Strathmore UNIVERSITY

Do High School National Examination Final Grades Predict Undergraduate Performance?
Case of a Kenyan Private University

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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11/03/2021 ..... [*Date*]

This Research Project has been submitted for examination with my approval as the Supervisor.

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…March 11, 2021..... [*Date*]

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Abstract

The university placement system in Kenya places great emphasis on Kenya Certificate of Secondary Education (KCSE) Examination. This is the final exam through which high school students are evaluated throughout the country. This study looks into the ability of these examination results to predict university performance using data from a private university in Kenya. Scarce research in the area suggests KCSE offers little value in predicting university performance. In this study, we test the predictive value of KCSE results on year-by-year university performance and cumulative 4-year performance. The data also allows comparison of KCSE with a basic aptitude test. Results suggests that KCSE results offer some value in predicting university performance. The results also suggest there is little difference in the predictive ability of KCSE on year-on-year performance compared to the cumulative university performance

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Chapter 1: Introduction

1.1 Background

Education is considered an investment since current consumption is sacrificed for the hope of increasing future income (Woessmann, 2003). Education is a component of human capital (Schultz, 1961). Distribution of human capital is a determinant of income inequality and a person's human capital can be the perpetuator of his/her social disadvantage (Burgess, 2016). Production capacity of human capital is larger than all other forms of wealth taken together (Schultz, 1961). Education is attained at different levels namely: primary, secondary, and tertiary level.

For a work force, primary education is only enough for basic production, secondary education allows the workers to use technology and higher education allows invention of technology (Keller, 2006). It is suggested that the years of graduation (for example, the final year of high school) may have larger effects on wages compared to just years of school attended (Layard & Psacharopoulos, 1974). This study will focus on the transition between secondary education and higher education with a focus on Kenya.

The country is currently in the process of switching between its curriculum hence two different curricula are running concurrently. The data analyzed is from the older 8-4-4 system. In this system primary education was designed to take eight years to complete, while secondary school would take 4 years and 4 years for university. The system was said to be too broad and burdensome and was also touted as a reason for a wave of strikes experienced in schools (Wanjala, 2017). Due to this the country opted to a new curriculum that will have secondary school organized into two levels namely, junior secondary (Grades 7, 8 and 9) and senior school (Grades 10, 11 and 12) (Government of Kenya, 2019). The transition from secondary school to university education heavily depends on academic achievement in high school.

The high school curriculum offers a variety of subjects. Some subjects are compulsory while others are optional. Mathematics, English and Kiswahili are compulsory. The non-compulsory subjects include: Biology, Physics, Chemistry, History, Geography, Religious Education and Foreign Languages among others (Government of Kenya.c, 2014).While in high school, pick a mix of the non-compulsory subjects, depending on the university courses they hope to pursue in university.

This study has focused on the importance of high school grades in predicting university performance. At the end of the four years in high school, the students are evaluated through a final high school examination called Kenya Certificate of Secondary Education Examination

(KCSE). The student's performance is graded from highest possible grade A to the least possible grade E per subject. Each grade is assigned a certain number of points with grade A- 12 points, A-(minus) – 11 points and E – 1 point. A student's individual subjects are then aggregated to a maximum total of 84 points. The minimum requirement for direct entry into a degree program in Kenya is C+. The KCSE results are therefore a great determinant to the student's university placement.

The current university placement system focuses on two key aspects in a student's KCSE grades. First, the student's aggregate score is considered and secondly a cluster score of 4 specific subjects considered to be paramount to the course a student would like to undertake. The student then gets an aggregated cluster score that is used as the students score in the competitive course selection process (Government of Kenya, 2014). This use of clusters has received some criticism. For example, students who excel in science courses but fail in language courses may not be admitted to science degrees or even any university course (Sanga, 2018).

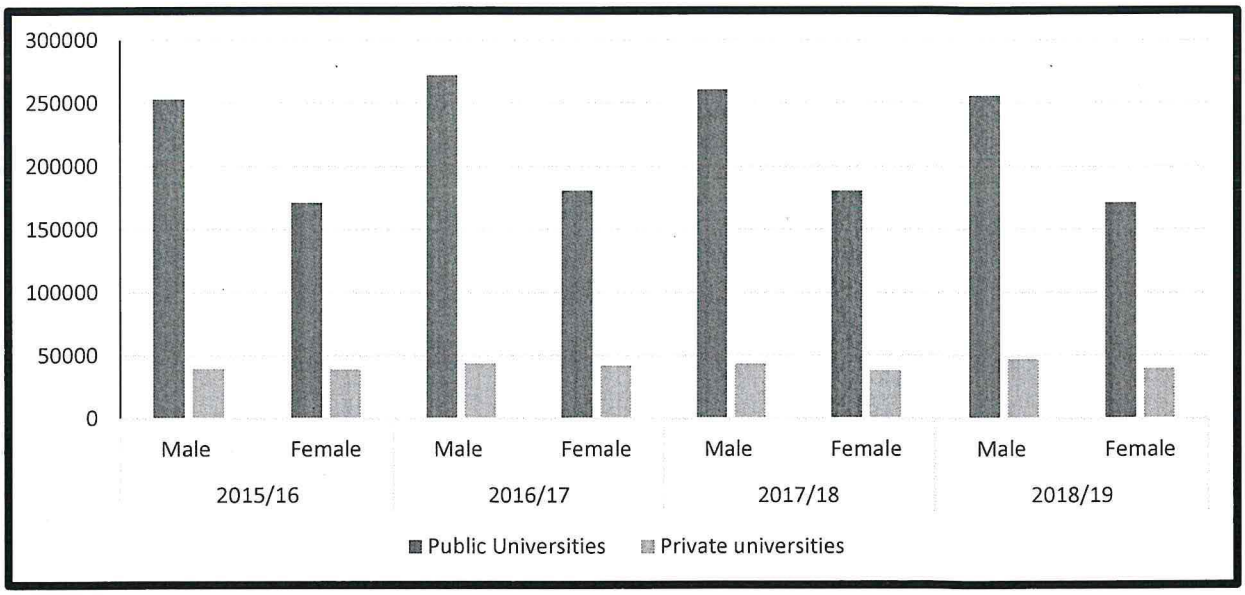
In addition to the KCSE grades, some additional criteria are used in the university placement process. Some form of affirmative action criteria may also be applied where deemed necessary (Government of Kenya, 2014).This includes lowering the overall cutoff point for degree programs for female students (Government of Kenya.d, 2014). The selection criteria could be prone to possibly marginalize certain groups of people and favor others. Looking at the situation in 2008, it was found that the current system based on KCSE grades did not promote geographical or socio-economic equity of access to university (Munavu, Ogutu, & Wasanga, 2008). However, it has been argued that the task of placement authorities is not to compensate for educational disadvantage but instead identify talent (Great Britain, 2004).

The students follow a variety of paths in attaining post-high-school education. The students may be placed in either public or some of the private universities that admit government sponsored students. Some students prefer not to join the course they have been assigned to. Such students have different options including: joining a public university under the self-sponsored path where they receive no government aid in paying their tuition fees; they may apply for admission at a private university; or they may also opt to pursue diploma courses. In the year 2019, 2,632 students who qualified for admission to degree programs opted for diploma courses (Republic of Kenya, 2020). Whichever path is followed, KCSE grades play a pivotal role in transitioning to higher education (Wabwoba & Mwakondo, 2011) .

There are currently 63 universities in Kenya, 31 are public (government owned) and 32 are private (Republic of Kenya (b), 2019).There are 714 approved degree programs in private universities (Republic of Kenya (b), 2019). About 15% of the students that enrolled in

university enrolled in private universities in 2018/19 academic year (Figure 1). It can also be noted that there is very little gender variation in private universities as opposed to the variation in public universities. Figure 1 also shows that university enrollment numbers have remained around 300,000 for males and 250,000 for females.

Figure 1: University Enrollment by Sex



Source: Government of Kenya

The placement system of students and in Kenyan universities has its merits and demerits. The centralized process has a few obvious merits especially in countries such as Kenya where infrastructure is less developed. It is much faster to perform the placement through a centralized service. A non-centralized method would easily result in one student being admitted to more than one school (Gale & Shapley, 1962). Another problem would be the expense related to this both for the university and the students. The university would incur much greater costs in time and money individually reviewing each application and possibly arranging physical interviews. It would also incur the student's additional costs of travel to prospective interviews and other costs such as fees for additional tests. However, admissions done by individual universities would allow them to find students that best fit the individual university's culture. This could include further aptitude tests and in person interviews. In-person admissions interview ratings have been shown to have significant positive correlations with performance of students in university (Yingling, Park, Curry, Monson, & Girotti, 2018).

This study investigates the current admission criteria in Strathmore University, which is a private university in Kenya, by looking at how high school results help predict university

performance. The school offers a variety of four-year undergraduate degree programs under its different faculties. The four years are split into eight semesters. At the end of each semester students sit an examination to assess their progress. Grades from the four years form the cumulative average grade of the student. This average is generally an indicator of the student's success in the university.

The application process at the university is guided both by government policies and individual preferences of the institution. The university admissions process begins when a student picks a course and then applies for the chosen course. The student should first meet the minimum academic criteria stipulated by the university for the specific course. These are further evaluated using an entrance test administered by the school followed by an oral interview. The students are admitted to their chosen course based on their performance in the tests and the interview (Strathmore University, 2020).

1.2 Problem Statement

KCSE results play a key role in determining both the student's university admission and the course to be studied. The use of KCSE grades has faced criticism. That is, using KCSE grades may not be the most efficient in filtering and selecting the ideal student for a particular university course. Students who score similarly at KCSE level end up with different university cumulative scores. This could be because there are some form inequalities experienced in high school that unfairly disadvantage certain students (Koljatic, Silva, & Cofre´, 2013) This raises the issue on the validity of the KCSE score in predicting academic performance in university courses. In addition, students who score similarly at KCSE level end up with different university cumulative scores.

With the use of only KCSE results in admission screening, normative and psychomotor skills are completely ignored (Nyabuti, 2018).In the area of predictors of undergraduate student performance little research has focused on Kenya. Much of this research outside Kenya has been focused on tests such as the SAT, which is an aptitude test (Bai, Chi, & Qian, 2013) unlike KCSE which is curriculum based. The research outside Kenya has included: Cyrenne & Chan (2010), Allensworth & Clark (2020), Galla, et al., 2019 & Boyd(2004). The results in the papers generally support the current admission criteria used in the context of their respective study. There is a general agreement in the studies that high school grades are strong predictors of perfomance (Bai, Chi, & Qian, 2013 & Galla, et al., 2019). In Kenya, the only accessed literature in Kenya focuses on the use of KCSE in medical school students with a focus on the cluster points necessary for admission (Obwoge, Priscah, Mohamed, Keraro, & Kangethe, 2017). In the study, it is found that the aggregate KCSE grade had no significant effect on performance in preclinical and clinical courses. However, a few subjects

such as Biology, Mathematics and Kiswahili are seen to positively influence performance in clinical courses.

To the best of my knowledge, there has been minimal empirical research on the area of admission predictors at university admission in Kenyan private universities. This study seeks to empirically investigate the current validity of using KCSE exam results for university placement by looking at the ability of KCSE results to predict student performance at university level. The measures of success used include first year, second year, third year and fourth year performance. This study also attempts to control for general aptitude test which has otherwise not been replicated in Kenya. The study will therefore answer the following research question.

1.2 Research Question

1. Do KCSE results predict academic performance in specific years in university, or cumulative university performance?

1.3 Research Objective

1. To test predictive ability of KCSE results in predicting performance in university.

1.4 Significance of the study

The purpose of this study is to investigate the effectiveness of the current use KCSE results to inform admission decisions. This study will help Strathmore University in better understanding the current admission criteria. That is, it will compare KCSE and aptitude tests ability to inform admission decisions. Further, it will inform at which level of the university the KCSE results help best predict. This study will also contribute to the empirical research in the area of predictors of academic success in university in Kenya.

Chapter 2: Literature Review

2.1 Theoretical Literature

Sternberg, Bonney, Gabora & Merrifield (2012) suggests that student should be admitted to university on two basis: having the academic skills necessary to succeed in college and the potential for active citizenship and active citizenship. Attempts are made to compare academic skills prior to admitting a student to university. This can be done through high school grades or some form of test scores (Sternberg, Bonney, Gabora, & Merrifield, 2012).

Gender differences in the pattern of academic achievement may not be due to differences in general ability (Mellanby, Martin, & O'Doherty, 2000). Sometimes these differences may be seen as a differing average score of males to females but instead of one gender being found to be in excess on the top end of the scale. One of the reasons for gender differences is that females tend to experience higher levels of anxiety leading up to academic assessments (Martin, 1997).

According to Fishman, A & Pasanella, A (1960) use of standardized examinations has become an accepted part of the admission selection process. This then led to studies into the validity of admission procedure. According to Fishman, A & Pasanella, A (1960), the research design follows a common procedure: measures taken previous to college admissions(predictors) seek to estimate measures taken after college attendance(criteria).

2.2 Empirical literature

Cyrenne & Chan (2010) study performance of students in the University of Winnipeg relative to their high school grades. They build a Least squares Variable Model and a Hierarchical Linear Model to estimate likelihood of success of students admitted. They find that a student's high school GPA is a strong predictor of their university GPA.

A study done in the Singapore Management University School of Accountancy also uses four-year GPA as a proxy for university success. In this study least squares regression analysis is used with the cumulative GPA as the dependent variable. The study also attempts to isolate the effect of mathematical aptitude. They find that the strongest predictor for this is the prior academic achievement (after excluding mathematics) (Seow, Pan, & TAY, 2014). The findings here seem counterintuitive. It would be expected that academic ability in Math ability would be paramount for success in an accounting course. Considering the results above we can assume that there may be other underlying reasons why aggregate scores would perform as a better predictor.

While still looking at cumulative university performance, a study in Nigeria (Ogbodo, Adeyemi, & Agboola, 2014)uses regression analysis to look at the performance as a function of the criteria used to admit the students. The stud distinguishes students admitted due to pure merit compared to those favored by some form of affirmative action such as the student's state of origin. The findings suggested that there was no significant difference in performance depending on the admission criteria used.

A study similar to the one in Singapore was done using a sample of students in the University of South Carolina. Similarly, the study used regression models to estimate the independent effect of each of the variables that predict perfomance. One of the included variables is the percentile rank of the student in their high school. However, the addition of this variable has virtually no effect to the predictive power(R^2) of the equation. The explanation to this is that the percentile rank is so highly correlated to another variable- high school GPA (Cohn, Cohn, Balch, & Bradley Jr., 2004)

Although high school grades seem to be good estimators of university performance high school grades have a few limitations. Allensworth & Clark (2020) give a number of challenges faced in using High School GPAs. First is the comparability of these grades across high schools. Secondly is the fact that studies show that there is moderate correlation of these grades and standardized test scores. There seems to have been increase in average high school GPAs yet averages for standardized test scores have remained steady. The third reason is the fact students that took harder classes would seem to have performed worse, yet this may not be the case.

In Kenya, Obwoge, Priscah, Mohamed, Keraro, & Kangethe, (2017) analyze data from two universities to investigate criteria used for admission to medical schools the study distinguish performance in clinical and preclinical studies. The study employs least squares regressions. The results show no significant influence of KCSE aggregate grades on the clinical and preclinical performance of students.

A study in China uses first, second, third and four-year cumulative performance as the measure of success. Similar to Kenya, the students in China sit one exam offered once a year- Chinese National College Entrance Examination (CEE). The exam is majorly the sole determinant of college admission. Unlike the SAT, and just like in Kenya, the CEE is not an aptitude test but is instead curriculum based and test mastery of subjects taught in high school. The study then uses regression analysis to determine the predictive power of different variables on first, second-, and third-year GPAs, and the 4-year cumulative GPA. The results show CEE as a strong predictor for all four. They also attempt to examine the nonlinear effect of the CEE results. Students are placed into quantile ranks. The results show

that students in the 40-60th and 60-80th percentiles had similar undergraduate GPAs (Bai, Chi, & Qian, 2013).

Wilson (1983) shows that first year performance -coded as first year GPA(FGPA)- is a surrogate for overall university GPA. It is also essentially easier to work with since it is available for most students since most students will survive the freshman regardless of how well or badly, they perform. This conclusion is arrived at through review of papers that attempt to predict later grades with earlier grades.

A national cross section of the United States is used to investigate on-time graduation with high school GPAs as the predictor. The study provides literature as to why high school GPAs may not be as popular. These reasons include: comparison across different high schools becomes difficult; standardized test have shown low correlation with high school grades; and the fact that grades tend to be lower in more difficult classes, yet it does not mean that the students are academically weak. In an attempt to deal with this in the study high school GPAs were all scaled to a common scale. A structural equation was used. College graduation as a binary variable was regressed on a series of variables including high school GPA and standardized test scores. High School GPA(β=0,13) is seen as more powerful estimator than admission test scores(β=0.06) (Galla, et al., 2019).

Retention rates are important to universities since they allow financial stability of the institution. this is especially the case for institutions whose main funding comes from tuition fees. (Hossler, 2006) In a study done at the University of Texas, it is found that SAT scores and parents education level are significant to retention rates. The study conducts logistic regression with retention as the dependent variable (Boyd, 2004).

There has also been research that provides clear distinction between students that leave high school and join university immediately (school leavers) and those that are older students who later in life choose to pursue university education (mature age students). Research has shown that there are significant differences in the factors that predict university success among these two groups. McKenzie, K., & Gow, K. (2004) find that for school leavers past academic success accounted for 24% of their academic achievement while for mature age students only 5.7%. This study uses structural equation modelling on data from the University of Queensland. A study at the University of Newcastle found similar results when looking at the full 3-year GPA. In the study, results show that older students performed better than younger students (Cantwell, Archer, & Bourke, 2001). Mature students are said to be more likely to a deep approach towards their academic work. (Richardson, 1995)Mature students also tend to view education as an accelerator of change in their lives and may have greater pressure to succeed (Shanahan, 2006).

Girls in Kenya tend to lag behind boys according to key performance indicators such as transition and completion rates in high school and primary school national tests (Wanzala & Otieno, 2016). A study in Turkey provides hope for the situation in Kenya. The study uses data from a public university in Turkey to look at how girls perform in university using regression. Females are seen to perform better than males measuring cumulative GPAs, even though females came in with lower entrance scores (Dayioğlu & Türüt-Aşik, 2007). Opposing research (Lynn, 1996) would suggest that males are seen to perform poorly when comparing younger age sets. This is because females mature faster than males, but at around the age of 16 this trend reverses.

The issue of class attendance may also affect performance. A study in Ireland considers the effect of attendance on student performance using two stage least squares regression (Kirby & McElroy, 2003). The study finds that attendance is more helpful in enhancing the grade rather than obtaining the threshold pass mark.

Performance in preadmission tests may help predict the performance in the university courses a person is admitted in. However, the reason as to which the test score predicts performance may sometimes not be as apparent. In a review of the Law School Admissions Test (LSAT), Henderson (2004) there is a significant highlight of the role of test taking speed in the performance at the test. This is the reason why the LSAT may predict performance in a law school in the USA. Consequently, law schools majorly administer time pressured tests hence it is this aspect of the LSAT that helps predict the test scores. The study shows the LSAT is a poor predictor of takeaway tests and other tests with less time pressure.

2.3 Summary of Literature Review

There are different factors that may be used as criteria for admission to university. Sternberg, Bonney, Gabora & Merrifield (2012) suggests that student should be admitted to university on two basis: having the academic skills necessary to succeed in college and the potential for active citizenship and active citizenship. Whichever the method they all follow a similar pattern. Hence a similar pattern can be used to test their efficiency. the tests have two parts.

A set of preadmission measures are chosen and a measure to define what success may be (Fishman & Pasanella, 1960) From the empirical literature, a few of these measures for success include: Four-year cumulative grade (Seow, Pan, & TAY, 2014), retention (Boyd, 2004), First-year grades (Bai, Chi, & Qian, 2013) and on-time graduation (Galla, et al., 2019). It is possible to group this literature in terms of the measure of academic success(performance) that they attempt to predict.

Seow, Pan, & TAY (2014) & Ogbodo, Adeyemi, & Agboola (2014) use cumulative perfomance as the measure of academic success. Seow, Pan, & TAY (2014) find that high school gtrades are the best predictors of the cumulative score. This may agree with the research on the suggests that high school grades predict scores based on the individual's characteristic of having self-control (Galla, et al., 2019). Ogbodo, Adeyemi, & Agboola (2014) find that there is no significant difference in perfomance between students that are admitted through forms of affirmative action and those that academically merit their admission.

The research in Kenya has not attempted to evaluate the use of aptitude tests. This study will look into the use of KCSE aggregate results in predicting undergraduate performance.Aditionally, the data makes it possible to control for aptitude tests among other control variables. The other control variables that have been suggested from literature. These include:gender (Martin, 1997) , the age at which students enter university (McKenzie & Gow, 2004) and class attendance (Kirby & McElroy, 2003).

Chapter 3: Research Methodology

3.1 Theoretical Framework

According to Fishman, A & Pasanella, A (1960) predictors of academic performance are either intellective or non-intellective. Research suggests that the intellective characteristics of a person include test scores and course marks (Fishman & Pasanella, 1960). This can be in the form of achievement tests or aptitude tests (Koljatic, Silva, & Cofre´, 2013).

The study will control for a few of the possible non-intellective factors. First will be gender differences. Gender differences has been shown to affect performance in tests (Martin, 1997) hence it is important to control for gender in this study. Another non -intellective factor is the differences in mature age students. In-person interviews are also likely to help in predicting student academic success (Yingling, Park, Curry, Monson, & Girotti, 2018). Strathmore University conducts in-person interviews during the admission process. The prospective student is assigned a grade by the interviewer. This study will use these grades as an indicator of how the student performed in the oral interview.

In measuring educational achievement Hanushek (1979) suggests the following production function:

$$A_{it} = f(B_i^t, P_i^t, S_i^t, I_i)$$

Where A_{it} is achievement at time t; B_i^t is family background influences until time t; P_i^t is the effects of peers until time t; S_i^t is school inputs until time t and I_i is innate ability. Innate ability is not cumulative as it is assumed it does not change for an individual.

Rothstein (2004) suggests that the work of admissions officers is to predict the students most likely to be successful. This means that the assessment of students may be written as an equation:

$$E[y_i * |X_i, S_i] = \alpha + \beta X_i + \gamma S_i$$

Where y_i is the student's performance, X_i is a vector of student's individual characteristics and S_i is the student's test scores.

3.2 Empirical Model

The estimation model is therefore:

$$Y = \alpha + \beta X_i + \gamma S_i$$

Where: Y is the outcome measure i.e. First year grades, second year grades, third year grades, and cumulative 4-year grades.

X is a vector of student's individual characteristics such as age, gender. This also includes the students score from aptitude tests and oral interviews.

S is a vector of students KCSE average grades. That is KCSE English, KCSE mathematics and KCSE mean grade. These grades will be coded in a categorical dummy to allow quantitative analysis.

Estimation Issues

There are factors that may affect performance but are events that occur after admission. An example of these factors is student effort in university such as hours in the library. These are ignored since they would not be able to be evaluated prior to admission to university. Hence, admission officers would not have such information before making decisions. However, it is possible that these different variables would affect performance.

The assumption is made that university exams are standardized hence are comparable across different graduation classes. It is also assumed that KCSE exams are standardized. This allows the comparison of students who sat for KCSE at different years.

3.3 Data

The data for this study was obtained from Strathmore University. The sample is gotten from 3,825 undergraduate students from the university. Table 1 shows the various description of various variables obtained. With regards to KCSE results, the admissions office only records KCSE mean grade and the KCSE Mathematics and KCSE English Scores. The absence of the results of other subjects limits the possible analysis.

Also available is the results of the Strathmore Entrance Test. We make the assumption that the results of these results are a measure of aptitude while those of KCSE measure academic achievement in the curriculum. Koljatic, Silva, & Cofre´ (2013) make the distinction that achievement tests test mastery of specific subjects while aptitude tests measure verbal and mathematical skills needed for problem solving. The assumption of the test as an aptitude test is arrived at since all students regardless of curriculum attended in high school are expected to attempt the test.

Table 1: Definition and Measurement of Variables

Variable	**Format**	**Explanation**
Dependent variable		
Year 1/Year 2/ Year 3/ Year 4 Grades	Score out of 100	The percentage score the students scored in the respective academic year in university
Independent Variables		
KCSE mean grade	KCSE grading system (A, B+, B, etc.)	The average grade the student was awarded in KCSE exams
KCSE English	KCSE grading system (A, B+, B, etc.)	The average grade the student was awarded in KCSE English exams
KCSE Mathematics	KCSE grading system (A, B+, B, etc.)	The average grade the student was awarded in KCSE Math exams
Entrance test Math score	Score Out of 100	The students score from the university entrance math score
Entrance test English score	Score Out of 100	The students score from the university entrance English score
Oral Interview	Alphabetic Grades (A, B+, C, etc.)	The score that the student was awarded by the university officer during the oral interview
Gender	0: Male 1: Female	Male or Female
Average attendance	A percentage out of 100	The students average class attendance in university
Graduation year	Year of Graduation	The year the student graduated in comparison with others
Age	Age	The students age now
Intake Year	Year of Joining	Intake Year

Chapter 4: Study Findings

4.1 Descriptive Statistics

The study sample is 2,965 students. This sample excludes students who did not attend the 8-4-4 system and students with missing records. The data consists of students who enrolled at the university between 2005 and 2019. However, only students who have graduated are included in the sample. Due to this there is a possible bias for the students admitted from 2017 to 2019. Since only graduated students are included there may be a tendency to include high performing students who were able graduate in a period shorter than four years. This may be due to the fact that the students took extra evening classes to fast-track progress. We however choose to admit these students to the analysis since the quick completion is a post admission parameter and could not affect the admission process.

The independent variable of interest in the study is the national exam results. This is comprised of the mean KCSE grade and Math and English individual grades. Table 2 shows the distribution of KCSE mean grades of the students in the sample by gender. In the sample, 45.51% of the students are male while 54.49% are female. As expected, majority of the students scored C+ or above. This is because C+ is the minimum cutoff for direct entry into a degree program. More males scored an A (plain) grade. In all other grades there are more females than males.

Table 2: Distribution of KCSE Scores in the Sample

First row has *frequencies* and second row has *row percentages*

KCSE MEAN GRADE	GENDER		
	Male	Female	Total
A	99	80	179
	55.31	44.69	100
A-	276	300	576
	47.92	52.08	100
B	301	361	662
	45.47	54.53	100
B+	273	400	673
	40.56	59.44	100
B-	264	316	580
	45.52	54.48	100
C+	137	158	295
	46.44	53.56	100
Total	**1,350**	**1,615**	**2,965**
	45.53	**54.47**	**100**

The main dependent variable is university performance. This has been divided into year-by-year performance. Additionally, the cumulative university performance is calculated. There are less records for students with first year results since several students are exempted from taking first year courses. This is because they have previous post high school education. These students are excluded from first year analysis. The average grade results are recorded

as percentage points. Table 3 shows descriptive statistics of the university performance. The average grades range from 61% to 63% with a standard deviation between 6 and 9.

Table 3: Description of Dependent Variable

Dependent Variable	N	mean	sd	Min	max
Average Grade for Year 1	2,849	61.47	7.13	44.67	85.79
Average Grade for Year 2	2,849	61.27	8.883	0	89.04
Average Grade for Year 3	2,965	62.50	6.784	0	83.25
Average Grade for Year 4	2,965	62.46	7.358	0	83.29
Cumulative Average	2,965	61.98	6.349	12.38	83.76

In addition to KCSE results, a few control variables are used. The entrance test scores for both Math and English are percentage points achieved by the student during the university issued tests. Students sit this test during the admission interviews. We proxy these tests as aptitude tests. The Average Attendance mean is at 90.8% with a small standard deviation of 7.84%. This is expected as the university requires students to attend at least two-thirds of classes in each specific unit to complete the course. Table 4 below shows the descriptive statistics of these control variables. The average age is 19.84 with a variance of 2.3. The English and math entrance results seem to have higher variances than the university grades. a possible reason to this is that the university average covers several tests hence the variance is likely to be smaller than one test.

Table 4: Descriptive statistics of Control Variables

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Independent Variables					
Entrance English Test	2,965	66.32	17.79	5	556
Entrance Math Test	2,965	63.58	13.64	2	100
Age at Admission	2,965	19.84	2.302	2	42
Average Attendance	2,965	0.908	0.0784	0	0.996

4.2 Results and Discussion

4.2.1 Effect of High School National Results on University Performance

KCSE grades are coded as a categorical dummy with C+ as the base. Table 5 shows how much more a student scored in university compared to a student who scored C+. Grade A students tend to have 9% to 10% higher grades than students that got C+. The results seem coherent with expectations. The results show that a higher KCSE mean grade tends to increase university performance. There also seems to be a uniform declining progression. That is, A students scored more than B+ students, and B+ students scored more than B plain students in university. For example, an A student would score 9.852% more than a C+ student in cumulative university performance. The effect of university performance is significant across all grades excluding performance in year 2 for B(plain) and B- (minus) students. Additionally, the predictive value of KCSE on the year-to-year university performance is similar to that of cumulative university performance.

The results contradict those of Obwoge, Priscah, Mohamed, Keraro, & Kangethe (2017) that find KCSE mean to have no effect on university performance. This is the only other accessed literature looking at KCSE grades and university performance. A likely source of the differing results is that Obwoge, Priscah, Mohamed, Keraro, & Kangethe (2017) used only medical students in the sample. Due to the high cutoff grades required for admission to medical schools, over 77% of the students scored A or A-. This causes the data to be highly skewed.

Table 5: KCSE Mean Grade on University Performance

	Year 1	Year 2	Year 3	Year 4	Cumulative
KCSE MEAN - A	9.573***	10.30***	9.208***	9.287***	9.852***
	(0.830)	(1.749)	(0.784)	(0.891)	(0.715)
KCSE MEAN - A Minus	7.981***	8.612***	6.774***	6.882***	7.673***
	(0.666)	(1.398)	(0.627)	(0.713)	(0.572)
KCSE MEAN - B Plus	5.612***	3.961***	5.274***	5.511***	5.423***
	(0.591)	(1.239)	(0.556)	(0.632)	(0.507)
KCSE MEAN - B	4.274***	1.302	3.975***	3.511***	3.828***
	(0.526)	(1.096)	(0.492)	(0.559)	(0.448)
KCSE MEAN - B Minus	1.937***	0.542	2.563***	1.720***	2.057***
	(0.484)	(1.012)	(0.454)	(0.516)	(0.414)

*** p<0.01, ** p<0.05, * p<0.1

Standard errors in parentheses

KCSE Mathematics grades and KCSE English grades have no statistically significant effect on the university performance. This may be caused by the fact that the KCSE mean included in the regression may include the effect of the English and Mathematics results. A second regression is performed without the KCSE mean included since these subjects are included in the calculation of the mean grade. In this second attempt, KCSE Math and KCSE English remain with no statistically significant effect on performance. Detailed results can be found in the appendix section.

Entrance test results have little to no effect on university performance. Entrance English test results are not statistically significant in predicting university performance. Entrance Math test results have a statistically significant effect. However, the effect of these Entrance Math results is negligible and negative in value. For example, in Year 1, a 10% difference in test performance suggests the student would score 0.28 less marks in university. Performance in oral interview also has no significant effect on the university grades. Detailed results can be found in the appendix section. The results contradict those of Koljatic, Silva, & Cofre´ (2013) which finds that achievement tests such as KCSE offer no superior value to aptitude tests. In contrast, this study shows KCSE having greater predictive value than the aptitude tests.

On initial analysis, the percentage of variance explained by the regression models varies between 28% and 16%. This can be considered low since the majority of the admission parameters have been included in the regressions. The lowest is fourth year at an R-squared of 16.2%. This differs with Geiser & Santelices (2007) who found an increasing R-squared from first year to fourth year. However, Geiser & Santelices (2007) also agree that one would expect predictive power to reduce over the course of the student's life in university. This is because other factors come into play such as the academic engagement of the student in school. This can be seen since the effect of class attendance increases from first year to fourth. The lowest being 0.77 in year on and 2.07 in year 4.

Chapter 5: Conclusion

5.1 Summary

The Kenya Certificate of Secondary Education exam plays a key role in placing majority of the students into their university courses. This study looked into the predictive ability of KCSE results on university performance both year by year and cumulative performance using data from Strathmore University. Strathmore University is a private university in Kenya offering a variety of degree programs.

The results show significant positive effects of KCSE mean results on university performance, especially for students that scored highly in KCSE. It is also noted that KCSE Math and KCSE English results offer no significant value in predicting university performance. The university administered tests also offer little prediction value. Results also suggest that KCSE offers little difference in the predictive value on year-on-year performance compared to cumulative performance.

5.2 Policy Recommendation

The study results support the use of KCSE grades for student selection. The results also suggest that Strathmore University should reconsider the use of the entrance aptitude test since it offers little value in predicting university performance. This could also be improved by looking into how the test is structured.

5.3 Limitations of the study

A key limitation in the data is that the data used was for students who graduated. This excludes data for students who dropped out along the way. However, it is likely that inclusion of these students would only reduce the effects of KCSE on university performance. Additionally, the study only looks at the broad criteria used for admission. It does not look at the specific criteria, such as cluster scores, used for each and university course.

5.4 Areas of further research

Further research can look into the use cluster scoring criteria used for each course and whether or not it offers predictive value for the success of a university student. This could offer stronger validation for the use of KCSE grades in university selection.

Additional research can also compare the use of cumulative high school performance as opposed to KCSE. Since KCSE is a single exam, it may suffer from certain flaws. For example, students may only work hard leading up to the exam. This structure of learning puts them at a disadvantage in university where every single test is recorded. This is however

difficult due to lack of high school data since schools do not report results of their internal examinations.

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Appendix

Regression Summary

VARIABLES	Average Grade Year1	Average Grade Year 2	Average Grade Year3	Average Grade Year4	Cumulative average
ENTRANCE ENGLISH	-0.00883	-0.0205	-0.000256	-0.00796	-0.00780
	(0.00743)	(0.0156)	(0.00701)	(0.00797)	(0.00639)
ENTRANCE MATH	-0.0284***	-0.0694***	-0.0297***	-0.0368***	-0.0308***
	(0.0106)	(0.0219)	(0.00980)	(0.0111)	(0.00893)
AGE AT ADMISSION	0.711***	-1.741***	0.509***	0.212***	0.477***
	(0.0647)	(0.121)	(0.0543)	(0.0617)	(0.0495)
KCSE MEAN - A	9.573***	10.30***	9.208***	9.287***	9.852***
	(0.830)	(1.749)	(0.784)	(0.891)	(0.715)
KCSE MEAN - A Minus	7.981***	8.612***	6.774***	6.882***	7.673***
	(0.666)	(1.398)	(0.627)	(0.713)	(0.572)
KCSE MEAN - B	4.274***	1.302	3.975***	3.511***	3.828***
	(0.526)	(1.096)	(0.492)	(0.559)	(0.448)
KCSE MEAN - B Plus	5.612***	3.961***	5.274***	5.511***	5.423***
	(0.591)	(1.239)	(0.556)	(0.632)	(0.507)
KCSE MEAN - B Minus	1.937***	0.542	2.563***	1.720***	2.057***
	(0.484)	(1.012)	(0.454)	(0.516)	(0.414)
KCSE ENGLISH - A	3.484	13.69	3.508	-2.440	0.263
	(6.246)	(9.586)	(4.299)	(4.886)	(3.919)
KCSE ENGLISH - A Minus	2.559	13.02	2.687	-3.119	-0.452
	(6.234)	(9.549)	(4.283)	(4.868)	(3.904)
KCSE ENGLISH - B	3.032	12.65	2.491	-3.172	-0.478
	(6.225)	(9.521)	(4.271)	(4.854)	(3.893)
KCSE ENGLISH - B Plus	2.985	13.57	2.865	-2.869	-0.268
	(6.228)	(9.530)	(4.275)	(4.858)	(3.896)
KCSE ENGLISH - B Minus	3.347	12.32	2.763	-3.144	-0.259
	(6.231)	(9.527)	(4.273)	(4.857)	(3.895)
KCSE ENGLISH - C Plus	1.661	14.31	2.227	-2.909	-0.721
	(6.341)	(9.842)	(4.415)	(5.017)	(4.024)
KCSE ENGLISH - C Minus	3.821	14.30	3.863	-1.874	0.590
	(6.251)	(9.572)	(4.293)	(4.879)	(3.913)
KCSE ENGLISH -D	-3.550	8.827	0.265	-2.417	-2.534
	(7.041)	(11.04)	(4.950)	(5.626)	(4.512)
KCSE ENGLISH - D Plus	5.031	16.96	3.590	-0.933	1.799
	(8.806)	(16.39)	(7.353)	(8.357)	(6.702)
KCSE MATH - A	-2.503	-1.306	6.130	5.601	2.028
	(4.457)	(9.545)	(4.281)	(4.866)	(3.902)
KCSE MATH - A Minus	-2.852	-2.441	5.486	5.912	1.747
	(4.460)	(9.551)	(4.284)	(4.869)	(3.905)
KCSE MATH - B	-3.018	-0.826	5.424	5.223	1.554
	(4.451)	(9.533)	(4.276)	(4.860)	(3.897)
KCSE MATH - B Plus	-3.642	-2.142	5.834	6.031	1.550
	(4.455)	(9.541)	(4.280)	(4.864)	(3.901)

KCSE MATH - B Minus	-3.829	-2.703	5.436	5.160	1.172
	(4.449)	(9.528)	(4.273)	(4.857)	(3.895)
KCSE MATH - C	-3.300	-1.073	5.838	6.949	1.951
	(4.453)	(9.537)	(4.278)	(4.862)	(3.899)
KCSE MATH - C Plus	-4.234	-3.246	5.548	6.157	1.365
	(4.446)	(9.522)	(4.271)	(4.854)	(3.893)
KCSE MATH - C Minus	1.145	6.624	8.002	10.08	5.509
	(4.497)	(9.629)	(4.319)	(4.909)	(3.937)
KCSE MATH - D	0.136	-1.328	6.177	7.800	2.725
	(4.678)	(9.961)	(4.468)	(5.078)	(4.073)
KCSE MATH - D Plus	-1.754	7.171	6.796	9.158	4.172
	(4.677)	(9.958)	(4.466)	(5.076)	(4.071)
ORAL SCORE - A	-0.00245	4.678	4.169	5.622	3.381
	(3.606)	(7.725)	(3.465)	(3.938)	(3.158)
ORAL SCORE - A Minus	-1.195	4.025	4.172	5.086	2.744
	(3.756)	(8.038)	(3.605)	(4.097)	(3.286)
ORAL SCORE - B	-0.936	3.891	3.926	4.986	2.832
	(3.599)	(7.712)	(3.459)	(3.931)	(3.153)
ORAL SCORE - B Plus	-0.527	5.317	4.088	5.901	3.301
	(3.619)	(7.753)	(3.477)	(3.952)	(3.170)
ORAL SCORE - B Minus	-1.885	6.197	3.838	5.618	2.658
	(3.684)	(7.894)	(3.540)	(4.024)	(3.227)
ORAL SCORE - C	-1.774	2.814	3.646	4.936	2.641
	(3.648)	(7.809)	(3.503)	(3.981)	(3.193)
ORAL SCORE - C Plus	-2.699	-0.985	2.590	4.506	1.680
	(3.707)	(7.921)	(3.553)	(4.038)	(3.238)
ORAL SCORE - C Minus	5.818	5.543	-3.452	4.875	2.230
	(7.213)	(15.45)	(6.932)	(7.878)	(6.318)
Attendance	0.775***	-0.707	1.718***	2.079***	1.489***
	(0.245)	(0.512)	(0.230)	(0.261)	(0.209)
GENDER	0.202***	0.162***	0.244***	0.150***	0.196***
	(0.0166)	(0.0328)	(0.0147)	(0.0167)	(0.0134)
Constant	27.12***	65.78***	14.14*	34.01***	27.32***
	(8.694)	(16.15)	(7.245)	(8.234)	(6.604)
Observations	2,849	2,965	2,965	2,965	2,965
R-squared	0.252	0.178	0.237	0.162	0.276