rossouw, 2018) agree that a high English competency level is associated with academic success. English is a 'secondary or foreign language' for most students when it is not their mother tongue. Thus, they experience difficulty expressing themselves due to their 'unclear' communication skills. However, this research suggests that English is no longer a barrier to SA students' academic success. This improvement may result from schools better preparing students to cope with English as a medium of instruction.

The importance of high performance in NSC Mathematics cannot be underestimated because it is a prerequisite for admission to many HEIs study fields. Consequently, students with high mathematics achievement in secondary school are better prepared to transform technical information in a meaningful way, promoting on-time graduation. This research indicated that students with NSC Mathematics have a greater likelihood of on-time graduation and concurs with international (Atuahene & Russell, 2016;

Zelkowski, 2011) and SA studies (Murray & Oosthuizen, 2017; van Broekhuizen et al., 2016). However, this finding contradicts Jansen and De Villiers's (2016) research, which found no statistically significant association between NSC Mathematics and performance in an accounting degree programme.

While the school type and English proficiency indicated no statistical significance, the analysis revealed that students with NSC Accounting have a higher likelihood of timeous graduation than those without it. Also, these students have a greater likelihood of on-time graduation than those with NSC Mathematics, all else being equal. It is argued that students with high school mathematics will perform well in an accounting degree because both disciplines test numerical and analytical skills. However, evidence shows that students with NSC accounting outperform those without this subject (Yanto et al., 2011). One possible reason is that students' interest in accounting before enrolment at HEIs and those seeking job opportunities in the business field after graduation may exert higher engagement that may positively influence their timeous graduation (Uyar & Güngörmüş, 2011). SA studies also revealed a connection be NSC Accounting and academic success and timeous graduation (Matarirano et al., 2020; Rossouw & Brink, 2021).

Unlike NSC English and Mathematics, NSC Accounting is not a prerequisite for entry into a BCOM degree at UCT. It is questionable whether NSC accounting should be a pre-requisite because students without this subject must master this new discipline's specific business language, terms and concepts, which may negatively influence on-time graduation.

Student performance in the NBTs: The NSC and NBT exerted interrelated results insofar that both inform HEIs regarding access and placement. Internationally, HEIs rely on SAT and ACS scores for placement, and these tests indicate which students require developmental courses for academic success (Zwick & Sklar, 2005). SA's NBT evaluates students' proficiency levels in AL, QL and MAT and, based on results, advises HEIs on categories of students that need additional support to achieve academic success (CETAP, 2018). The results in these categories indicated that AL and MAT are significantly associated with on-time graduation, while QL was not.

- The AL results in this research displayed an increased likelihood of on-time graduation. Thus, the higher the NBT AL results, the greater the possibility of timeous graduation, aligning with Rankin et al.'s (2012) research. T AL support modules are the most substantial intervention for academic success (van Rooy & Coetzee-Van Rooy, 2015). This result may align with UCT's Step-Up programme results below, which assists students in integration into university and helps them understand academic reading and reasoning.

In contrast, the NBT MAT result indicated a decreasing likelihood of on-time graduation. This outcome is surprising because prior research showed that NBT MAT was a better predictor of academic success than NSC Mathematics (Mahlobo, 2015). However, the results concur with a more recent study by Mabizela and George (2020) that argues that academic success may be attributable to the overlap of content assessed in the NBT MAT and NSC Mathematics (Mahlobo, 2015).

The outcome for QL was unanticipated. In common with NSC Mathematics and NBT MAT, QL is numerical, requiring a high level of analytical thinking to identify and solve problems in quantitative situations, which is crucial for students' success. However, this result contradicts Allers et al. (2016), who found that the QL in NBT was the major predictor of the final mark in physiology. These competing results infer that the NSC and the NBT results are not mutually exclusive but complementary and should be used to find the most appropriate placement and support for enhancing students' chances of academic success and on-time graduation.

3. ENVIRONMENTAL FACTORS AND ON-TIME GRADUATION

Astin (1993) emphasised that understanding the educational process and factors influencing academic success will be limited to students' input information unless data on the students' environment is available. The research investigated the academic development, support and financial assistance provided for UCT students and their relationship to timeous graduation.

Academic development and support: Students who enrol at SA HEIs have diverse cultures and habits and may experience difficulty dealing with personal and institutional cultures. UCT's Step-Up module helps students integrate into the HEIs' academic and social lives to improve their on-time graduation chances(UCT, 2018). This research

analysis found a statistically significant difference between students who enrolled in the Step-Up module and those who did not, insofar as the former group's likelihood of graduating on time is 2.13 times greater than unenrolled students, all else being equal.

This result concurs with studies that found a positive relationship between academic development programmes (Dukhan et al., 2016; Jansen & de Villiers, 2016) but contradicts the study by Smith, Case and van Walbeek (2014), which found that the development programmes did not improve the graduation rate. Reasons for this positive outcome may be that HEIs assisting students with academic and social integration promote their sense of belonging, incorporating them into learning groups to share their experiences and learn their peer group's cultures (Hallett, 2013). Also, students are more comfortable sharing their reflections on student assignments in support groups, promoting academic success (Glew et al., 2019). Furthermore, as this module is offered to first-year students, it enhances their critical thinking and confidence in academia, positively affecting on-time graduation. Based on this positive likelihood, all HEIs should consider introducing Step-Up type modules to all first-year students to improve timeous degree completion.

A focus on financial aid: – the purpose of financial aid is to make university studies more affordable for students without the financial means to enable them to achieve academic success. However, this study indicated that examining the odds ratio, while holding all else equal, students with financial aid were less likely to graduate timeously than students without financial aid.

Students from disparate backgrounds react differently to financial aid. International studies found that students from minority and low socioeconomic backgrounds responded positively to higher awards, improving degree completion, but increased awards did not improve on-time graduation (Chen & DesJardins, 2010; Hossler & Chen, 2017). Studies also found that high tuition fees correlate positively with students' likelihood of working while at university, and high-intensity work negatively on-time graduation (Neill, 2015; Triventi, 2014).

Students from lower socio-economic backgrounds who support their families may opt to work to supplement their income. Excessive work hours unrelated to their study field negatively affect students' timeous degree completion and undermine financial aid's

purpose (Dhunpath et al., 2017). On the other hand, student employment may be a direct consequence of the rise in tuition fees because financial aid does not always cover students' total expenses leaving them with an income gap. Providing students with additional financial aid to reduce 'out-of-pocket costs' may improve on-time graduation (Bhorat & Pillay, 2017; Dominguez-Whitehead, 2017) but redirecting these funds will defeat its purpose.

CHAPTER 6. CONCLUSION

HEIs need to know the factors associated with academic success to make informed decisions regarding the student support required to succeed academically. The principal objective of this research study was to investigate whether there is a relationship between financial aid and on-time graduation for students studying towards a Bachelor of Commerce (BCom) degree, specialising in Financial Accounting: Chartered Accountant Stream, at UCT for the period 2013 to 2018. Secondary to this purpose, the study's further aimed to investigate whether there is a relationship between financial aid and on-time graduation for accounting students at UCT, aggregated by selected variables identified in the literature.

The investigation found that students who receive financial aid are more likely to take longer than the prescribed time to graduate. In contrast, UCT GAP Aid had no association with on-time degree completion. In light of these findings and because on-time graduation is a priority, HEIs should find alternative incentives for students to graduate timeously. Another significant study result is that students enrolled in the Step-Up programme are more likely to finish on time. This suggested that improving accounting students' integration into HEIs academic and social life may better improve timeous graduation than increased financial aid.

Students' input characteristics and academic abilities at the time of university enrollment are also essential factors for on-time degree completion. This study revealed that female, younger and White students are most like to achieve on-time graduation. A significant research finding is that students with NSC Accounting have a significantly greater likelihood of on-time graduation than those with only NSC Mathematics. These results, correlated with increased enrollment numbers, indicate

that HEis should implement more specific interventions to ensure on-time degree completion for Black SA, male and older students.

HEIs are currently engaged in balancing students' attributes at the time of enrolment with the educational environment best suited for on-time graduation. Perhaps the most valuable findings of this research are that financial aid alone is insufficient to achieve students' academic success as measured by their on-time graduation, but rather that it is the interaction of various factors that shape a student's pathway to success.

1. SIGNIFICANCE OF THE STUDY

This research adds to the body of literature about accounting students' success factors that may influence their on-time graduation. More specifically, how financial aid affects students' likelihood of on-time graduation is a valuable area of research, especially with the high cost of tertiary education and increased student financial aid requests. Although much work has been done in understanding student success, this study adds value to the discussion on the interrelationship between accounting students' input characteristics, academic ability and the higher education environments on time to degree completion.

This study may further add value to discussions about the admissions policy and placements for accounting students. While the research results will reflect the nature of the particular university, the findings may also be valuable to other public HEIs that have similar admission standards and student bodies.

2. LIMITATIONS OF THE STUDY

The study poses several limitations. The first limitation is using student record data from UCT for the two accounting programmes only. Also, this investigation was limited to the variables available from such secondary data, and thus, the outcomes cannot be generalized.

Another limitation came from the choice of the analysis method. EHA models are susceptible to unobserved heterogeneity. The omission of variability between individuals may be a source of model misspecification and may lead to biased parameter estimates if they are correlated with the variables included in the model (Ampaw & Jaeger, 2012; Steele, 2005). Vermunt (2001) reckon that frailty may have a

much more significant effect in hazard models than in other types of regression models.

Lastly, using a quantitative method only is a limitation in itself. Understanding students' success is multifaceted and quantitative analysis provides only a portion of the insight into students' success as measured in on-time graduation.

3. REVISITING THE RESEARCH QUESTIONS:

Q1. To what extent does financial assistance affect students' on-time graduation?

The research analysis revealed a statistically significant negative association between Fin Aid and on-time graduation insofar that Fin Aid recipients have a decreased likelihood of timeous graduation. In contrast, the receipt of GAP Aid was not statistically significant in the study.

Q2. To what extent do students' input and environmental factors affect students' on-time graduation?

The students' input factors are fixed at the time of enrollment; thus, the academic environment is the only area that HEIs can influence to enable academic success and promote on-time graduation. The selected variables, gender, race and age, indicated a statistically significant association with on-time graduation. To the extent that males were less likely to graduate timeously than females, Black, Coloured and Indian/Asian students were less likely to graduate on time than White students, and older students were less likely to graduate timeous compared to younger students.

For the academic ability variables, the analysis found that NSC English and the type of school attended were not significantly associated with on-time graduation, while NSC Accounting and Mathematics were. The NBT QL indicated no significant association with on-time graduation. The NBT AL indicated a significantly positive association concerning on-time graduation, while the NBT MAT indicated a significantly negative one.

The environmental factors that showed significance in this study were UCT's Step-Up programme which had a statistically positive association with on-time graduation. All else being equal, his finding indicates that enrollment in the module assists students with academic development and integration into the university's academic and social life. Fin Aid had a statistically negative association, and GAP Aid had no statistically significant association with on-time graduation. The negative association of financial aid may be attributable to (1) the insufficient size of the award, compelling students to work to supplement their tuition costs or (2) students diverting some financial aid to

alleviate their families' poverty. Both assumptions lead to recommendations for future research.

4. FUTURE RESEARCH

It would be worthwhile to investigate whether further research would produce similar results using data from all student enrollments in the Faculty of Commerce and even for the broader HEIs' enrolments to inform policy decisions and support interventions.

The institution may benefit from future mixed methods research, examining which factors affect on-time graduation from the institution and students' perspectives. Exploring what UCT is doing well and what environmental factors improve or impede students' academic success from students' points of view may provide a wealth of information for future policy decisions.

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APPENDICES

APPENDIX 1 - ETHICS APPROVAL

Faculty of Commerce

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04th June 2019

Ms Lily Roos
College of Accounting
University of Cape Town

Dear Ms Roos

REF: REC 2019/000/048

SOUTH AFRICAN STUDENT SUCCESS: THE IMPACT OF FINANCIAL AID ON TIME TO COMPLETION

We are pleased to inform you that your ethics application has been approved. Unless otherwise specified this ethical clearance is valid for 1 year and may be renewed upon application.

Please be aware that you need to notify the Ethics Committee immediately should any aspect of your study regarding the engagement with participants as approved in this application, change. This may include aspects such as changes to the research design, questionnaires, or choice of participants.

The ongoing ethical conduct throughout the duration of the study remains the responsibility of the principal investigator.

We wish you well for your research.

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APPENDIX 2 - TABLES and FIGURES

Table 17: Collinearity Diagnostics – VIF

VARIABLE	VIF	SQRT VIF	TOLERANCE	R-SQUARED
ACTNGrde12Rslt	1.33	1.15	0.7505	0.2495
MathGrd12FinRslt	2.36	1.54	0.4230	0.5770
EngGrd12FinRslt	1.24	1.11	0.8075	0.1925
NBTALScore	1.50	1.23	0.6664	0.3336
NBTQLScore	1.73	1.32	0.5776	0.4224
NBTMathScore	2.38	1.54	0.4201	0.5799
Mean VIF	**1.76**			

Table 18: Deviance statistics

Model:	Model C(2) with interaction terms	Model C(2) without interaction terms	Difference
N:	2868	2868	0.0000
Log-Lik Intercept Only	-1025.8310	-1025.8310	0.0000
Log-Lik Full Model	-862.0290	-864.6840	2.6550
D	1724.057(2846)	1729.368(2849)	5.310(3)
LR	327.605(21)	322.295(18)	5.310(3)
Prob > LR	0.0000	0.0000	0.1500
McFadden's R2	0.1600	0.1570	0.0030
McFadden's Adj R2	0.1380	0.1390	0.0000
ML (Cox-Snell) R2	0.1080	0.1060	0.0020
Cragg-Uhler(Nagelkerke) R2	0.2110	0.2080	0.0030
McKelvey & Zavoina's R2	0.2960	0.3000	-0.0040
Efron's R2	0.1230	0.1180	0.0050
Variance of y*	4.6740	4.7010	-0.0270
Variance of error	3.2900	3.2900	0.0000
Count R2	0.8860	0.8840	0.0020
Adj Count R2	0.0120	-0.0090	0.0210
AIC	0.6160	0.6160	0.0000
AIC*n	1768.0570	1767.3680	0.6900
BIC	-20934.0020	-20952.5760	18.5740
BIC'	-160.4170	-178.9910	18.5740
BIC used by Stata	1899.2080	1880.6340	18.5740
AIC used by Stata	1768.0570	1767.3680	0.6900

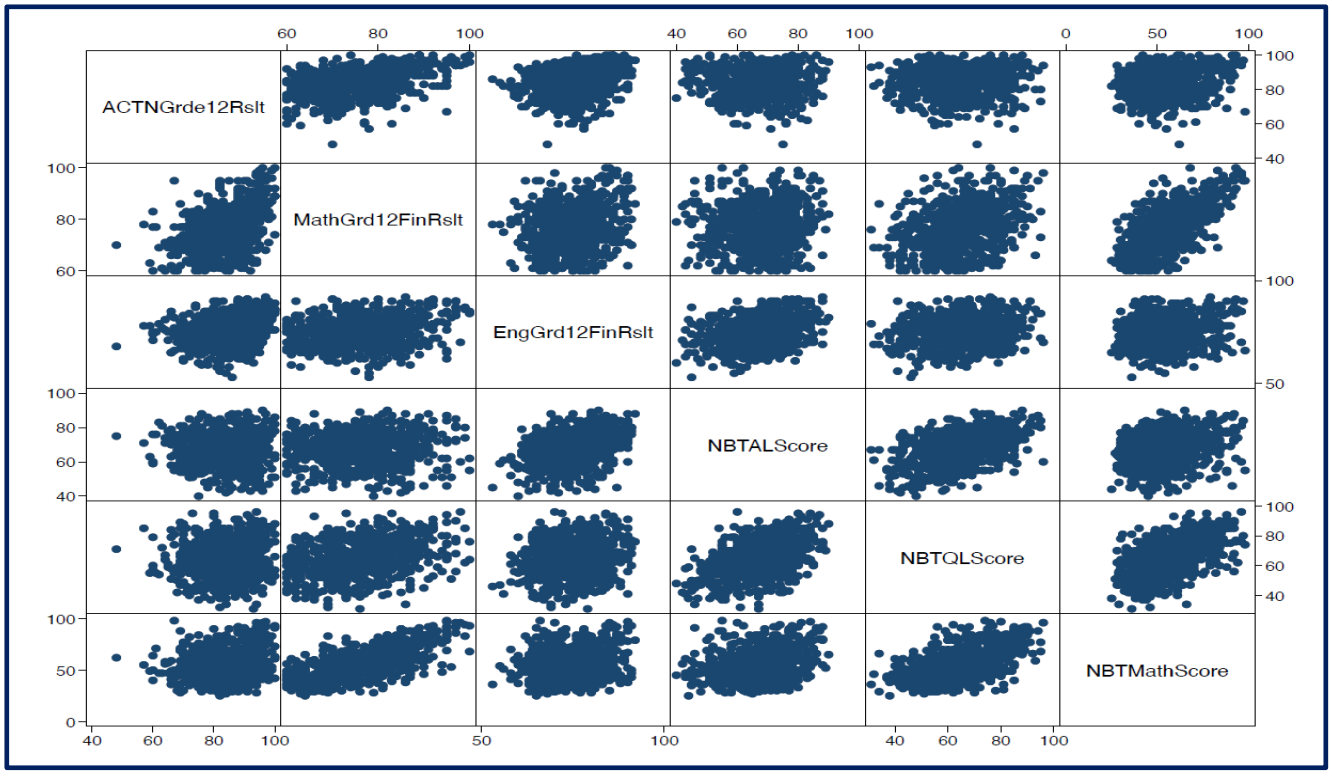

Figure 2: Collinearity Diagnostics - Scatterplots for NSC Results and NBT Scores

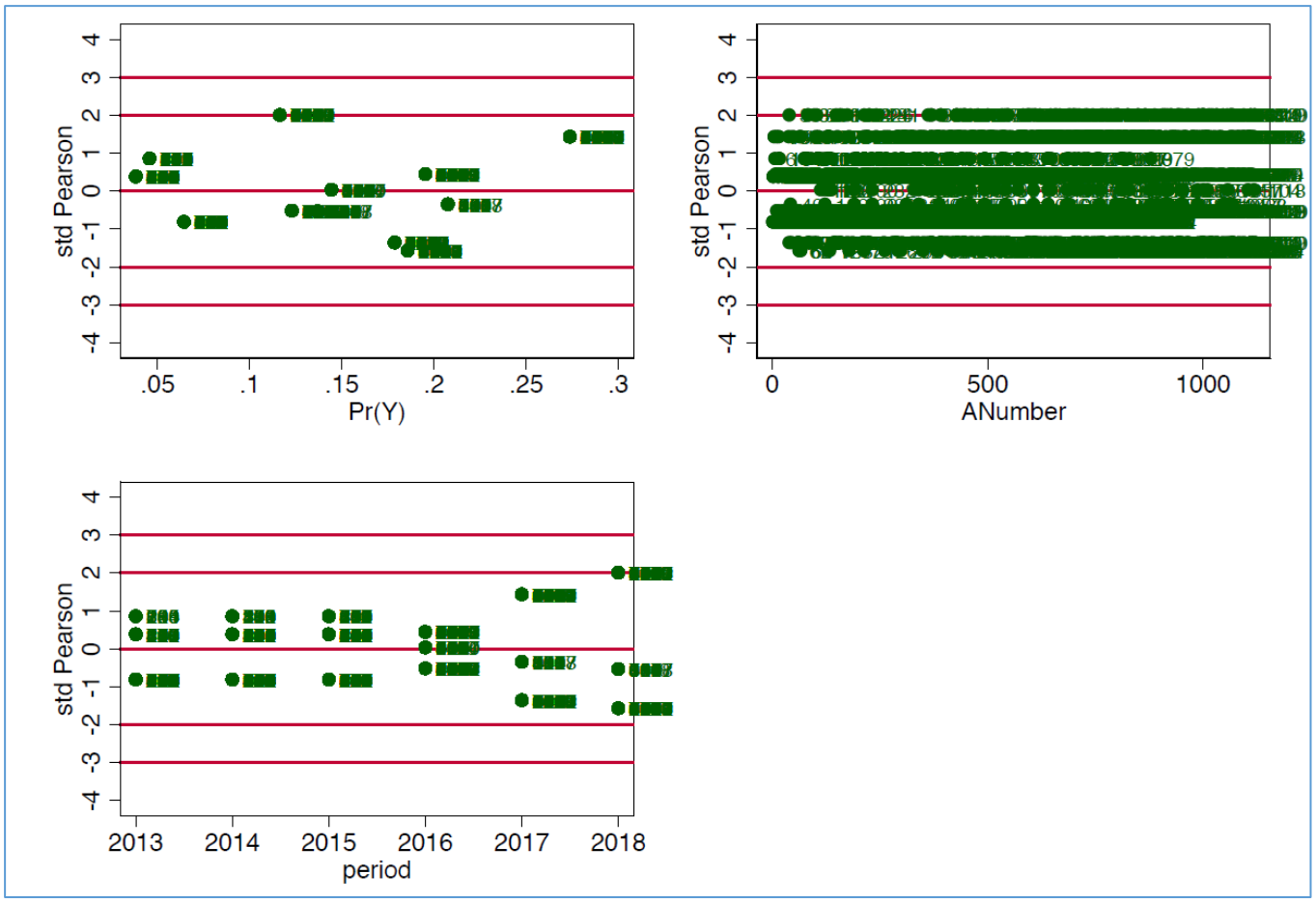

Figure 3: Scatterplots - Pearson residuals

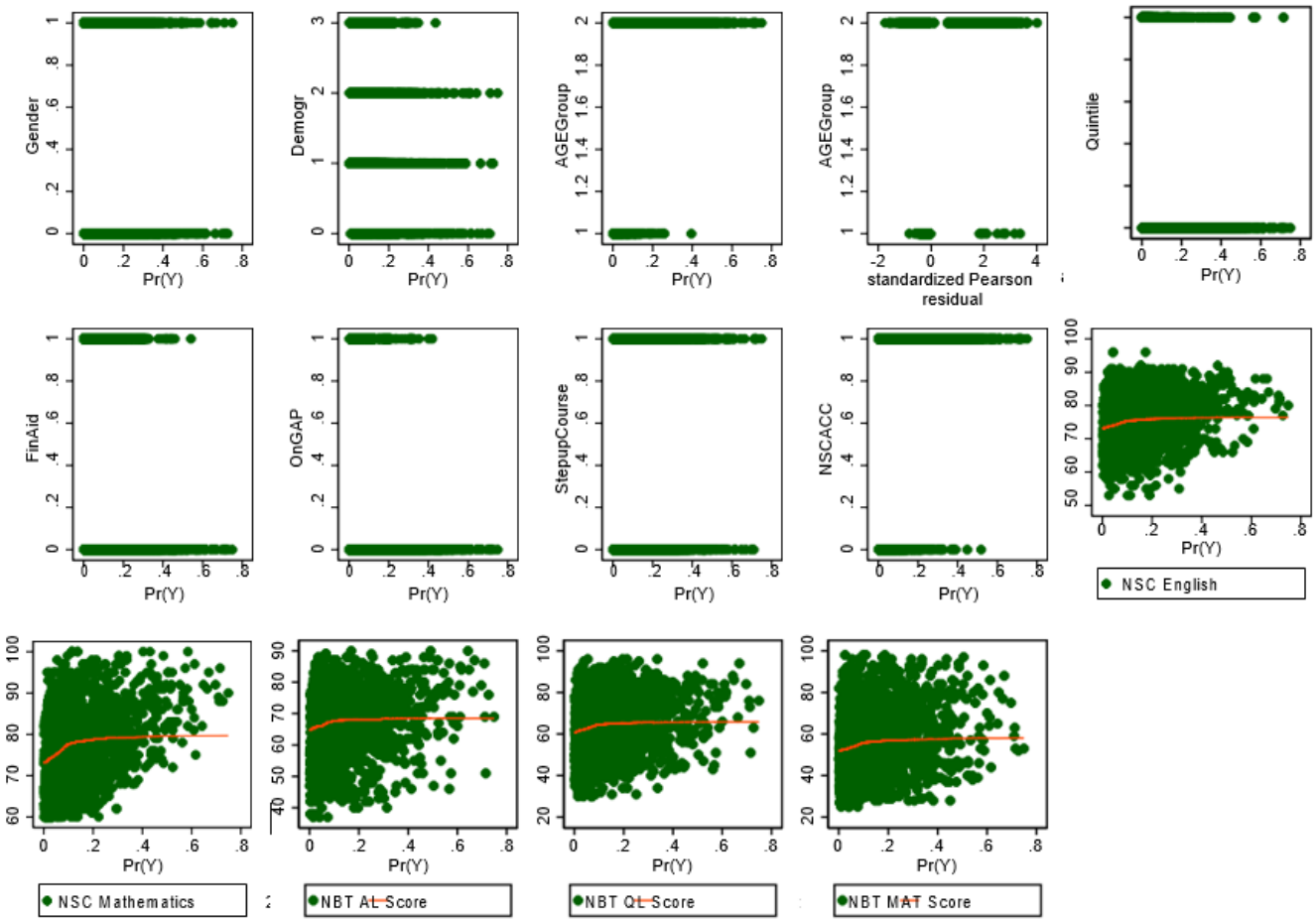

Figure 4: Linearity – Scatter plots and Regression plots