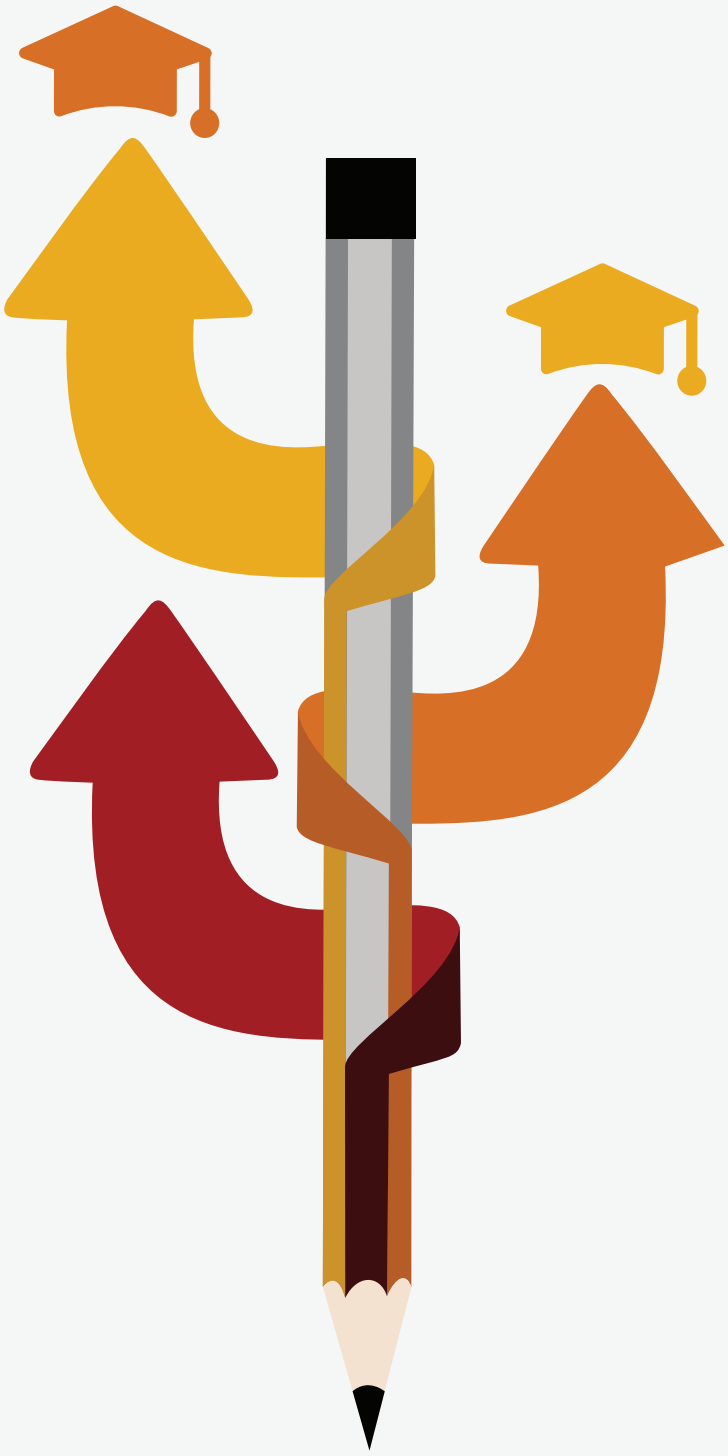
NSFAS
National Student Financial Aid Scheme

NSFAS Research Report 07:

IMPACT OF FUNDING ON ACADEMIC PERFORMANCE: An exploration of two South Africa universities



NSFAS Research Report 07:

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The National Student Financial Aid Scheme (NSFAS) research reports contain original research designed to inform and improve internal NSFAS operational efficiency to inform the wider stakeholder community, as well as forming the base for policy proposals. This report is based on analysis conducted within the NSFAS Academic Performance Project, in addition to a consideration of contributions to relevant literature and policy debate.

In this report the reader will find:

- Information on the academic performance profile of NSFAS and non-NSFAS funded students in the 2018 academic year at two historically advantaged universities.
- Information on institutional and other differences in academic performance of NSFAS and non-NSFAS funded students.
- Multi-variate exploration of the correlation between being NSFAS funded and average academic performance.

Summary findings:

- The study confirmed that the lower the age, the higher the average academic performance. When this overarching finding was considered by funding status, it was interesting to find that this effect is most pronounced for NSFAS funded students;
- The study confirmed a negative correlation between being male and average academic performance at an aggregate level. When funding source is considered, it becomes clear that this negative effect is also most pronounced for NSFAS funded students;
- The study confirmed that a full-time student is significantly and positively associated with average academic performance, in comparison to a part-time or special/external student. This effect is significantly most pronounced for NSFAs funded students;
- At an aggregate level we found Humanities and Science, Engineering and Technology (SET) students to perform better than Business and Commerce students. When funding status is taken into account, we found inconsistent effects on performance in the Business and Commerce and Humanities field, where as SET students, regardless of funding status there is a positive correlation with average academic per formance. It is interesting to find that self-funded students in Business and Commerce and Humanities appear to struggle in terms of performance.

Prepared
By: Research and Policy
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1. Introduction and Background

Education is an important driving force for economic and social development[1]. Investment in education has the potential to create much bigger pools of qualified people with the knowledge and skills required to contribute significantly to the development of the country[2]. While the contribution specifically, of higher education to development has been contested over time, it is irrefutable that improving the overall levels of education of a country is a necessary condition for improved levels of development. In addition, from a social transformation perspective, access to university education is still seen as one of the key mechanisms to achieve social mobility[3].

Growing investment in higher education continue to push the debates on cost benefit, impact and value for money, into the forefront of political discourse. The massification of higher education, arguably intensifies this interest increasing access to higher education, and growing levels of participation has also brought other phenomena with implication for throughput and success rates (for example, the increasing diversification of the student populations).

While we acknowledge that measuring the value of higher education, both at an individual- and aggregate state-level, is a complex endeavour, such investigation remains necessary[4]. The National Plan for Post-School Education and Training (PSET) maintains that within the higher education environment, throughput and success remains a priority[5]. It is important to uncover for example, faculty and/or demographic inequalities in the way in which students are served at different institutions. Thus, academic performance, as an indicator of the effectiveness of the higher education system and the impact of government financial support, remains an important issue for countries.

This further aligns with growing policy concern on improving our understanding and contributing to more robust measures to gauge the impact and effectiveness of NSFAS funding in South Africa. While in the South African context, there is growing understanding in relation to academic success (proxied by graduation and retention) of publicly funded students in comparison to self-funded students, there exists a gap in understanding the relationship between funding and achievement (proxied by individual academic score). In addition, as it has been noted internationally, there has been little systematic research which examines funding as a predictor of academic success, alongside other variables. This research report contributes to both these gaps in that it analyses government funding through NSFAS (which constitutes the biggest proportion of funding of PSET in South Africa) as a predictor of academic achievement, alongside the influence of other notable variables.

2. LITERATURE

In order for us to adequately contextualise the contribution, it is necessary to understand:

1. Current policy discourse and development with relevance to the allocation of funding to students for further and higher education in South Africa.
2. Extant knowledge on the predictors of academic performance at university.
3. Extant knowledge on the link specifically between public funding and academic performance at university.

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[1] Guo, L., Huang, J., & Zhang, Y. (2019). Education Development in China: Education Return, Quality, and Equity. Sustainability, 11(13), 3750. 1-20.

[2] DFID (2006). The Importance of secondary, vocational and higher education to development. Briefing, a DFID Practice Paper, Policy Division Info Series No. 097. DFID, London

[3] Rolfe, H. (2017). Inequality, Social Mobility and the New Economy: Introduction. National Institute Economic Review, 240(1), R1–R4.

[4] Blagg, K., & Blom, E. (2018). Evaluating the return on investment in higher education. Urban Institute (September 2018), https://www. urban. org/sites/default/files/publication/99078/ evaluating_the_return_on_investment_in_ higher_education.pdf.

[5] DHET (Department of Higher Education and Training). (2017). National Plan for Higher Education and Training. Retrieved from https://slideplayer.com/slide/17820667/

2.1 Current policy discourse and development with relevance to the allocation of funding to students for further and higher education in South Africa

The NSFAS was established in terms of the National Student Financial Aid Scheme Act 56 of 1999, with the 2019/2020 financial year marking the 27th year since NSFAS was established. It is the mandate of NSFAS to administer financial support to poor and academically deserving students to gain access to higher and further education institutions. Following widespread student protests between 2015 and 2016, in December 2017, former President Jacob Zuma announced that government will subsidise free higher education for poor and working-class students[6].

A set of new principles for the allocation of Department of Higher Education and Training (DHET) funding was thus introduced for new entrants to the post-school education and training (PSET) system in South Africa for the academic year 2018, and thereafter. The new scheme changed the landscape of financial support for poor and working-class students wishing to access PSET in two main ways. Firstly, the former loan and bursary scheme was changed to a pure bursary scheme with no repayable loan component. Secondly, it redefined the financial definition of poor and working-class students from those with a household income of less than R122,000 to ones with household income up to R350,000.

In 2019 NSFAS funded more than 550 000 students at TVET colleges and universities[7]. Government has also set aside more than R80 billion for the next three years to ensure that prospective students from poor and working-class families have access to funding for further and higher education. This is a massive investment and an important policy lever to transform, not only participation in further and higher education, but also access to the labour market. Considering the scale of government investment and commitment to post-school education and training, a continual appraisal of the efficacy of the funding policy on the measures of learning outcomes and performance in terms of grade/score, retention and through put amongst other things, remains important.

2.2 Extant knowledge on the link between public funding and academic performance at university

a. The predictors of academic performance at university

The literature considering the predictors of academic performance or success at university can be grouped into four broad areas: 1) those that consider academic predictors, 2) those that consider psychosocial predictors, 3) those that consider individualised cognitive appraisal as a predictor and lastly, 4) those that consider demographic predictors. Even in these areas there are institutional, regional and country specific findings. For example, while the literature has shown support for the relationship between previous academic performance (such as matric score) and university performance[8, 9, 10], the predictive capacity is found to be different for different individuals, age groups and locations, and country-specific differences are also evident. For example, that Grade Point Average only explained 30% in the variation in academic performance in first year students in an Oregon State University study[11]. Relatedly, authors have also found lecture attendance, language proficiency and study habits to be predictors of student success[12].

[6] Mailovich, C. (2018). Where is Zuma getting the money for free higher education from, asks SACP. Retrieved from: https://www.businesslive.co.za

[7] National Student Financial Aid Scheme (NSFAS) (2019) Press Release: NSFAS 2020 Applications official opening. 2 September.

[8] Power, C., Robertson, F., & Baker, M. (1987). Success in higher education. Canberra: Australian Government Publishing Service.

[9] Bratti, M., & Staffolani, S. (2002). Student time allocation and educational production functions, HEW 0207001. Economics Working Paper Archive at WUSTL, Washington University, Washington.

[10] McKenzie, K. & Schweitzer, R. (2001) Who succeeds at university? Factors predicting academic performance in first year Australian university students. Higher education Research and Development, 20 (1): 21 – 33..

[11] Shoukat, A., Haider, Z., Munir, F., Khan, H. & Ahmed, A. (2013) Factors contributing to the students academic performance: A case study of Islamia University Sub-Campus. American Journal of Educational Research 1, No. 8: 283 – 289.

[12] Delaney, L., Harmon, C., & Ryan, M. (2013). The role of noncognitive traits in undergraduate study behaviours. Economics of Education Review, 32, 181-195.

Furthermore, a large part of the literature suggests the importance of student integration into the university as a predictor of academic success, but this has also been recently challenged in that research is starting to suggest that high levels of integration into the university culture can actually have negative implications for academic performance[13]. Other research work has confirmed that while engagement patterns might be reliable predictors of academic performance in other countries, within the South African context "the trends across race and gender suggest that engagement and academic performance remain differentiated along race and gender[14]".

A student's educational success is also found to be heavily contingent on the social status of their parent's[15, 16]. This tends to be related to the type of schools from which students come, which greatly influences educational performance and academic achievement[17]. While McKenzie and Schweitzer (2018)[9] make a distinction between the impact of demographic and psychosocial predictors of success, within the South African context, it is very difficult to test these factors independently. Studies looking exclusively at demographic characteristics as predictors have reported inconsistent results[18, 19, 20].

The collinearity of these factors is illustrated, for example where Carlson (2006)[21], within the American context, found that African-American males from disadvantaged families will have poorer academic performance than White males. These outcomes are further compounded by the fact that African-American students tend to come from poor communities with lower standard of schooling. Given the continued confluence of race and socio-economic status and its impact on education outcomes within the South African context[22], it is likely that our analysis will find similar relationships.

A final part of the literature concentrates on the internal psychological predictors of success and here the assertion is that high levels of self-efficacy tend to be predictive of university grades[9]. However, the complex interaction between performance, self-efficacy, motivational and cognitive variables, have been highlighted as an area that requires more longitudinal research to unravel[23].

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[13] Beck, K.A., Joshi, P., Nsiah, C. & Ryerson, A. (2014) The impact of sociability on college academic performance and retention of Native Americans. Journal of American Indian Education, 53 (1), 23 – 41.

[14] Schreiber, B. & Yu, D. (2016) Exploring student engagement practices at a South African university: Student engagement as reliable predictor of academic performance. South African Journal of Higher Education (SAJHE), 30 (5), 157 – 175.

[15] Graetz B, (1995) Socio-economic status in education research and policy. In: Ainley, J. et al. Socio-economic status and school education. DEET/ACER. Australian Council for Educational Research. Canberra: Australian Government Public Service.

[16] Considine, G. & Zappala, G. (2002). The influence of social and economic disadvantages in the academic performance of school students in Australia. Journal of Sociology, 38, 129.ISBN 0644359919.

[17] Miller, W.P and Birch, R.E. (2007). The influence of type of high school attended on university performance. Retrieved from http://www3.interscience.wiley.com/journal/118538313.

[18] Sothan, S. (2019). The determinants of academic performance: evidence from a Cambodian University. Studies in Higher Education, 44(11), 2096-2111.

[19] Dika, G., & Belay, A. N. Y. J. A. Determinants of University Student's Academic Achievements and Gender Differences: The Case of Addis Ababa University Main Campus. Journal of Culture, Society and Development, Vol.37, 1-8.

[20] Danilowicz-Gösele, K., Lerche, K., Meya, J., & Schwager, R. (2017). Determinants of students' success at university. Education economics, 25(5), 513-532.

[21] Carlson, C. W. (2019, September 24). Academic Performance of Students Who Receive Need-based Financial Aid. OTS Master's Level Projects & Papers. 108. Retrieved from https://digitalcommons.odu.edu/ots_masters_projects/108.

[22] Kruss, G. & Wildschut, A. (2015): How does social inequality continue to influence young people's trajectories through the apprenticeship pathway system in South Africa? An analytical approach, Journal of Education and Work. doi:10.1080/13639080.2015.1076157

[23] Honicke, T. & Broadbent, J. (2016) The influence of academic self-efficacy on academic performance: A systematic review. Educational Research Review, 17, 63 – 84.

b. The link between funding and academic performance at university

Literature examining this link uses various proxies and this makes the comparison and clear interpretation of the link, sometimes problematic. Thus, in much of the international[24, 25] and national[26, 27] research, the overarching conclusion has been that the relationship between student funding and academic performance or success is unclear. Some studies have found a relationship, while others did not[28] , and there are those that suggest within the context of other contributing factors, a negative relationship[24].

Coonrod (2008), examining the impact of student loans, found a positive relationship between financial aid amount and academic performance. The assertion is that students who take out loans will understand that the money is not a gift, which means they must work hard to complete and repay the amount. This impact is also alluded to in Van der Berg (2017: 12)[21] where he asserts that the loans granted through NSFAS (at that time) likely present "an incentive to poor students, who are from weak academic backgrounds, to persevere".

The year 2018 represents an important departure point for NSFAS as from 2018 the Scheme only grants bursaries to students. It would be important to continuously assess the impact of this policy departure on student success, especially given Van Der Berg's (2017) assertion that a loan, rather than a bursary scheme, is important for providing this incentive to achieve.

However, amidst significant and growing investment through public funding in higher education, there is paucity in the literature on student funding, bursary allocations and bursaries in general with respect to South Africa and concomitantly the 'impact' of that funding.

Mngomezulu et al (2017) found that one of the factors which seems to contribute to the poor academic performance of funded students within the South African context, is the choices students make when faced with competing demands on the limited funds they have. The authors point out that whilst students' academic success can be undermined on different fronts, another set of challenges relate to the psycho-social impact of being publicly funded. This aligns with earlier sentiments of authors such as Koen et al. (2006)[29] who argue that disadvantaged students do not fail only because of financial issues, they also face significant challenges in coping with the academic programme. Part of the problem is that students from poorer households often suffer from poor quality basic education which poorly prepares them for advanced studies at university.

A more recent contribution by Naidoo and McKay (2018) suggests no relationship between funding and performance, proxied by graduation, in one South African university. As expected though, students receiving merit bursaries yielded best results. These are students who generally have good performance results, as the eligibility criteria for gaining access to these bursaries is good matric results. Thus, a strong relationship exists between the amount of funds allocated for merit bursaries and academic performance. The study does however confirm a link between drop out and financial difficulties in finding that 50 per cent of students who drop out of higher education institutions do so for financial reasons.

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[24] Berlanga, V., Figuera, P. & Escoda, N.P. (2016) Academic performance and persistence of study bursary holders. Revista De Cercetare Si Interventie Social, 54, 23 – 35.

[25] Harrison, N. Davies, S. & Waller, R. (2018) Access, participation and capabilities: Theorising the contribution of university bursaries to students' well-being, flourishing and success. Cambridge Journal of Education, 48 (6), 677 – 695.

[26] Mngomezulu. S. (2017). Does financial assistance undermine academic success? Experiences of 'at risk' students in a South African university. Journal of Education, 68. Retrieved from http://joe.ukzn.ac.za.

[27] M McKay, T., Naidoo, A. & Simpson, Z. (2018) Exploring the challenges of first-year student funding: An intra-institutional case study. Journal of Student Affairs in Africa, 6(1), 19 – 32.

[28] Weaver, A.E. (2013) The relationship between students' financial responsibility for college and levels of academic motivation and success. Ohio: Ashland University

[29] Koen, C., Cele, M., & Libhaber, A. (2006). Student activism and student exclusions in South Africa. International Journal of Educational Development, 26(4), 404-414.

In sum then, there is quite an established set of literature which focuses on the more favourable outcomes for government funded students in comparison to non-funded students in terms of retention, drop-out and graduation in South Africa. A recent contribution[30] suggests further positive impacts even for labour market absorption of NSFAS-funded graduates. While the overarching positive impact of NSFAS funding has become a dominant narrative within the South African discourse, authors caution that there remains very poor overall throughput within the South African higher education system[31] [32]. Clearer understanding of the factors contributing to better throughput, is necessary.

3. METHODOLOGY

3.1 Sample and data

The South African higher education system consists of 26 universities. The data for this study was obtained from two of these institutions: Rhodes University (Rhodes) and the University of the Witwatersrand (Wits).

Two classifications of universities are routinely used within the South African context. The first classification distinguishes three university types:

1) *Traditional*, which refers to those institutions that offer basic formative degrees and at postgraduate level, offer honours degrees, and a range of masters and doctoral degrees.
2) *Universities of technology*, which are those institutions that tend to offer mainly vocational or career-focused undergraduate diplomas, the BTech and a limited number of masters and doctoral programmes; and
3) *Comprehensive universities* offer programmes typical of universities and universities of technology.

Universities have also been differentiated in terms of the historical legacy of the apartheid system, as historically white or advantaged universities (HWUs/HAUs) and historically Black or disadvantaged universities (HBU/HDUs). Based on this categorisation, both universities would be classified as HAUs. A notable difference is that the University of Witwatersrand is located in a major urban metropole, while Rhodes is based in an arguably more rural setting.

Each of the institutions supplied us with essentially three separate datasets. The datasets contain records of a total of all actively registered students at each university for the 2018 academic year (this amounted to a total of 48 141 records). For Wits the total amount of entries was recorded as 39 951 and for Rhodes a total of 8 190 was recorded. The total data consisted of information for undergraduate and post-graduate students.

The first dataset contained student information alongside performance scores for 2018. The second dataset added more detailed information on the course the student was registered for, and the final dataset provided bursary detail for each student. Merging the three datasets into a novel dataset thus allowed exploration of the relationship between different types of funding support and academic performance.

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[30] Wildschut, A., Rogan, M. & Mncwango, B. (2019) Transformation, stratification and higher education: exploring the absorption into employment of public financial aid beneficiaries across the South African higher education system. Higher Education. Advance online publication: https://doi.org/10.1007/s10734-019-00450-z.

[31] Chetty, R. & Pather, S. (2015) Challenges in Higher Education in South Africa. In: Condy, J. (eds). (2015) Telling stories differently: Engaging 21st century students through digital story telling. Condy, J. (eds). African SUN MeDIA: Sun Press. ISBN 978-1-920689-85-8.

[32] Maree, J.G. (2015) Barriers to access to and success in higher education: Intervention guidelines. South African Journal of Higher Education (SAJHE), 29 (1), 390 – 411.

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A few clarifications of the final data and analysis must be outlined:

• The analysis focuses only on under-graduate (UG)[33] students (excluding 36% of the student data submitted for Wits and 30.8% for Rhodes)
• The analysis focuses only on South African students[34] (excluding 3.5% of the data submitted for Wits and 13% for Rhodes)[35].

Methodologically, the study thus involved an analysis of 29 637 (24 698 at Wits and 4 921 at Rhodes) students registered at two South African universities for the 2018 academic year. While previous work looked at the impact of funding types on performance, using graduation rates as the proxy, this is a cross-sectional investigation, looking at the impact of funding on performance, proxied by the average individual academic mark for the year.

The flow charts below illustrate the data cleaning and management decisions and the resulting sample for analysis.

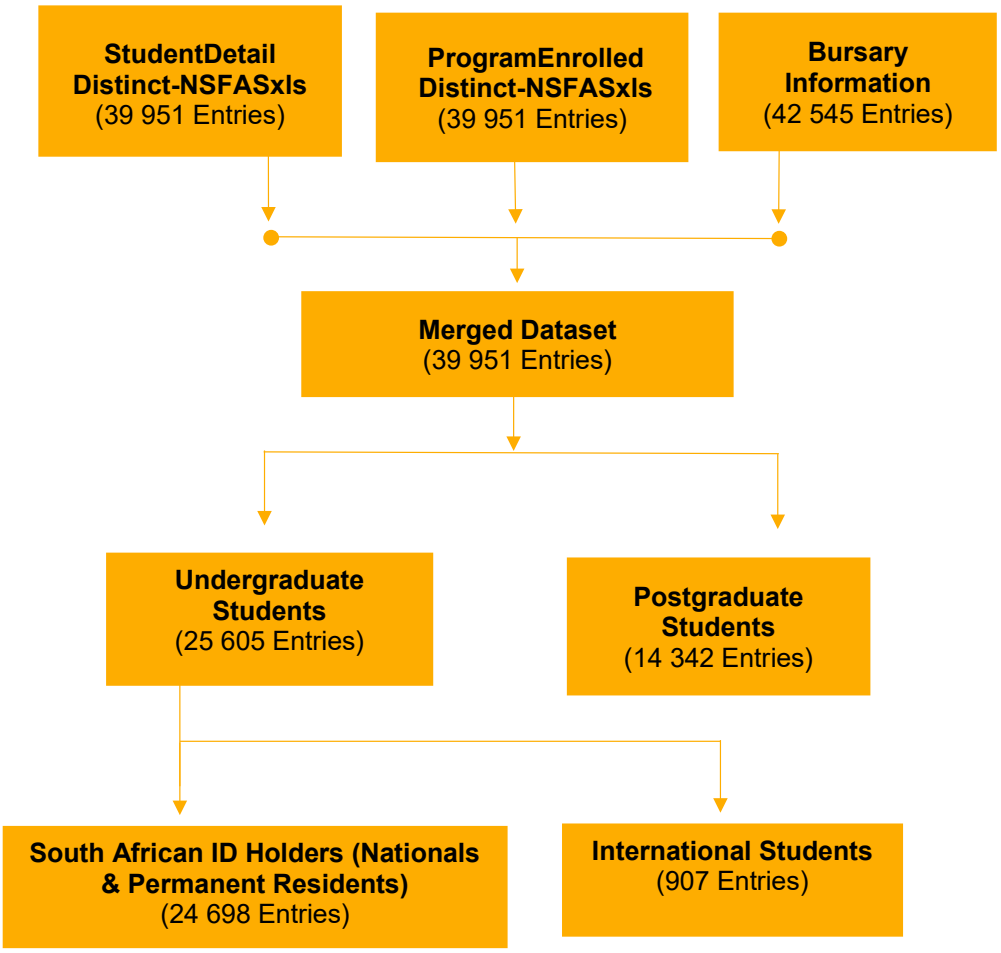

Figure 1: Flow chart for Data Management of WITS-NSFAS datasets

[33] Annual grade scores are not computed for post-graduate students.

[34] Could not establish gender and age for these students as the method to do so relies on the ID number of a student.

[35] South African nationals and permanent residents comprise 96.5% of total undergraduate students who were enrolled in 2018.

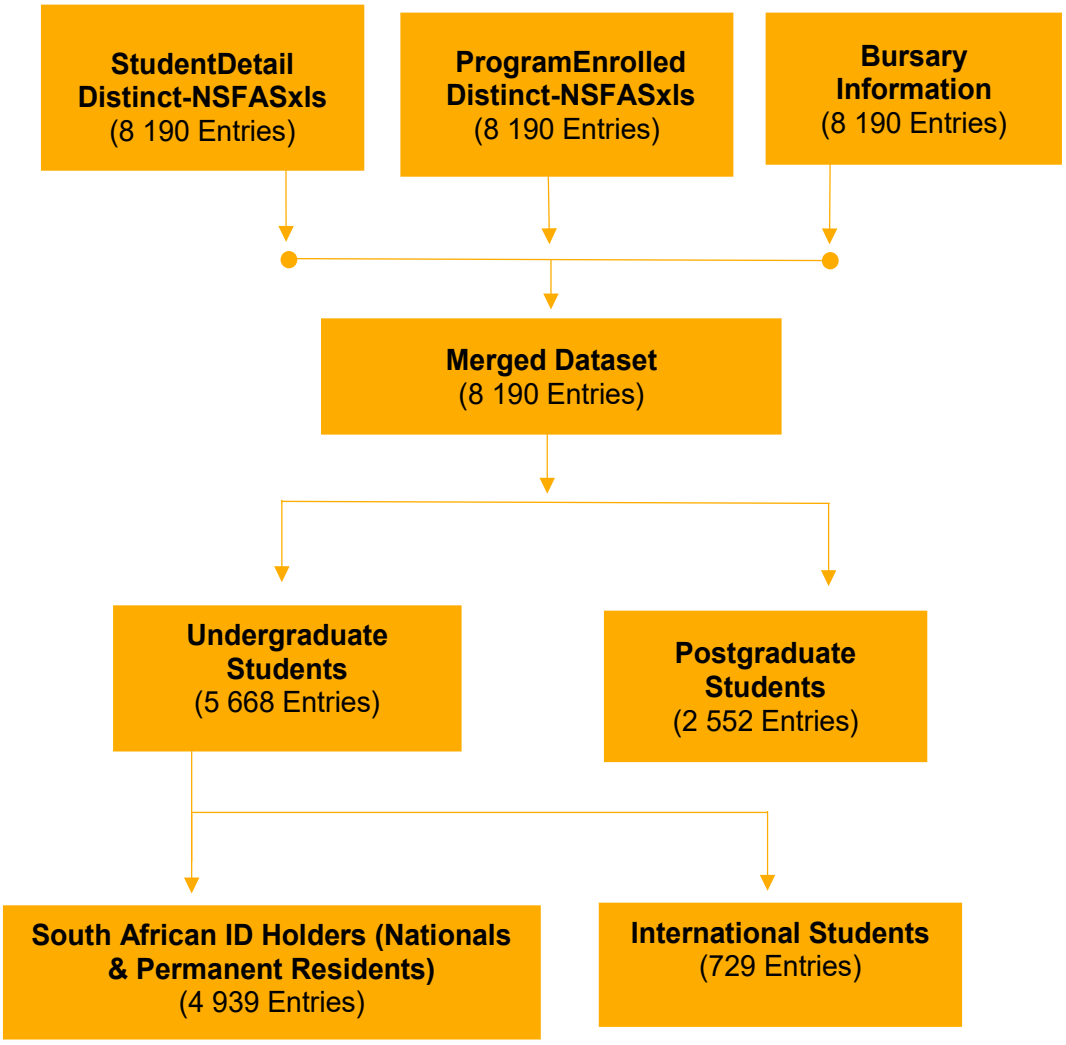

Figure 2: Flow chart for Data Management of WITS-NSFAS datasets

3.2 Variables

Academic performance is the *dependent or outcome variable*, and it is proxied in this study by the average annual individual score. The average annual individual score is generated by dividing the total score achieved by the number of courses/modules taken during the academic year. It is in continuous form. While acknowledging the limitations of this measure, given differential grading practices across faculties[36], this represents a reasonable quantitative measure of performance. Grade or score is also a predictor of likely retention or graduation.

The major *independent variable* was the type of funding received by the student. This variable had three possible statuses: National Student Financial Aid Scheme (NSFAS) bursary, self-funded and other bursaries, which each is represented by a dummy i.e. yes=1 and No=0. Other independent variables are; age, gender (0 = female, 1 = male), mode of attendance, field of study[37], year of study (1= year 1, 2= year 2, 3= year 3, 4= year 4, 5= year 5, 6= year 6) and name of institution (1= University of Witwatersrand, 0= Rhodes University).

[36] Lei, P. W., Bassiri, D., & Schultz, E. M. (2001). Alternatives to the Grade Point Average as a Measure of Academic Achievement in College. ACT Research Report Series.

[37] We use the categorisation suggested by CHE (2013) in their vital stats publication where 20 CESM categories are divided into four broad fields or areas of study in the following way: 1. Science, Engineering and Technology (SET): CESM 01, 02, 06, 08, 09, 10, 13, 14, 15 & 16 2. Business & Commerce (B&C): CESM 04 3. Humanities (Hum): CESM 03, 05, 11, 12 ,17, 18, 19 & 20, and 4. Education (Ed): CESM 07.

Table 1: Summary of variables

Variable	Description	Type of variable
Academic Performance	Grade, average score for the 2018 academic year	Continuous
Gender	Gender of student (0 = Female, 1 = Male)	Categorical/ Nominal
Age	Age of student as at the end of 2018	Continuous
Mode of attendance	Mode through which student attend classes. (1= External/Special; 2= Full Time; 3= Part Time)	Categorical
Field of Study	Field of study which student is enrolled in. (1= Science; Engineering and Technology; 2= Business & Commerce; 3= Humanities; 4= Education)	Categorical
Year of study	Total number of years that have been spent in the university (1= year 1; 2= year 2; 3= year 3; 4= year 4; 5= year 5; 6= year 6)	Categorical
Institution	Name of Institution where student is enrolled. (1= University of Witwatersrand, 0= Rhodes University)	Nominal
NSFAS Funded	If student is funded by NSFAS (0= No; 1= Yes)	Nominal
Other Funding	If student is not funded by NSFAS but has other internal or external funding sources (0= No; 1= Yes)	Nominal
Self-funded	If student academic study is self-funded (0= No; 1= Yes)	Nominal

3.3 Analytical techniques

The data obtained was analysed using both descriptive and inferential statistics (Analysis of Variance, Correlation and Ordinary Least Square Regression).

Descriptive
Descriptive statistics are used to describe the basic features of the data and the sample constituted for the study; it provides simple summaries about the sample. The statistics include frequency distribution, mean, median, mode and tables.

Analysis of Variance
A One-Way Analysis of Variance (ANOVA) is used when there is a need to test for differences in the means of the dependent variable broken down by the levels of the independent variable. In this case the categorical independent variable (with two or more categories) and a normally distributed interval dependent variable. Specifically, the method is used to test the difference between two groups. In this report, a one-way ANOVA test was used to determine whether average academic performance differed based on selected demographic and academic variables and being a recipient of NSFAS funding or not.

Bivariate correlation
A correlation is used when there is an aim of examining the linear relationship between two (or more) normally distributed interval variables or between a dichotomous variable and a continuous variable. In other words, it is a test to ascertain whether there is a relationship between one or more variables, as well as the direction of that relationship (positive or negative). If a positive relationship is found this means that an increase/decrease in the dependent variable is related to an increase/decrease in the independent variable. If a negative relationship is found, this means that an increase in the dependent variable is related to a decrease in the independent variable, and vice versa. In this report the linear relationship between average academic performance (grade) and being a recipient of NSFAS funding and other characteristics were explored.

Multiple linear regression
Multiple linear regression is a predictive analysis which is used to explain the relationship between one continuous dependent variable and two or more independent variables. First, it can be used to identify the nature of the effect that an independent variable has on a dependent variable as well as understanding how much the dependent variable change when there is change in any of the independent variables. In this report, we explore, among other things, the nature of effect and the magnitude of being a recipient of NSFAS funding on average academic performance. The statistical analyses were performed using the Statistical Package for Social Sciences (SPSS).

4. RESULTS

4.1 Summary of characteristics of data

In this section, a descriptive analysis relating to selected variables like gender, age, faculty, year of study and institution is undertaken, drawing on WITS and RU data.

The University of Witwatersrand sub-sample is constituted as follows. Of the 24 698 students who enrolled in 2018, the majority are female and full-time registered students accounting for roughly 55.5% and 93.6% respectively. Students in the SET field accounted for the majority of the sub-sample (51.4%), followed by a substantial proportion in the Humanities (22.7%), Business and Commerce (14.2%) and the smallest proportion in Education (8.7%). In terms of funding, only 26.3% of 2018 registered students at WITS were funded by NSFAS, while the remaining are either funded by other funding sources or were self-funded. The majority of students enrolled at WITS are first year students (35.7%), with the proportions falling monotonically as the year of study increases. The mean score for this university was recorded at 57.1.

The Rhodes sample is constituted as follows. Most of the students were female (62%), first year (33.8%) and full-time students (91.3%). At Rhodes, students in the Humanities field accounted for the majority of the sub-sample (46.2%), followed by a substantial proportion in the SET field (24.9%), Business & Commerce (16.8%) and the smallest proportion in Education (12.1%). In terms of funding, 36.2% of 2018 registered students at Rhodes were funded by NSFAS, while the remaining are either funded by other funding sources or were self-funded. The mean score for this university was recorded at 55.8.

On average students in the sample are around 22 years of age. On average Wits students perform better than Rhodes students (57% average score compared to 55%). In terms of gender, the majority of the sample was female (56%). Compared to the over-all sample, females are over-represented in the Rhodes sub-sample, whereas the female representation in the Wits sub-sample is consistent with the overall study sample.

Furthermore, the largest proportion of students are enrolled in the SET field (47%) followed by Humanities (26.6%), a notable proportion in Business and Commerce (17.2%) and the smallest proportion in the Education field (9.3%). SET students are over-represented in the WITS sub-sample and significantly under-represented in the Rhodes sub-sample. The representation of students in the BCM field in the sub-samples is similar to the total population. Students in Humanities are slightly under-represented in the WITS sub-sample, but quite substantially over-represented in the Rhodes sub-sample. While for Education, the WITS sub-sample's proportional representation is largely consistent with the over-all sample, Rhodes is marginally over-represented.

Table 2: Summary of demographic characteristics of sample

	Total		WITS		RU	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Age						
Mean	**22**		21.75		23.21	
Median	**21**		21		21	
Mode	**20**		20		21	
Min	**14**					
Academic Score						
Mean	**56.89**		57.1		55.81	
Median	**56.48**		59		55.71	
Gender						
Male	**12858**	**43.4**	10987	44.5	1871	38
Female	**16769**	**56.5**	13711	55.5	3048	62
Attendance Type						
EX/Special (Occasional)	**22**	**0.1**	20	0.1	2	0.0
Full Time	**27620**	**93.3**	23127	93.6	4493	91.3
Part Time	**1977**	**6.7**	1551	6.3	426	8.7
Field of Study						
Science, Engineering & Technology	**13907**	**47.0**	12684	51.4	1223	24.9
Business & Commerce	**5083**	**17.2**	4255	14.2	828	16.8
Humanities	**7877**	**26.6**	5603	22.7	2274	46.2
Education	**2752**	**9.3**	2156	8.7	596	12.1
Year of Study						
Year One	**10478**	**35.4**	8813	35.7	1665	33.8
Year Two	**8005**	**27.0**	6552	26.5	1453	29.5
Year Three	**7935**	**26.8**	6423	26.0	1512	30.7
Year Four	**2572**	**8.7**	2281	9.2	291	5.9
Year Five	**323**	**1.1**	323	1.3	0	
Year Six	**306**	**1.0**	306	1.2	0	
Funding						
Self-Funded	**16926**	**57.1**	14344	58.1	2582	52.3
NSFAS	**8273**	**27.9**	6487	26.3	1786	36.2
Others	**6085**	**20.5**	5923	24.0	162	3.3
Institution						
Witwatersrand	**24698**	**83.3**	-	-	-	-
Rhodes	**4939**	**16.7**	-	-	-	-
Total	**29619**	**100.0**	**24698**		**4921**	

Table 3 reveals further distributive features of the sub-samples with respect to NSFAS funding recipients.

Consistent with the findings of other reports[38], the proportion of female funded students are higher than males across both institutions, although the proportions at RU is more aligned with the national funded data for 2018 (female to male ratio being 61.4%: 38.6%). Year 1 students also account for the largest proportion of students that are funded by NSFAS at both institutions. With respect to faculty of enrolment, Humanities accounts for the largest proportion of NSFAS funded students at Rhodes (48.5%), while NSFAS funded students at WITS can be found primarily in the SET field (52.7%). The overwhelming majority of NSFAS funded students at both Rhodes and WITS can be found in the Humanities and SET fields (76.2% of Rhodes subsample and 73.6% of WITS sub-sample).

Table 3: Comparative distribution of NSFAS funding recipients

	WITS		RU	
	Freq.	**%**	**Freq.**	**%**
Gender				
Male	2991	46.1	706	39.5
Female	3496	53.9	1080	60.5
Year of Study				
Year One	2960	45.6	716	40.1
Year Two	1854	28.6	605	33.9
Year Three	1294	19.9	417	23.3
Year Four	354	5.5	48	2.7
Year Five	12	0.2	0	0.0
Year Six	12	0.2	0	0.0
Field of Study				
Science, Engineering & Technology	3416	52.7	495	27.7
Business & Commerce	913	14.1	357	20.0
Humanities	1355	20.9	867	48.5
Education	803	12.4	67	3.8

4.2 Determining differences in performance

To determine whether any mean differences exist in academic performance as a result of demographic factors, an ANOVA (a test of difference between a dependent variable with respect to an independent variable) was used, and the results are presented in Table 4. At an aggregate level, the results suggest a significant difference between all the variables examined and academic performance. However, when disaggregating on the basis of NSFAS funding status, we see that the relationship between gender and academic performance is no longer significant. The reported F-test statistic thus, with respect to gender, indicates that the mean of the dependent variable differs significantly between the two groups (in this case male and female), or stated alternately, the difference in the mean is in favour of the female group with female students having the highest mean academic performance, while male students have comparatively the lowest.

[38] NSFAS (2019) NSFAS Research Output 2018/2019. NSFAS Beneficiary Profile

Table 4: Comparative test of difference in academic performance by demographic characteristics (see Appendix for detail)

	Total	NSFAS Funded	Non-NSFAS Funded
Age	**9.018***	3.727*	7.795*
Field of Study	**437.694***	43.794*	183.009*
Gender	**283.628***	106.334	180.713
Year of Study	**437.964***	82.352*	306.876*
Contact Mode	**203.397***	5.416*	242.567*
Institution	**36.597***	17.912*	65.170*

To probe further into the impact of demographic variables and student's financial support on academic performance, a point biserial Pearson's product-moment correlation was carried out to compare performance across funding status. The point biserial correlation is the value of Pearson's product moment correlation when one of the variables is dichotomous and the other variable is continuous. Values range from +1, a perfect positive relation; through zero, no association at all; to −1, a perfect negative correlation. The results are presented in Table 5. The value of correlation coefficients (r) was found to be positive and significant ($p<0.01$), though weak for self-funding and other bursary types across the years of study (except self-funded in year 5 and other bursary in year 6) which suggests a positive and significant association between being self-funded or receiving another bursary type. On the other hand, being NSFAS funded have negative values but significantly correlated with academic performance at all levels. It requires noting that the negative relationship between being NSFAS funded and academic performance is a weak one because the values are less than or not close to 1. At institutional level the correlations are largely significant at WITS, whereas there is mostly no significant relationship between year of study and funding type at RU.

Table 5: Point Biserial Pearson's product-moment between academic achievement and funding sources across year of study

Funding Source	Academic Achievement among Undergraduate Students					
NSFAS	-0.094*					
Self-Funded	0.170*					
Other Bursary	0.200*					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total						
NSFAS	-0.043*	-0.052*	-0.067*	-0.087*	-0.078	-0.108***
Self-funded	0.199*	0.122*	0.130*	0.179*	0.051	0.140*
Other Bursary	0.090*	0.265*	0.211*	0.269*	0.187*	0.77
University of Witwatersrand						
NSFAS	-0.053*	-0.055*	-0.067*	-0.093*	-0.078	-0.108***
Self-funded	0.220*	0.133*	0.141*	0.170*	0.051	0.140**
Other Bursary	0.134*	0.332*	0.212*	0.262*	0.366*	0.198*
Rhodes University						
NSFAS	-0.039	-0.053*	-0.026	-0.040		
Self-Funded	0.053*	-0.039	0.036	-0.028		
Other Bursary	0.006	0.010	0.002	0.000		

* correlation is significant at the 0.01 level (2-tailed).

4.3 Academic achievement amongst NSFAS funded and non-NSFAS funded categories

To understand more deeply the impact of student funding on academic performance, a test of mean difference focusing on NSFAS funding and otherwise was carried out in both institutions using ANOVA as well as accounting for differences in the year of study, and the results are presented in Table 6. This reveals that that the mean of the dependent variable (academic performance) differs statistically and significantly between both non-NSFAS funded and NSFAS funded students at Year 1, Year 2, Year 3, Year 4 and Year 6 for the University of Witwatersrand registered students in 2018.

From the table, non-NSFAS funded students have a relatively higher mean annual score in academic year examined for Years 1, 2, 3, 4 and 6 respectively. A contrary result is indicated for Rhodes University where a statistically significant mean difference is observed for Year 2 only. In other words, there is a statistically significant difference in the academic performance of NSFAS and Non-NSFAS funded students regardless of year of study at WITS. At Rhodes however, there is no consistent influence of year of study on academic performance between NSFAS and non-NSFAS funded students.

Table 6: One-Way ANOVA of Test of difference between academic achievement and NSFAS funding status (NSFAS Funded and Non-NSFAS funded)

Year of Study	NSFAS Funding Status	**Total**			University of Witwatersrand			Rhodes University		
		Mean	**N**	**F**	Mean	N	F	Mean	N	F
Year 1	Non NSFAS	**53.6587**	**6427**		53.2819	5473		55.82	954	2.478
	NSFAS	**52.2762**	**3673**		51.4233	2957		55.80	716	
	Total	**53.1559**	**10100**		**52.6300**	**8430**		**55.81**	**1670**	
Year 2	Non NSFAS	**57.0840**	**5542**		57.3202	4689		55.79	853	4.108*
	NSFAS	**55.7331**	**2459**		55.6945	1854		55.85	605	
	Total	**56.6688**	**8001**		**56.8596**	**6543**		**55.81**	**1458**	
Year 3	Non NSFAS	**59.2877**	**6215**		60.0370	5112		55.81	1103	1.044
	NSFAS	**57.3880**	**1707**		57.9037	1290		55.79	417	
	Total	**58.8784**	**7922**		**59.6072**	**6402**		**55.81**	**1520**	
Year 4	Non NSFAS	**63.2120**	**2125**	**19.10**	64.1602	1882		55.87	243	0.460
	NSFAS	**60.5013**	**399**		61.1478	351		55.77	48	
	Total	**62.7834**	**2524**		**63.6867**	**2233**		**55.85**	**291**	
Year 5	Non NSFAS	**71.6498**	**310**	**1.965**	71.6498	310	1.965			
	NSFAS	**66.5833**	**12**		66.5833	12				
	Total	**71.4610**	**322**		**71.4610**	**322**				
Year 6	Non NSFAS	**70.3014**	**292**		70.3014	292				
	NSFAS	**61.3077**	**13**		61.3077	13				
	Total	**69.9180**	**305**		**69.9180**	**305**				

*,*** indicate significance at 1 per cent and 10 per cent

4.4 The impact of funding and other factors, as well as the magnitude of that impact on academic performance

To establish the impact of funding and other factors, as well as the magnitude of that impact on academic performance, a simple regression was carried out. This test differs from the preceding ones as it considers the relationship between funding and academic performance within a multi-variate context. The results of the variance inflation factor (VIF) showed that multicollinearity was not detected, suggesting the model to be well defined for analysis, this is so following the removal of year 2 and Education as a high level of collinearity was detected with these variables. Table 7 presents the results for the correlates of academic achievement.

Table 7: Determinants or Correlates of Academic Performance

	Pool			WITS			RU		
	B	Std. Error	VIF	B	Std. Error	VIF	B	Std. Error	VIF
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(Constant)	52.101*	0.917		46.672*	1.046	1.914	55.819*	0.081	
Age	-0.136*	0.021	2.148	-0.336*	0.028	1.051	-0.001	0.002	3.694
Gender	-2.316*	0.151	1.044	-2.504*	0.179	1.851	-0.022	0.014	1.031
Full-Time	1.243*	0.437	2.084	1.326*	0.505	4.906	-0.009	0.052	4.649
S, E & T	6.044*	0.312	4.479	9.297*	0.384	3.545	0.035	0.032	4.080
B & C	2.461*	0.344	3.158	5.343*	0.430	4.149	-0.023	0.033	3.360
Humanities	5.187*	0.323	3.802	9.349*	0.420	1.914	0.018	0.030	3.694
Year One	-4.196*	0.193	1.563	-	-	-	-	-	-
Year Two	-	-	-	5.157*	0.230	4.149	0.004	0.017	4.913
Year Three	2.017*	0.201	1.487	7.996*	0.240	1.382	0.000	0.018	1.378
Year Four	4.688*	0.299	1.309	11.023*	0.352	1.487	0.036	0.032	1.497
Year Five	4.681*	0.761	1.174	8.699*	0.824	1.373	-	-	-
Year Six	2.815*	0.785	1.183	6.918*	0.852	1.183	-	-	-
Self-Funded	4.549*	0.172	1.343	4.725*	0.198	1.196	0.010	0.024	3.032
Other types of bursary	7.623*	0.211	1.606	9.017*	0.242	1.260	0.002	0.039	1.033
NSFAS Bursary	0.575*	0.193	1.402	0.058	0.223	1.709	0.009	0.024	3.003
Institution	-1.212*	.207	1.114	-	-	-	-	-	-
F	367.919	398.487	1.074						
Sig	0.000	0.000	0.378						

* *, **, *** means significant at 1%, 5% and 10%

* For Aggregate/Pool Model, variables Education as Field of Study and Year Two were dropped due to collinearity
* For WITS and RU Models, variable Year Two was dropped due to collinearity
* S, E & T means Science, Engineering and Technology fields of study
* B & C means Business and Commerce fields of study

The analysis reveals that the impact of the independent variables on the level of academic performance is similar for both the total sample in column 2 and the WITS sample in column 5, whereas it is not so for Rhodes in column 8. For the total sample the age of the student was found to be statistically significant and negatively ($p>0.05$) related to academic achievement, suggesting a unit increase in age reduces academic achievement of students by 0.13 percent. This result is consistent to that at the University of Witwatersrand where the impact is even stronger (0.33), but while indeed negative at Rhodes, was not found to be significant. Being a male student is negatively associated with academic performance. The impact is negative and significant at both an aggregate level ($B = -2.316$, $p > 0.05$) and for WITS ($B= -2.504$, $p>0.05$). Considering the field of study, it is evident that being enrolled in SET has the strongest positive and significant impact on academic performance.

The analysis did not find any variables to statistically significantly influence academic performance at Rhodes University, but the reader is also referred to the poor model fit for this university. In other words, the collection of variables are not good predictors of academic performance in the Rhodes sub-sample, based on the data at our disposal. This is however not the case with the total sample and University of Witwatersrand estimates where there was enough evidence to suggest that most of the selected variables significantly impact on academic performance ($p>0.05$).

Lastly, being self-funded or having other types of bursary other than NSFAS funding, increases academic performance/achievement for WITS and the total sample. Whereas, at an aggregate level, being NSFAS-funded is significantly and positively associated with average performance. So, overall, there is a moderately positive and significant relationship between NSFAS funding and academic performance. When the institution is taken into account, we see that while the relationship remains positive, it is weak and no longer significant.

5. DISCUSSION

This study focused on academic performance, proxied by average individual scores, amongst undergraduate students enrolled in two public universities in South Africa in 2018. It investigated and demonstrated empirically the effect of funding on academic performance in these two Historically Advantaged (HA) higher education institutions within the South African higher education system.

One notable finding is the moderately positive and significant relationship between NSFAS funding and average academic performance at aggregate level. At institutional level the relationship remains positive but weak and no longer significant. This contributes to our understanding on the impact of student funding on academic performance in the South African context. An earlier study focusing only on one university suggested that the amount of NSFAS funding was inversely related to academic performance (in that instance proxied by graduation), whereas merit-based awards significantly promoted student performance[20]. Our findings also suggest, at an aggregate level, that being self-funded or having other types of bursary other than NSFAS funding, increases academic performance.

Consistent with most research, this study also found that female students are likely to perform better on average than male students[30, 40, 41]. While some research has suggested that the gender difference in performance might be explained by other factors, such as self-efficacy[42], in the South African context, this finding is consistently supported (see for example [43] who refer to this as the *Martha Effect*).

[39] Kolster, R., & Kaiser, F. (2015). Study success in higher education: male versus female students. (CHEPS Working Paper series; No. 2015-07). Center for Higher Education Policy Studies (CHEPS). https://doi.org/10.3990/4.2589-9716.2015.07

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[41] Jackman, M.W., & Morrain-Webb, J. (2019). Exploring gender differences in achievement through student voice: Critical insights and analyses. Cogent Education, 6(1), 1567895.

[42] Pirmohamed, S., Debowska, A. & Boduszek, D. (2017) Gender differences in the correlates of academic achievement among university students. Journal of Applied Research in Higher Education, 9 (2). pp. 313-324. ISSN 2050-7003.

[43] Van Broekhuizen, H. & Spaull, N. (2017) The 'Martha Effect': The compounding female advantage in South African higher education. Stellenbosch Economic Working Papers: WP14/2017. November.

The field of study findings are also largely consistent with other studies that have found performance in Commerce and related fields to be lower than others. These findings appear to be in concordance with those of Masui et al (2014)[44], who demonstrated differential grading by field of study, and support the idea that differential grading is possibly induced by departmental norms[45]. Regarding students' age, in some studies, older students show a slight superiority in academic performance[46, 47] but in other studies, the youngest students perform better . In this study the results were in line with that of Pirmohamed[39] which suggest that younger students perform on average better than older students at an aggregate level.

6. CONCLUSION

South African government has remained committed to increasing access to higher education in the country which is seen, not only as a means to transform the profile of participation in further and higher education, but also as a means to increase graduation and retention towards addressing long standing challenges of inequality and poverty. Considering the large-scale investments and growth in investment in this sector, the appraisal and efficacy of impact of this policy lever remains important and required.

Extant knowledge in the South African context points to the positive impact of public funding for higher education in terms of lower levels of drop-out, higher levels of retention and higher levels of graduation in comparison to un-funded students[49]. Recently completed research further points to positive implications for the employability of publicly funded students[31]. However there exists a paucity of research and understanding in two important ways:
1. how public funding affects performance at higher education institutions, where individual average annual score is used as the proxy, and
2. how funding impacts on performance within a multi-variate context

The findings of this study contribute by highlighting that at an institutional level it might be possible to find no significant relationship between NSFAS funding and performance. The relationship between NSFAS funding and academic performance can also be found to be negative, when considered in a bivariate context. These findings are in line with recent analysis within the South African context[20].
However, at an aggregate level and controlling for the impact of other variables, a positive and statistically significant correlation between being NSFAS funded and average academic performance comes to light.

In other words, NSFAS-funded students do as well (or as badly) as self-funded and bursary-funded students. That is good news considering that most NSFAS-funded students come from schools that may not be 'elite' or well capacitated.

The limitations of the research is inherent in that only two university datasets were available for analysis, but further research can address the limitations in that it is possible to consider a panel methodology to facilitate more robust analysis over time, as well as extending the sample to include more universities

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[44] Masui, C., Broeckmans, J., Doumen, S., Groenen, A., & Molenberghs, G. (2014). Do diligent students perform better? Complex relations between student and course characteristics, study time, and academic performance in higher education. Studies in Higher Education, 39(4), 621-643.

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[46] Clifton, R. 1997. "The Effects of Social Psychological Variables and Gender on the Grade Point Averages and Educational Expectations of University Students: A Case Study." Canadian Journal of Higher Education 27 (2/3): 67–90.

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Appendix I. Details of information in each of the dataset supplied by the two institutions

Name of Dataset	Details of dataset
Program enrolled – NSFAS	Stuno: Student Number, **Calendar**; Year of study; **PROGRAM_ CODE:** Code of program student is enrolled in; **PROGRAM_ Name:** Name of program student in enrolled in; **FACULTY:** Name of Faculty student is enrolled into; FT/PT: Attendance; Qualified; **Avg Marks:** Average Marks; **Yr Of Study:** Year of Study; New To University; Univ_subject_list: The Univ_subject_list (courses, marks and classification).
Bursary_Information-NSFAS.xls	**Calendar_Yr:** Calendar Instance Year, **Faculty, Stuno:** Student Number, **Full Bursary:** Yes or No, **Staff Bursary:** If student is a recipient of the staff bursary type, and it is indicated by 1=Yes or 0=No, Self-Funding: If student is self-funded, and it is indicated by Yes or No, **Internal Scholarship:** If student is a recipient of the bursary type, and is indicated by Yes or No, External Scholarship: If student is a recipient of the bursary type, and is indicated by Yes or No, **External Bursary:** If student is a recipient of the bursary type, and is indicated by Yes or No, NSFAS: If student is a recipient of the bursary type, and is indicated by Yes or No, **Merit Award Flag:** If student is a recipient of the bursary type, and is indicated by 1=Yes or 0=No, **Number of Years Registered**.
StudentDetail_NSFAS.xls	ID number, Calendar Instance Year, Program Code, **Program Name:** Program Name, Stuno: Student Number, First Name, Surname, Registered: Registration Status, Date of Birth, Country of Birth, Citizenship, Home Language, Nationality, Permit Type, Address 1, Address 2, Address 3, Address 4, Address 5, Postal Code, Province.

Note:

• Datasets for each of the institutions were initially merged using key variables which are ID number, Student Number and Programme Code)- merging by adding variables.
• Datasets were further merged across institutions dataset using merging by adding cases.

Appendix II. Comparative test of difference in academic performance by demographic

	Total	NSFAS Funded	Non-NSFAS Funded
Age	**9.018***	3.727*	7.795*
Field of study			
Science, Engineering and Technology	**58.3725**	54.8884	59.7896
Business, Commerce and Management	**53.6370**	53.4659	53.6926
Humanities	**56.6500**	56.5673	56.6826
Education	**56.2456**	51.7689	58.3268
Total	**56.8853**	**54.7931**	**57.7111**
ANOVA, F -test	**F = 437.694***	F = 43.794*	F = 183.009*
Gender			
Female	**58.0595**	55.9616	58.8613
Male	**55.3523**	53.3478	56.1764
Total	**56.8854**	**54.7931**	**57.7113**
ANOVA, F- test	**283.628***	106.334	180.713
Year of study			
Year One	**53.1562**	52.2762	53.6570
Year Two	**56.6694**	55.7331	57.0853
Year Three	**58.8815**	57.3880	59.2922
Year Four	**62.7875**	60.5013	63.2120
Year Five	**71.4502**	66.5833	71.6498
Year Six	**69.9180**	61.3077	70.3014
Total	**56.8853**	**54.7931**	**57.7111**
ANOVA, F-test	**437.964***	82.352*	306.876*
Contact mode			
EX/Special	**60.3459**		
FT	**57.2947**		
PT	**50.6622**		
Total, F-test	**56.8853**		
ANOVA	**203.397***	5.416*	242.567*
Institution			
RU	**55.8133**	55.8142	55.8129
Wits	**57.1029**	54.5115	58.0462
Total	**56.8853**	**54.7931**	**57.7111**
ANOVA, F-test	**36.597***	17.912*	65.170*