

Determinants of Academic Performance for Undergraduate Students in Kenya: An Educational Production Approach

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Abstract: Investment in human capital plays an important role in determining individual life outcomes. Dropping out of some of the university undergraduate students constitutes a huge loss of public resources so far spent on them before completing their studies. In addition, the government idea on banning of boarding primary schools coupled with the suggested policy that in order to enhance access to secondary education, public boarding schools should be abolished, calls for urgent need to research on the effects of school type and category in determining the educational outcomes of students. The objectives of this study are to identify the determinants of academic performance for university undergraduate students in Kenya; and to analyze the effects of school type and school category on academic performance of university undergraduate students in Kenya. The study was based on the education production function as the theoretical framework. The sample consisted of 1,506 university undergraduate students from six public universities and three private universities. An ordered probit model was estimated in establishing the determinants of academic performance for the undergraduate students. This study found that the academic performance of first year university students is determined by the category of primary school attended and also the university course being taken by the students in the university. First year university students who had attended primary day schools attained better grades than those who attended boarding primary schools. Students taking humanities courses attained better grades than those taking science courses in their first year exams at university level. The study recommends that the Kenyan government ought to fast track implementation of the total ban for all primary boarding schools in Kenya.

Key Words: Education production function, academic performance, school type, school category

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I. INTRODUCTION

Background to the Study

It has been established that investment in human capital plays an important role in determining both economic growth and individual life outcomes²⁰. However, a study in Cambodia found that personal backgrounds play a potential role in predicting academic performance of undergraduate students²⁸. In Pakistan,³⁰ found that individual factors such as test competence, academic competence, and test anxiety were important factors that discriminate between low GPA and high GPA achievers. In another Pakistan study by³ it established that graduate student's performance is significantly affected by schooling whether it is private school or government school. A study in Bangladesh, by² concluded that the type of schools in which students study greatly influence the educational performance and academic achievement of the students. Another study in UK by¹⁷ included the type of high school attended on academic performance of medical students and found that medical students from state-funded schools do better at medical school than their counterparts from independent schools and prior attainment should be interpreted within the context of an individual's educational circumstances. The effect of individual students is emphasized in a Chilean study by²⁶ who found that parental socio-economic status variables do not have a significant impact on academic performance of evening university students.

In recognition of the importance of university education and for equity reasons, governments all over the world finance this sector of education. However, owing to unfavorable economic conditions, financing of universities from public resources has not been sustainable. Owing to the fact that higher education is expanding at an enormous rate, governments are becoming increasingly unable to fully finance it; hence the need for diversified sources of funds including the private sector³¹. Consequently, revenue diversification in African

universities has been encouraged leading to a shift from financing of university education from taxpayers to parents and students who benefit directly or indirectly from receiving skills ²⁷.

In Africa, the introduction of tuition fees and the shift towards near full cost recovery on accommodation and catering has widely been seen as a significant move of lifting the universities out of the poor financial position occasioned by the reduction in government financial support. However, despite the fact that the move is noble, the implementation has been slow and has impacted negatively on poor families some of whom have withdrawn their children from universities. Household education costs have become a heavy burden on poor and rural households, resulting in negative educational consequences such as dropping out ¹. If students from economically disadvantaged households do not drop out, they will need to work additional hours to support themselves financially while they study at the expense of their studies, or otherwise they are forced to live in poverty. If they drop out of universities, poor students will ultimately be excluded from education because of the need to earn additional income. A study in Ethiopia by ³³ recommended that working in the ground with high school and improving students earlier before they joined in to university will be more effective so as to improve their academic achievement in college level too.

The Government of Kenya is committed to providing quality and accessible higher education system that shares the same goals, values and principles that would make it a critical player in driving economic growth and eradicate poverty through employment creation ²⁴. Despite this commitment, Kenya's higher education sector faces some challenges including inadequate public funding and the consequent declining quality of educational output. However, owing to poverty and a weak national economy, a number of households have difficulties raising the increasing cost of university education in Kenya. Owing to financial constraints facing them, university students in Kenya are feared to be involved in activities that affect their studies. ²², reported that students were engaging in on-campus income generating activities such as selling hard drugs and unrefined alcohol while others were engaging in commercial sex for subsistence. However, few studies have investigated the relationship between university students' social behaviour, social economic status and their academic performance.

Academic performance

Academic performance as the dependent variable has been measured using different proxies in various studies. ⁹ used the number of O' level passes for exam success; ³² used test scores and graduation rates; ¹¹ included multiple measures like math test scores, reading test scores and the highest grade attained; ⁶ used propensities to graduate (speed of passing exams) from schools; ⁸ used the grades achieved by first-year undergraduate students in economics in the exams of three subjects ordered according to a decreasing level of mathematical content; ²⁹ used a standard reading, math, and science test, which provided the test scores; ¹⁶ used math and reading test scores; ¹⁵ used graduation rates; CGPA was used by ^{2, 33} while ³⁰ used GPA. In this study the level of academic performance was measured using the grade attained in first year at University.

Pre-university educational moulding

¹³ observes the final high school grade as having significant direct positive effects on the academic performance of all undergraduate students in the university, and more specifically on both the male and female students, the local students, both the Athi River and Nairobi campus students, students in the second and fourth year of study and among students taking business- and social science-based courses.

A number of studies ^{5, 6, 7, 17} have confirmed the importance of high school types in determining students' academic performance. The study by ⁴ on a sample of university students from university of Milan, found that students from public schools perform better academically, followed by religious private schools and then lay private schools while, ⁶ found that private schools are less effective than public ones in enhancing educational outcomes. A Kenyan study on Kenya Certificate of Secondary Education (KCSE) performance by ¹⁹ established that students in mixed schools felt that they would have performed better in single sex schools than in mixed schools, and boys were also found to perform better in single sex schools than in mixed schools. This study includes the type and category of both primary and secondary school attended among the regressors.

Socio-economic background

Academic performance is affected by a number of factors including admission points, social economic status and school background ^{18, 9, 29} found that socio-economic status as well as family structure plays a significant role in the academic performance of the offspring. One of the first empirical studies of the factors that influence student's scholastic results was the 'Coleman Report'. The authors found that, in the US, allocating more financial resources to schools had no significant impact on student test scores. On the contrary, the most important predictor of test scores was the socioeconomic background of pupils. Since then, international research has not produced clear-cut evidence on the effect of additional funding on student performance ²⁹. Family's financial resources as measured by the logarithm of family income may be used to

choose better school for the child and to provide a more suitable environment for studying⁹. They further argued that families with more than one child, are likely to compete for resources and that parental attention is reduced as family size increases.

A study by²⁸ examined the determinants of academic performance of 329 undergraduate students selected from a university in Cambodia. Based on the findings from the multivariate regression analysis, a number of variables, namely high school grade, English ability, class attendance, study effort, academic self-efficacy, and family socio-economic status were found to be positively associated with academic performance.

Problem Statement

Given that a number of university undergraduate students face economic difficulties that lead them to undertake activities which distract them from their studies, their levels of achievements are likely to be affected. This would mean that the quality of training in these universities is low, meaning that skills attained may not match the government's expectations as far as industrialization is concerned. The reported dropping out of some of the university undergraduate students due to financial constraints constitutes a huge loss of public resources so far spent on them before completing their studies. In addition, the government idea on banning of boarding primary schools²³ coupled with the suggested policy by¹⁴ that in order to enhance access to secondary education, public boarding schools should be abolished, calls for urgent need to research on the effects of school type and category in determining the educational outcomes of students. Educational achievements of undergraduate students in Kenya's universities have not been investigated, hence, the need to establish the factors which influence educational achievements of university students.

Objectives

1. To identify the determinants of academic performance for university undergraduate students in Kenya
2. To analyze the effects of school type and school category on academic performance of university undergraduate students in Kenya

Theoretical framework

In the past attempts have been made to approach education as a production process. The "educational production function" concept was suggested as a viable approach to educational research as early as the late nineteen-sixties. Subsequent studies, typically viewed test scores as the single output of an educational process characterized as a function of educational inputs and student demographics¹⁵. These have culminated in the current controversy over whether "resources matter" in education^{11, 15}. The controversy arises from the empirical finding that student demographic characteristics and family background better explain their performance on standardized tests than do measures of the resources devoted to their education¹⁵.

In theoretical works, the education production function *may* appear as a "black box", with its functional form left unspecified. Applied analyses, however, generally rely on a classical regression approach, which assumes a linear (or log-linear) shape for education production function²⁹. The reduced form of the theoretical model for educational production function as illustrated by¹⁵ is

$$Q = \alpha + \beta'X + \delta E + \varepsilon \dots\dots\dots(1)$$

Where Q is the single educational output, X is a vector of student and/ or household demographic characteristics such as household income, wealth, parents' educational attainment and socioeconomic indicators, and E is expenditures on schools at the appropriate level (school, school district, school provincial or school national) of aggregation.¹⁵ observed that estimates of δ are often statistically insignificant and that the output and expenditures are simultaneously determined by the household demographic characteristics, X, such that

$$E = a + b'X + d'P + \mu \dots\dots\dots(2)$$

Where P is a vector of input prices

This study shall be based on the "educational production function" as the theoretical framework for analyzing the relationship between output and various inputs. The expenditure equation (2) above shall not be estimated since data for the amount incurred by the parents in financing for their children's university undergraduate education is not available, instead the amount of loan and bursary allocated to the student by the Higher Education Loans Board (HELB) was captured which may not be endogenously determined by the household demographic characteristics. In addition inputs like school uniform, stationery, sporting materials and the like were not captured in the data set.

II. METHODOLOGY

Empirical model

Following the theoretical framework outlined above our empirical model for analyzing schooling outcomes will utilize an educational production function approach as presented by⁸. This model has been used

in both developing and developed countries. According to this approach, educational output is explained as a function of several inputs as

$$A = f(x) = f(G, BT, ST, T) \dots\dots\dots(3)$$

Where A is a categorical grade variable¹ as the metric for examination achievement; x is a vector of determinants consisting of the following variables: G is gender dummy variable; BT denotes college (humanities, health science etc) type dummies; ST represents school type dummies and T are time/ cohort dummies pertaining to the academic courses considered in the sample which shall proxy for any externalities resulting from disturbances in the learning environment such as strikes.

Previous studies have failed to incorporate the category² of primary and secondary schools attended in explaining the students' academic performance. ¹⁴ suggested that in order to enhance access to secondary education, public boarding schools should be abolished. There is need for testing whether this policy if implemented would affect the quality of students produced by the education system and this can conveniently be measured at the university level by the students' academic performance. The current study shall incorporate these additional variables in equation (1) and grade attained shall be used as the dependent variable.

In the last years new techniques allow us to deepen in the study of multinomial choice variables ¹⁰. The multinomial logit and probit models do not take into account that dependent variable reflects an order. In this way, regression analysis of categorical grades can be achieved through specifying an ordered probit model³ hence would be estimated.

The ordered probit model can be used to model a discrete dependent variable that takes ordered multinomial outcomes ²¹ like examination performance, with categorical outcomes such as grades. Thus, our starting model is formulated through a latent performance variable A* that it is unobserved (an individual's "true" marks) and which depends on a linear combination of explanatory variables:

$$A^* = \beta' X + \varepsilon, \varepsilon | X \sim \text{Normal}(0, 1)$$

Where X is a set of explanatory variables, β a set of coefficients and ε an error term, uncorrelated with the set of regressors with a normal distribution. The dependent variable used is individual grade. Thus, the higher value of our latent variable, the higher will be the probability that the individual attains a higher grade category.

However, A* is unobserved and what we do observe is:

$$A_i = \begin{cases} 0 & \text{if } A_i^* \leq \gamma_1 \\ 1 & \text{if } \gamma_1 < A_i^* \leq \gamma_2 \\ \dots & \dots \\ (M-1) & \text{if } A_i^* > \gamma_{(M-1)} \end{cases}$$

Where $\gamma_1, \gamma_2, \dots, \gamma_{(M-1)}$ are unknown cut points (or threshold parameters) to be estimated with β.

Sampling and Data Type

The study utilized data collected in 2006 by the Institute of Policy Analysis and Research (IPAR) in collaboration with the Higher Education Loans Board (HELB). The study population consisted of undergraduate university students. Quota sampling was used to select both public and private universities, the beneficiaries and non-beneficiaries of the Higher Education Loans Board (HELB) funding, and male and female students. The six public universities selected were University of Nairobi (UON), Egerton University, Maseno University, Moi University, Kenyatta University (KU) and Jomo Kenyatta University of Agriculture and Technology (JKUAT) while the three private universities sampled were Catholic University, Baraton University and United States International University (USIU). From each of the six public universities⁴, 150 beneficiaries and 50 non-beneficiaries of HELB funding were selected while from each of the three private universities⁵, 70 beneficiaries and 30 non-beneficiaries of HELB funding were also selected. Using simple random sampling a total of 1,506 university undergraduate students, who formed the units of analysis were selected and interviewed.

ⁱ Incase there is no adequate information for the grades obtained the study shall use 'deferring of studies' or/ and 'repeating of academic years' as the proxies to students' academic performance in which a logit/ probit model shall be estimated

ⁱⁱ Whether the last school attended was a day school, boarding school, mixed school, pure boys school or pure girls school

ⁱⁱⁱ An ordered probit is the more appropriate model, given that our dependent variable has a natural ordering

^{iv} University of Nairobi (200); Kenyatta university (201); JKUAT (208); Maseno university (200); Moi university (200) and Egerton university (200)

^v Catholic university (100); USIU (100) and Baraton university (97)

Self-administered questionnaire was used to gather both qualitative and quantitative data from undergraduate students in all the sampled universities. The collected information included students' socio-economic backgrounds⁶, pre-university educational moulding⁷, their academic performance, socialization patterns, how they cope with financial constraints, parental education and suggestions on how financing of university education can be strengthened in Kenya so as to improve students' academic performance²⁵.

III. DATA ANALYSIS AND STUDY FINDINGS

Descriptive Statistics

One thousand five hundred and six students were interviewed with most of them 1,202 (79.81 percent) being from public universities. Seven hundred and seventy six students representing 51.53 percent, took science related degree courses while 730 (48.47 percent) took humanities. Majority of the students 871 (57.84 percent) interviewed were males. The schools attended by the students both primary and secondary were analyzed by type (public, private or religious) and also by category (pure males/ females/ mixed day/ boarding). Public primary and secondary schools produced the majority with 1,262 (83.80 percent) and 1,288 (85.52 percent) respectively. Private primary schools had 164 (10.89 percent) leading religious primary schools that had produced 72 (4.78 percent) students. However, religious secondary schools with 118 (7.84 percent) led private secondary schools 100 (6.64 percent) by a small margin.

Regression Analysis

The dependent variable is grade obtained by the students in their first year at university level. The grades are arranged in ascending order with a value of 1 for low academic outcomes (E) and value of 5 for the highest grade (A).

Table 1: Ordered probit model estimation of University Students First year Grades in Kenya

Regressors	Dependent is Grade Ordinal variable (1 E, 2 D, 3 C, 4 B, 5 A)	
	Equation	
Primary School Category 1 if Day 0 Boarding	0.3883	(2.14)*
Primary School Category 0 if Mixed 1 Boys Or Girls	-0.1014	(-0.53)
Secondary School Category 1 if Day 0 Boarding	-0.2521	(-1.54)
Secondary School Category 0 if Mixed 1 Boys Or Girls	-0.1011	(-0.65)
Primary School Type 1 if Public 0 Private Or Religious	-0.2212	(-1.1)
Secondary School Type 1 if Public 0 Private Or Religious	0.0544	(0.33)
University Type 1 if private 0 public	-0.0064	(-0.05)
Type of Course 1 if Humanities 0 Science	0.2544	(2.22)*
Household Size	-0.0540	(-1.79)
Log Difference between Loan Applied and Loan Awarded 1st year	-0.0709	(-0.86)
Log Total Monthly Income of Family	0.0807	(0.97)
Gender Male 1	-0.1875	(-1.56)
Cut 1 (γ_1)		-3.2233
Cut 2 (γ_2)		-2.6064
Cut 3 (γ_3)		-1.0560
Cut 4 (γ_4)		1.3280
Log likelihood		-364.42
LR chi ²		23.66*
Pseudo R ²		0.0314
Number of observations		476

Based on the analysis, student performance in their first year in university was positively and significantly related to the category of primary school attended. Specifically, students who attended primary day schools performed better than those who had attended boarding primary schools. This is in line with the Kenyan government idea for totally banning all primary boarding schools²³. However, their academic performance was the same irrespective of whether the primary school was mixed or pure boys or pure girls. Either the secondary school category attended had a negative coefficient on academic performance even though they were statistically insignificant. The type of primary school attended had a negative coefficient showing that students

^{vi} Socioeconomic in terms of gender, age bracket, marital status, family's total monthly income and household size

^{viii} Type and category of both primary and secondary school last attended

from public primary schools performed worse than those who had attended private or religious primary schools, even though it was statistically insignificant. The positive coefficient on the secondary school type indicates that students who had attended public secondary schools performed better in their first year at university compared to those from private or religious secondary schools, even though the significance was not supported by statistical test of significant.

The type of university had a negative coefficient illustrating that students in public universities had better grades in their first year than those in private universities; however, the coefficient was not statistically significant. A positive and statistically significant coefficient on the type of course shows that university students who are taking humanities attained better grades than those taking science courses. Household size has a negative coefficient indicating that students from larger households had worse grades even though it was not statistically significant. The difference between the amount of loan applied and amount awarded in first year produced a negative coefficient showing that when the difference increases it also negatively affects the grades attained by the universities in their first year, even though not statistically significant. Family's total monthly income has a positive coefficient in the model indicating that when total monthly income of a family increase the students would attain better grades academically, even though statistically insignificant. The results are in line with those established in Ethiopia by ³³ that the magnitude of the effect of family income on student's academic performance though positive, but statistically it has no significant effect on students CGPA. The negative coefficient shows that female students attained better grades than the male students, however, there is no significant difference in academic performance between male and female students similar to findings by ¹⁸. Similar findings were deduced in Cambodia by ²⁸ who established that there was no sufficient evidence to indicate age, gender, household location, parental education, parental involvement, and teaching evaluation to have predictive power on academic performance.

IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Emanating from this study findings, the study concludes that the academic performance of first year university students as measured by grades attained is determined by the category of primary school attended and also the university course being taken by the students in the university. First year university students who had attended primary day schools attained better grades than those who attended boarding primary schools. Students taking humanities courses attained better grades than those taking science courses in their first year exams at university level.

Students' academic performance was the same irrespective of whether the attended primary school was mixed or pure boys or pure girls. The category of secondary school attended does not determine the academic performance of first year university students. The type of primary schools, secondary schools and university attended does not determine the grades attained by first year university students. Academic performance for first year university students is not determined by Household size, the difference between the amount of loan applied and amount awarded in first year, family's total monthly income, and the sex of the student.

Policy Recommendations

1. The Kenyan government ought to fast track implementation of the total ban for all primary boarding schools, as they negatively affect the performance of the students once they are at university level.
2. The ministry of education needs to fully support the idea of banning primary boarding schools in favour of increased primary day schools.

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