



Assessing factors contributing to students' academic performance in Plateau State Polytechnic, Nigeria

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Abstract

Education is one of the most important factors that not only instil critical skills, abilities, and knowledge in individuals, but also lead to individual, community, and national growth and progress. This study investigates factors that influenced academic performance among students of Plateau State Polytechnic, Barkin Ladi, Nigeria. Primary and secondary data were obtained through the administering of questionnaires and the collection of student results from the school records. A sample of 363 final year students from the population of 3860 final year students was selected using the Yamane sample size selection method. The data collected were analyzed using Quantile Regression with the help of R-Package Version 3.6.1. From the result obtained, different factors were identified at different quantile levels to have a significant influence on students' CGPA. At the higher quantile level (i.e. 75% and 95%), gender, number of siblings, mother's educational level, father's educational level, Unified Tertiary Matriculation Examination (UTME) score and how school fee is financed had significant effects on student CGPA. At the lower quantile (i.e. 5% and 25%), the number of siblings, mother's educational level, how school fee is financed, secondary school attended and UTME score had significant effects on student CGPA. Therefore, as the male students' results in the research seem to be lower than those of females, parents and schools should pay more attention to their education. Besides, the researcher recommends that government and schools provide support to children from large families.

Key words: quantile, academic performance, age, gender, education in Nigeria

1. Introduction

Academic performance refers to how well students, teachers, and institutions meet their short- and long-term educational objectives. As a key measure of institutional quality, it has always been a source of concern for educational institutions (Abdullahi & Mirza, 2018). Students' academic success is measured in tertiary institutions in a variety of methods, including cumulative grade point average (CGPA), grade point average (GPA), and test results, with GPA being used to measure students' achievement in a certain semester. According to Cambridge University research, academic achievement is frequently measured in terms of exam results. It is frequently defined by a student's performance on tests, course assignments, and examinations. As an indicator or performance measure of academic achievement, academic performance reveals itself in the class of degree acquired. Academic performance is defined by Chigozie (2019) in three ways: the ability to study and remember facts, that is, the ability to study effectively and see how facts fit together to form a larger pattern of knowledge, the ability to think for yourself in relation to facts, and the ability to communicate your knowledge verbally or on paper.

However, Nigerian polytechnics were established with the intention of training technologists, technicians, and managers in programs leading to the awards of Certificates, National Diplomas (NDs), Higher National Diplomas (HNDs), and Advanced Professional Diplomas that are pertinent to the needs, aspirations, and growth of the country's diverse economy and industries. It is with this aim that the training obtained from such Polytechnics will change the nation's economy and spur industrial growth. As surveying is the foundation of all development, it is crucial to strengthen training institutions, particularly in the polytechnic sector.

Education takes place as a learning process conducted in institutions of learning referred to as Schools as well as the institutions of higher education (universities, polytechnics and colleges) (Adeyemi, 2014). In institutions of learning such as schools and institutions of higher learning, education occurs as a learning process (Adeyemi, 2014). One of the most important factors that not only helps people develop the necessary knowledge, skills, and abilities, but also promotes the entire development of the person, the community, and the country as a whole is education. A well-educated person is not only capable of achieving his/her personal aims and aspirations, but also of effectively contributing to the general welfare of the community.

Nigerian society places a lot of value on education, since it sees it as the main path to achieving national development (Egbule, 2004). However, this can only be done by students if they actively participate in academic pursuits that will improve their academic performance while they are in the citadel of learning. This will result in the nation's technical development. Despite the importance placed on academic performance, according to Egbule (2004), student performance is declining. This can be due to students' participation in too many extracurricular and academic activities. Since student academic performance affects the quality of human resources in society, this problem appears to be a significant one that requires an urgent and serious solution. Additionally, Sakirudeen and Sanni (2017) claimed that there had been complaints about students' poor academic performance in external exams like the Unified Tertiary Matriculation Examination (UTME) and West Africa Examination Council (WEAC), which serve as the educational foundation for university admissions.

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The factors that affect students' academic failure in schools, colleges, and universities have been the subject of several types of research. Student effort, previous or prior academic performance, self-motivation, the socioeconomic status of the parents of the students, age, the number of hours studied per day, admission points, various entry qualifications, tuition trends, and the students' area of residence (rural or urban), are a few of the factors that have been identified (Farooq et al., 2011). They also found that factors including the school setting, family history, level of economic, political, and intellectual development, as well as social status and admittance requirements, have an impact on kids' academic achievement. Social Economic Status (SES) and parents' educational levels were found to have a substantial impact on student's overall academic performance (Farooq et al., 2011). Additionally, Farooq and his colleagues (ibid) noted that students with high and average socioeconomic status perform better academically than those with lower socioeconomic status. Besides, they claimed that in terms of how well their children performed academically in school, parents' education mattered more than their line of work.

2. Literature review

Many types of research have been conducted to investigate the aspects that influence a student's academic success (Mlambo, 2011; Abbasi & Mir, 2012; Bugge & Wikan, 2013; Mekonnen, 2014; Wambugu & Emeka 2016). It is a frequent topic to discuss the various factors that influence achievement levels. This is important because students' performance has a significant impact on student's personal and professional lives, as well as their academic self-esteem and persistence in the university system. The academic achievement of students has a significant impact on the economic and social growth of the nation.

Additionally, it impacts how much and how they participate in community life. Underfunding of Nigerian institutions (polytechnics) has affected their capacity to improve the state of their physical facilities, which are essential to teaching and research, as well as their ability to carry out their traditional duties of teaching and research in an effective and efficient manner (Bamiro & Adedeji, 2010). As a result, because the elements that had previously improved college success have been eliminated, students' performance has decreased. Aside from inadequate finance, a variety of factors that affect academic achievement may differ from one academic environment and one cultural context to another. For instance, a student's age, entry credentials, level of enthusiasm, and work ethics may have an effect on how well they succeed (Abbasi & Mir, 2012). Abbasi and Mir (2012) proposed that in light of this, students themselves play crucial roles in achieving high marks and should, for this reason, take advantage of all options presented to them in their academic environment.

Numerous studies have identified personality characteristics as one of the variables influencing academic performance. These include motivation, gender, parenting, housing costs, social background, time spent studying, time spent working, and time spent on paid labor (Bugge & Wikan, 2013). In addition, Islam (2014) also found that the students' gender had a significant, independent impact on their grade point average. However, some other findings from several studies indicated that gender had no appreciable impact on academic performance (Bugge & Wikan, 2013). Other studies have identified one of the elements that significantly influence academic success as being students' attitudes toward and interest in the course (Mekonnen, 2014).

A student's academic performance is influenced by the environment at the school, whether it be academic or not. The performance of the institution's students is most likely to improve if it provides a welcoming and conducive environment; otherwise, the performance will be negatively impacted. Physical facilities, institutional attendance policies, library resources, enrollment rates, the availability and qualifications of institutional academic staff, teaching strategies, and the evaluation system are among the institutional academic factors that have been identified as having an impact on performance (Haolader & Nickolaus, 2012; Haolader et al., 2015). Institutional factors, such as poor learning environments, intermittent water supplies, inadequate library resources, crammed test schedules, persistent strikes, and school closures, among others, do not significantly affect students' performance (Osaikhiwu, 2014).

A study also demonstrates a strong correlation between owning a computer and using technology to improve pupils' academic achievement (Ahlan et al., 2014). All of the aforementioned research (Abbasi & Mir, 2012; Haolader & Nickolaus, 2012; Bugge & Wikan, 2013; Ahlan et al., 2014; Islam, 2014; Haolader et al., 2015) shows that several studies have been done on the variables that, in general, influence students' academic success. The majority of the elements mentioned have to do with students' personal traits, family socioeconomic backgrounds, institutional problems, career-related challenges, social factors, and high school education (specialization and grade achieved).

At the University of Nairobi in Kenya, Wambugu and Emeka (2016) performed research on the relationship between entry requirements and academic performance in undergraduate science courses. In three distinct science topics at the undergraduate level, they reported discrepancies in the correlations and forecasts between the entry qualifying scores and student accomplishment scores. On-campus students were found to score better than distance learners in just one topic. The greater entry qualifying score of on-campus students compared to distance learning students was the cause of this exceptional performance in one subject. There was no discernible difference between on-campus and remote learning students' performance in the other two subjects. In that study, a slightly significant but not very strong association between the academic accomplishments of the two categories of students' entry qualifications was also found. This shows that previous/entry academic results, for both on-campus and distance learning students, are predictors of performance at the tertiary level.



Student performance is influenced by a variety of elements, according to Hansen (2000), including learning abilities, gender, and race. In their study, Gardy and Akbay (2015) discovered that factors including the mother's educational degree were positively connected with the student's academic achievement. Other factors influencing future academic achievement were the student's age, "class," work position, and, most importantly, the size of their families. Academic performance and student retention at higher education institutions are influenced by a variety of factors. According to Simmons et al. (2005), family income level, full-time attendance, receiving grant aid, and completing advanced level classes in high school all have statistically significant effects on first-generation college students' college persistence. According to Ali et al. (2013), social networks and sports activities, among other things, have an impact on students' academic achievement. According to Islam (2014), parents' educational levels, as well as their level of involvement in their children's education, have a significant impact on academic performance.

It is necessary to investigate the factors that influence student academic performance, as they have major repercussions for the country's people resources. Most of the previous studies on students' academic performance used simple linear regression for analysis, but this classic approach summarizes the average relationship between a set of regressors and the outcome variable based on the conditional mean function. This provides only a partial view of the relationship, as interest is in describing the relationship at different points in the conditional distribution of the response variable. Simple linear regression does not perform satisfactorily when outliers exist or the conditional distribution of the outcome given that the covariate is not symmetric (Koenker et al., 2005).

2.1. Objectives of the study

This study aims to assess factors contributing to the academic performance of students in Plateau State Polytechnic, Barkin Ladi, Jos, Nigeria using Quantile Regression Model.

The specific objectives are as follows;

- i. determine factors affecting the academic performance of students in Plateau State Polytechnic, Barkin Ladi, Nigeria
- ii. Fit quantile regression model to students' academic performance
- iii. Determine the significant factors at the lower, median and upper quantile.

3. Methodology

3.1. Study population and sample size

The population of this study is 3860 final-year National Diploma (ND) and Higher National Diploma (HND) students of Plateau State Polytechnic BarkinLadi, Plateau State, Nigeria. Using Yamane's (1967) method of sample size selection with a 0.05 margin of error, a sample of 363 final-year students of the institution was used for the study. Primary and Secondary data were used for the study. The respondents were selected randomly with the help of a simple random sampling. This helps to reduce the potential of human bias in the selection of respondents included in the study; as a result, the simple random sample provides a sample that is highly representative of the population.

3.2. Instrumentation for data collection

The instrument used in carrying out this research was a self-designed questionnaire. It was divided into 2 sections. The items in the questionnaire were based on the literature review above. The first section was on "personal profile" which includes student age at entry, gender (male, female), high school attended (private, public), marital status (married, single), employment status, Unified Tertiary Matriculation Examination (UTME) Score at Entry, and how school fee is financed. The second section was on family background, which includes the number of siblings, the mother's educational level, and the father's educational level. The questionnaire used in this study was validated through face validity and content validity among lecturers in the Department of Statistics and Operations research with expertise in the field of research. The reliability of the questionnaire was also tested via a pre-test with 20 students who were not included in the main study. This yielded a reliability test value of 0.86.

3.3. Data collection

The above questionnaire was distributed to 363 students to fill and returned after providing the desired information. After the administration of the questionnaire, the respondents' registration numbers were traced to the institution record to get the CGPA (results).

3.4. Quantile regression

Quantile regression (QR) as introduced in Koenker and Bassett (1978) is an extension of classical least squares estimation of conditional mean models to the estimation of an ensemble of models for conditional quantile functions. In quantile regression, the median estimator minimizes the symmetrically weighted sum of absolute errors (where the weight is equal to 0.5) to estimate the conditional median function and other conditional quantile functions are estimated by minimising an asymmetrically weighted sum of absolute errors, where the weights are functions of the quantile of interest. This makes quantile regression robust to the presence of outliers.



Consider the following standard linear model

$$y_i = \mu(x_i) + \epsilon_i \tag{1}$$

Where $\mu(x_i)$ may be thought of as the conditional mean of y_i given the vector of regression x_i and ϵ_i is the error term with mean zero and constant variance.

Typically

$$\mu(x_i) = x_i'\beta \tag{2}$$

for a vector of coefficients β

The p^{th} ($0 < p < 1$) quantile of ϵ_i is the value, q_p for which $P(\epsilon_i < q_p) = p$.

The p^{th} conditional quantile of y_i given x_i is then written as:

$$q_p(y_i/x_i) = x_i'\beta(p) \tag{3}$$

$$i = 1, 2, \dots, n$$

Where $q_p(y_i/x_i)$ represent the conditional-quantile function of the response variable given the covariate. In this case the student CGPA at selected quantiles given a set of predictors which include: student age at entry, gender, high school attended, marital status, number of siblings, employment status, mother's educational level, father's educational level, UTME score at entry, and how school fee is financed. $\beta(p)$ is an estimated vector of coefficients depending on p . Where p has been chosen to include lower (5th, 25th), median (50th) and upper (75th, 95th) quantiles. The deterministic part of the specified quantile regression, represented by the function, $x_i'\beta(p)$, is estimated using the minimization method. The p^{th} regression quantile ($0 < p < 1$) is defined as any solution, $\beta(p)$, to the quantile regression minimization problem

$$\beta(p) = \min_{\beta \in R^p} \sum_{i=1}^n \rho_p(y_i - x_i'\beta), \tag{4}$$

where the loss function is given by

$$\rho_p(u) = u(p - I(u < 0)) \tag{5}$$

This can also be written as:

$$\rho_p(u) = u(pI(u > 0) - (1 - p)I(u < 0)) \tag{6}$$

or

$$\rho_p(u) = \frac{|u| + (2p - 1)u}{2} \tag{7}$$

where $I(\cdot)$ denotes the indicator function (Yu & Moyeed, 2001). For a $\beta(p)$ the p^{th} function assigns a weight of p to positive $p = 0.5$ s and a weight of $1 - p$ to negative residuals. The quantity is called the regression quantile. Note that the case where $p = 0.5$ corresponds to minimizing the sum of absolute residuals, i.e. median regression.

3.5. Results and analysis

Table 1 clearly shows the descriptive statistics of the respondents. There are 182 male respondents that represent 50.14% and 181 female respondents that stand for 49.86%. The age distribution of the respondents includes; 24.79% are below the age of 20, 68.60% within the age 20-30, 5.51% are within the age of 31-40 while only 1.10% of the respondents are of 41 years and above. This clearly indicated that most of the respondents are youths. In terms of secondary school attended, 55.10% of the respondents came from public schools while 44.90% of them are from private schools. Most of the respondents are single and thus still live under the care of their parents as 88.71% of the data attested to that, and only 11.29% are married.



The employment status of the respondent shows that 88.71% of them were unemployed and 17.08% are employed. The family background of the respondents clearly shows that 15.43% of the respondents have 0-2 siblings, 54.54% have 3-5 siblings, 25.90% have 6-10, and 4.13% have siblings above 10. The information about the respondents' parent's educational qualifications shows that 10.74% of the respondents' mothers have no formal education at all, 23.69% of the respondents' mothers have primary education, 39.40% of the respondents' mothers have Secondary education and 26.17% have Tertiary education, while 5.23% of the respondent fathers have none formal education, 15.70% of them have primary education; 39.67% of the respondents fathers have Secondary education and 39.40% of the respondents' mothers have Tertiary education.

The students' CGPA indicated that 4.13% of the respondents falls in the range below 2.00, 28.93% were in 2.00 – 2.49, 45.45% in the range of 2.50 – 2.99, 19.01% were in the range of 3.00 – 3.49 and the remaining 2.48% were in the range of 3.50 – 4.00. About 65.01% of the respondent's school fees were financed by their Parents /guidance, 33.33% of the respondent's financed their school fees themselves, 0.83% of the respondent school fees was financed through scholarship and 0.83% of the respondent school fees was financed through other means.

Table 1. Summary statistics of data collected

Variables	Number of respondents	Percentage of respondents
Gender		
Male	182	50.14%
Female	181	49.86%
Age at entry		
Below 20	90	24.79%
20 – 30	249	68.60%
31 – 40	20	5.51%
41 and above	4	1.10%
Secondary school attended		
Public	200	55.10%
Private	163	44.90%
Marital status		
Single	322	88.71%
Married	41	11.29%
Employment status		
Not employed	301	82.92%
Employed	62	17.08%
No. of siblings		
0 - 2	56	15.43%
3 – 5	198	54.54%
6 – 10	94	25.90%
Above 10	15	4.13%
Mother's educational level		
None	39	10.74%
Primary	86	23.69%
Secondary	143	39.40%
Tertiary	95	26.17%
Father's educational level		
None	19	5.23%
Primary	57	15.70%
Secondary	144	39.67%
Tertiary	143	39.40%
Student CGPA		
Below 2.00	15	4.13%
2.00 – 2.49	105	28.93%
2.50 – 2.99	165	45.45%
3.00 – 3.49	69	19.01%
3.50 – 4.00	9	2.48%
How school fee is financed		
Parents /guidance	236	65.01%
Self	121	33.33%
Scholarship	3	0.83%
Others	3	0.83%
Total	363	100



Figure 1 shows the histogram of the response variable indicating the asymmetry of the data. Figure 2 shows that the curve is skewed, thus violating the assumption of normality in simple linear regression, therefore, giving the grounds for using the quantile regression which does not work under any assumptions.

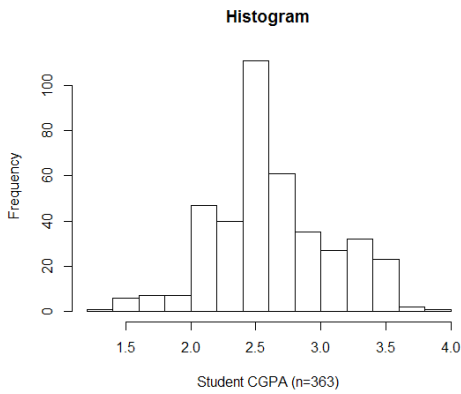


Figure 1. Histogram of the Student CGPA

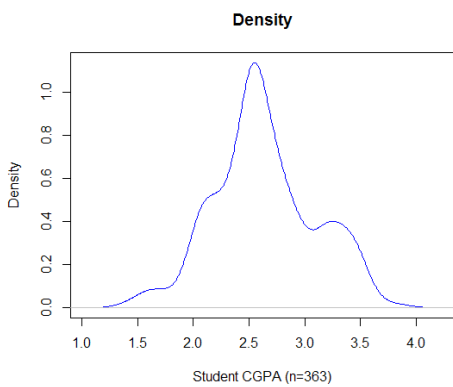


Figure 2. Density plot of the student CGPA

From the result in Table 2, we observed that the estimate of the intercept is 1.275280 for the 0.05 (5%) quantile showing that on average, the CGPA of the students within this quantile when other factors are fixed is approximately 1.28. Factors whose confidence intervals do not contain zero within the range are those that significantly influence the CGPA of students in this 5% quantile and these include: number of siblings (6 – 10) and how the school fee is financed (parent/guardians), while other factors do not significantly influence the CGPA of these low performing students. Thus, those students who have between 6 – 10 siblings were about 0.1328 times better than those who have between 0 – 2 siblings. A student with a 0-2 number of siblings performed better than those who have a number of siblings above 10. The CGPA of low-performance students whose fees were financed by their parent/guardians is 0.005 times that of students whose school fees were financed differently.



Table 2. Quantile regression coefficients at 0.05 quantile level

Fixed effect	Categories	Estimate	Lower bound	Upper bound
Intercept	-	1.275280	-1.797693e+308	1.376460
Gender	Female(ref)	-	-	-
	Male	6.586000e-02	-2.880300e-01	3.287200e-01
Age at entry	20-30(ref)	-	-	-
	31-40	-7.755000e-02	-1.797693e+308	3.279000e-02
	41 and above	5.906900e-01	-1.797693e+308	7.605700e-01
	Below 20	1.228900e-01	-2.220600e-01	1.625600e-01
Secondary school attended	Private(ref)	-	-	-
	Public	-6.030000e-03	-1.967700e-01	1.170700e-01
Marital status	Married(ref)	-	-	-
	Single	-1.531700e-01	-2.140900e-01	1.377690
Employment status	Employed(ref)	-	-	-
	Not employed	1.023100e-01	-3.896800e-01	3.250500e-01
No. of siblings	0-2(ref)	-	-	-
	3-5	1.374400e-01	-9.275000e-02	3.790400e-01
	6-10	1.328200e-01	5.229000e-02	5.064100e-01
	Above 10	-1.467100e-01	-1.797693e+308	3.915700e-01
Mother's educational level	None(ref)	-	-	-
	Primary	-2.190000e-01	-3.007500e-01	6.661500e-01
	Secondary	-1.767200e-01	-4.089500e-01	7.248500e-01
	Tertiary	-1.699200e-01	-3.114600e-01	7.362200e-01
Father's educational level	None(ref)	-	-	-
	Primary	-1.348300e-01	-7.448700e-01	1.797693e+308
	Secondary	2.294300e-01	-2.023500e-01	1.797693e+308
	Tertiary	2.431800e-01	-5.815800e-01	1.797693e+308
UTME score	UTME score	2.870000e-03	-5.300000e-04	3.990000e-03
How school fee is financed	Others(ref)	-	-	-
	Parent/guidance	5.027000e-02	7.700000e-04	1.797693e+308
	Scholarship	-1.062000e-01	-1.797693e+308	1.797693e+308
	Self	7.195000e-02	-2.618000e-02	1.797693e+308

Table 3 shows the results of the group of students whose CGPA falls within the 25% quantile. For this group, the intercept value (though not significant) is approximately 1.82 of a total possible CGPA of 4.0, this group seems to be below expectation. Factors that significantly influence the CGPA of students in this quantile include: secondary school attended, mother's educational level (tertiary) and UTME score. Factors like gender, age at entry, marital status, employment status, number of siblings, father's educational status, and how school fee is financed do not significantly influence the CGPA of students at this quantile. The type of secondary school students attended influence the outcome of their CGPA as those who attended public secondary school shows a significant effect on student CGPA since the confidence interval do not contain zero within the range. Those who attended private secondary school seem to have better CGPA as indicated by the negative sign before the estimate of those who attended public secondary school. The estimates show that those children who attended public secondary school have 0.0978 times less CGPA than those who attended private secondary school. Also, those whose mothers have up to tertiary level education had 0.1121 increases in the CGPA of their children compared to mothers who have primary and secondary education.



Table 3. Quantile regression coefficients at 0.25 quantile level

Fixed effect	Categories	Estimate	Lower bound	Upper bound
Intercept	-	1.819420	-1.797693e+308	3.348880
Gender	Female(ref)	-	-	-
	Male	-6.353000e-02	-1.333200e-01	4.009000e-02
Age at entry	20-30(ref)	-	-	-
	31-40	9.960000e-02	-4.464200e-01	4.691000e-02
	41 and above	7.138000e-02	-1.797693e+308	3.077200e-01
	Below 20	-5.760000e-03	-1.651900e-01	3.800000e-02
Secondary school attended	Private(ref)	-	-	-
	public	-9.786000e-02	-1.815700e-01	-2.150000e-03
Marital status	Married(ref)	-	-	-
	Single	8.237000e-02	-2.167500e-01	1.305300e-01
Employment status	Employed(ref)	-	-	-
	Not employed	-9.866000e-02	-2.251700e-01	1.197000e-02
No. of siblings	0-2(ref)	-	-	-
	3-5	6.670000e-02	-8.879000e-02	2.483200e-01
	6-10	4.076000e-02	-1.328500e-01	1.833100e-01
	Above 10	-2.558000e-02	-5.269600e-01	2.749600e-01
Mother's educational level	None(ref)	-	-	-
	Primary	9.510000e-03	-9.937000e-02	1.518200e-01
	Secondary	6.438000e-02	-7.028000e-02	2.563900e-01
	Tertiary	1.121000e-01	7.460000e-03	2.665900e-01
Father's educational level	None(ref)	-	-	-
	Primary	-2.568700e-01	-4.980800e-01	8.732000e-02
	Secondary	-8.973000e-02	-2.532900e-01	2.175300e-01
	Tertiary	-1.676800e-01	-3.647800e-01	2.255500e-01
UTME score	UTME score	2.320000e-03	1.100000e-03	4.940000e-03
How school fee is financed	Others(ref)	-	-	-
	Parent/guidance	2.484800e-01	-1.018080e+00	1.797693e+308
	Scholarship	3.157100e-01	-1.797693e+308	1.797693e+308
	self	2.361600e-01	-1.000680e+00	1.797693e+308

Table 4 shows the finding for performance in the 50% quantile of students' CGPA. Estimates whose 95% confidence intervals do not contain zero within the given range are those that significantly influence the CGPA of these students in the 50% quantile. Such factors can be seen from the table to include the following: mother's educational level, father's educational level and UTME score. The intercept estimate of 2.86634 shows that when all other factors are held constant, the average CGPA of students in the 50% quantile is approximately 2.87. Thus, the median performance of students in the institution is geared toward lower credit. Students in this quantile whose mothers attain up to tertiary education experience about 0.177 changes in their CGPA, while those whose fathers attain up to tertiary education seem to have an inverse effect of about 0.17 on their CGPA within this quantile. Their UTME score has about 0.00232 changes in their CGPA. Factors such as student's gender, age at entry into the institution, secondary school attended, employment status, number of siblings and how their school fee is financed have no significant influence on the performance of students within this quantile.



Table 4. Quantile regression coefficients at 0.5 quantile level

Fixed effect	Categories	Estimate	Lower bound	Upper bound
Intercept	-	2.86634	1.21241	3.25928
Gender	Female(ref)	-	-	-
	Male	-0.06024	-0.11958	0.00849
Age at entry	20-30(ref)	-	-	-
	31-40	-0.17341	-0.31957	0.14970
	41 and above	-0.01268	-0.44805	0.68627
	Below 20	-0.04988	-0.11984	0.02828
Secondary school attended	Private(ref)	-	-	-
	public	0.00037	-0.08357	0.04107
Marital status	Married(ref)	-	-	-
	Single	-0.02366	-0.18643	0.16318
Employment status	Employed(ref)	-	-	-
	Not employed	-0.01817	-0.12291	0.07462
No. of siblings	0-2(ref)	-	-	-
	3-5	-0.00756	-0.12154	0.11085
	6-10	-0.09220	-0.24751	0.02972
	Above 10	-0.04463	-0.24027	0.15999
Mother's educational level	None(ref)	-	-	-
	Primary	0.02073	-0.05667	0.28133
	Secondary	0.05707	-0.00413	0.29378
	Tertiary	0.17683	0.07668	0.42526
Father's educational level	None(ref)	-	-	-
	Primary	-0.11085	-0.54540	0.03973
	Secondary	-0.10220	-0.49261	0.07524
UTME score	Tertiary	-0.17000	-0.53093	-0.00110
	UTME score	0.00232	0.00063	0.00549
How school fee is financed	Others(ref)	-	-	-
	Parent/guidance	-0.52915	-0.68936	0.63276
	Scholarship	-0.61463	-0.92898	1.05238
	self	-0.46695	-0.64879	0.66393

Table 5 shows the results for students within the 75% quantile of CGPA. These are the high performers in the population. Factors whose 95% confidence interval does not contain zero within the range have a significant influence on the CGPA of these students. There seem to be more influential factors in this quantile. These include: gender, number of siblings, mother's educational level, father's educational level, UTME score, and how school fee is financed. It can be observed from the results that the average performance is estimated to be about 2.1996, which is approximately 2.20. In addition, from the table of findings, it can be observed that female students seem to be better performers within this quantile than male students. Students with 3–5 siblings seem to be influenced by about 0.145 changes in CGPA while those whose mothers attain up to the tertiary level of education experience about 0.334 changes in their CGPA. Fathers' education up to secondary and tertiary levels influence their CGPA with about 0.546 and 0.629 inverse changes in the CGPA respectively. The student's performance in UTME has a positive, though minimal influence of about 0.004 on their cumulative grade point average. Lastly, school fee financing by parent/guardians has about 0.123 effective change/influence on the student's final CGPA.

Table 5. Quantile regression coefficients at 0.75 quantile level

Fixed effect	Categories	Estimate	Lower bound	Upper bound
Intercept	-	2.199640	1.059680	2.694830
Gender	Female(ref)	-	-	-
	Male	-1.770000e-01	-2.709500e-01	-1.067600e-01
Age at entry	20-30(ref)	-	-	-
	31-40	-2.397400e-01	-5.318700e-01	9.548000e-02
	41 and above	-4.073900e-01	-5.760500e-01	1.797693e+308
	Below 20	-8.746000e-02	-2.190800e-01	1.770000e-03
Secondary school attended	Private(ref)	-	-	-
	Public	-1.597000e-02	-9.485000e-02	8.336000e-02
Marital status	Married(ref)	-	-	-
	Single	7.267000e-02	-4.332000e-02	2.938100e-01
Employment status	Employed(ref)	-	-	-
	Not employed	-4.843000e-02	-1.596100e-01	6.852000e-02



No. of siblings	0-2(ref)	-	-	-
	3-5	1.451000e-01	1.070000e-02	2.063900e-01
	6-10	7.570000e-03	-1.892300e-01	8.244000e-02
	Above 10	1.312000e-02	-2.010800e-01	1.289300e-01
Mother's educational level	None(ref)	-	-	-
	Primary	9.208000e-02	-1.942300e-01	2.658800e-01
	Secondary	2.552000e-01	-4.936000e-02	4.224300e-01
	Tertiary	3.341700e-01	5.375000e-02	5.005100e-01
Father's educational level	None(ref)	-	-	-
	Primary	-3.177000e-01	-5.999200e-01	9.486000e-02
	Secondary	-5.463800e-01	-8.677700e-01	-1.532000e-01
	Tertiary	-6.239200e-01	-8.667000e-01	-2.635500e-01
UTME score	UTME score	4.140000e-03	2.610000e-03	8.770000e-03
How school fee is financed	Others(ref)	-	-	-
	Parent/guidance	1.236100e-01	5.789000e-02	1.592900e-01
	Scholarship	3.157100e-01	-1.797693e+308	1.797693e+308
	Self	2.361600e-01	-1.000680e+00	1.797693e+308

Table 6 reveals the results of students' performance in 95% quantile and factors that influence the students' CGPA. The intercept estimate of about 3.089 shows that the average performance of students given this quantile is approximately 3.09 which is classed/grouped as upper credit in the overall ranking of CGPA. Two factors with significant influence on the students' CGPA are their gender and how their school fees are financed. On gender, female students seem to perform better than their male counterparts do, since the estimated value of the male students is -0.10135 which is less than the reference value of 1. Gender (male) has an inverse effect on their CGPA. In addition, students whose school fees are financed on scholarships have about 0.05 influence on their CGPA. Factors like age at entry, secondary school attended, marital status, employment status, number of siblings, mother educational level, father educational level, and UTME score have no significant influence on the students' CGPA at this upper quantile level.

Table 6. Quantile regression coefficients at 0.95 quantile level

Fixed effect	Categories	Estimate	Lower bound	Upper bound
Intercept	-	3.089250	1.103510	3.959760
Gender	Female(ref)	-	-	-
	Male	-1.013500e-01	-4.158600e-01	-1.239000e-02
Age at entry	20-30(ref)	-	-	-
	31-40	-2.084200e-01	-3.243800e-01	1.797693e+308
	41 and above	-1.367700e-01	-3.783300e-01	1.797693e+308
	Below 20	-1.173700e-01	-3.528000e-01	1.134000e-01
Secondary school attended	Private(ref)	-	-	-
	public	3.970000e-02	-1.010600e-01	2.359600e-01
Marital status	Married(ref)	-	-	-
	Single	-2.429000e-02	-2.634100e-01	4.458800e-01
Employment status	Employed(ref)	-	-	-
	Not employed	6.511000e-02	-2.395100e-01	2.245000e-01
No. of siblings	0-2(ref)	-	-	-
	3-5	-1.641400e-01	-4.059700e-01	2.061700e-01
	6-10	-5.466000e-02	-3.565400e-01	3.997300e-01
	Above 10	-3.885000e-01	-6.980600e-01	1.797693e+308
Mother's educational level	None(ref)	-	-	-
	Primary	3.758600e-01	-3.058400e-01	6.221600e-01
	Secondary	2.206800e-01	-2.690300e-01	5.003500e-01
	Tertiary	3.023300e-01	-4.529500e-01	6.202400e-01
Father's educational level	None(ref)	-	-	-
	Primary	-1.862400e-01	-1.797693e+308	4.036900e-01
	Secondary	-2.582000e-01	-1.797693e+308	1.804000e-01
	Tertiary	-2.614300e-01	-1.797693e+308	1.064000e-01
UTME score	UTME score	1.280000e-03	-3.660000e-03	9.300000e-03
How school fee is financed	Others(ref)	-	-	-
	Parent/guidance	8.120000e-02	-5.304000e-02	1.890300e-01
	Scholarship	5.027000e-02	7.700000e-04	1.797693e+308
	self	-1.062000e-01	-1.797693e+308	1.797693e+308



3.6. Discussion

This research work explored the performance of Quantile regression. Having observed different factors affecting the academic performance of students, using Quantile Regression (QR), the result shows the estimated coefficient of 5%, 25%, 50%, 75% and 95% at different quantiles levels. At a 5% quantile level, the number of siblings (6 – 10) and how school fee is financed (Parent/Guardians) had a significant effect on student CGPA. At 25% quantile, type of secondary school attended, mother's educational level, and UTME score had a significant effect on student CGPA. At 50% quantile, the mother's educational level, father's educational level, and UTME score had a significant effect on student CGPA. At 75% quantile level, gender, number of siblings, mother's educational level, father's educational level, UTME score, and how school fee is financed had a significant effect on student CGPA and at 95% quantile level, students' gender, and how their school fee is financed had a significant effect on student CGPA.

These findings are in agreement with the research of Farooq et al. (2011) that discovered parents' education has a significant effect on students' overall academic performance. Also, Islam (2014) reported that parents' levels of education, as well as the level of involvement in their children's (students) education, have been reported to have significant effects on academic performance. Also, Gardy & Akbay (2015), in their study identified that the educational level of the student's mother positively correlated with the student's academic performance. Educated parents are better able to support, counsel, encourage, oversee and guide their children and, hence, parents should collaborate more closely to help their children improve their academic performance (Tesfay & Zekiros, 2015). It should also be noted that educated parents can give their children access to adequate psychological and emotional support in addition to positive educational and learning environment that fosters confidence and the development of success-oriented abilities.

In addition, Islam (2014) confirmed that the gender of the students showed a significant effect on CGPA which is in agreement with this study. In our findings, the result shows that female students perform better than male students do, which is also in agreement with the research of Woodfield and Earl-Novell (2006). Woodfield and Earl-Novell (2006) attributed this partly to female students being more academically responsible and thus less likely to be absent from classes. Garkaz et al. (2011) also found that gender was significantly related to the academic performance of students. Abdullah (2011) study also revealed that significant gender differences exist between males and females in relation to academic performance. This finding might be explained by the fact that female students spend more time at home study and are less engaged in social interactions than male students do.

We also identified that the students' age had a significant effect in predicting future academic performance. In our research, the quantile outcome indicates that younger students had higher scores in academic performance than the older students at the lower and upper quantiles. Age is a good indicator of success, since it has a significant impact on education (Abubakar & Udoh, 2010). Gardy and Akbay (2015) found that students of small ages perform better on standardized tests than those of higher ages. The possible explanation for this finding could be the result of older students having obligations besides schoolwork. Besides, with age students may lose learning motivation due to various reasons, such as difficult materials, inappropriate teaching methods, etc.

Furthermore, this study revealed that students with fewer siblings performed better than those who have a number of siblings above 10. According to Gardy and Akbay (2015), students from small-size households perform well academically. We may state that this study's findings are consistent with those of Egunsola and Isani (2014), who discovered that family size significantly affects students' academic performance. This finding could be due to the fact that because there are fewer people to send on errands, students who live in small homes typically have more time to read and study and get more parents' attention. Also, they get more attention from parents. The situation is reversed in large size families. Also, students from large size homes are more likely to exhibit social deviance due to a lack of care and adequate supervision. And since there are more people in a large size family, they exert more pressure or negative influences, which will have a negative impact on the students.

In addition, this study showed that students' performance in UTME has a positive, though minimal influence on their cumulative grade point average. UTME is an external exam at the secondary education level which serves as the educational foundation for university admissions in Nigeria. In accordance, Bugge and Wikan (2013) established that there is a correlation between results from upper secondary school and performance at the university level. However, according to Mlambo (2011), there is no significant effect of the previous academic record on the education achievement of the students.

4. Conclusion and recommendations

Based on our findings and discussion, it can be concluded that this investigation has indeed revealed overwhelming evidence that Plateau State Polytechnic students' academic performance (CGPA) is affected at different quantiles by different factors. The parameter estimates indicate that younger students outperformed their older counterpart's students academically in all the quantiles. Of course, children's age cannot be changed, but we might recommend both parents and school to pay more attention to older children, to provide their higher achievement.

We have noticed that students at higher quantiles take greater advantage of more educated parents, compared to students at lower quantiles. We conclude that parents that are more educated provide a better study environment that contributes positively to students' academic performance. This factor has a chain effect – we need to educate every generation better and better, so that the next generation has a better chance for being well educated.

The students whose school fees are financed by their parents perform better than those who struggle to pay their school fees themselves. The number of siblings also plays a vital role in academic performance as those who grew up in a family with fewer siblings perform better



than those who grew up in a family with a higher number of siblings. Again, we would not call families to have fewer children, however, the state and schools have to provide better educational conditions for children with many siblings.

UTME score of students also stands as a key determinant factor of student academic performance. Students with higher UTME scores perform better than those with lower UTME scores. At 25% quantile, the type of secondary school attended had a significant effect on student CGPA. Private school students perform better academically than their public school counterparts. Finally, marital status and employment status of students do not show any influence on the academic performance of plateau state polytechnic students.

In view of the findings, the following recommendations were made.

- I. The higher education institution management should consider giving admission to students who have higher UTME scores, as it has a positive influence on students' academic performance.
- II. It is recommended that parents should endeavour to improve themselves academically since their educational qualifications have a positive significant influence on their children's academic performance.
- III. The researcher also recommends that government and schools should pay more attention to children from large families, as students who grew up in a family with fewer siblings perform better than those who grew up in a family with a higher number of siblings.
- IV. The researcher recommends that for students to attain academic achievement, their parents/guardians must help in financing their education by paying the school fees and other educational needs of the student.
- V. As the male students' results in the research seem to be lower than those of females, parents and schools should pay more attention to their education.

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