THE RELATIONSHIP BETWEEN UNDERGRADUATE ACADEMIC ACHIEVEMENT AND PROFESSIONAL EXAMINATIONS PERFORMANCE

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ABSTRACT

This study assessed the relationship between various attributes of candidates' undergraduate academic achievement and candidates' performance in the Certified Public Accountants (CPA) examination, making use of multiple regression estimation techniques. The analysis included 78 first time candidates, who wrote the examination (Module E and F) between May 2005 and November 2007. Results indicated a positive, statistically significant correlation between the examination scores and the candidate's grade point average (GPA) and credit hours in general education. Years out of school and age showed no significant correlation with examination performance. The results indicate that candidates need to put more effort on general education and overall coursework mastery (GPA) in order to pass the CPA examinations.

Key words: academic achievement, examination performance, professional examination, Certified Public Accountants

INTRODUCTION

The number of candidates sitting for Certified Public Accountants examinations, offered by the National Board of Accountants and Auditors (NBAA), has been increasing over the years. For example, candidates who registered for the CPA examination in the Final Stage in May 2004 session were 2,455 compared to 4,606 in May 2013 session (NBAA, 2007, 2013). The increase has partly been caused by increased admission of students in higher learning academic institutions who enjoy exemption from part of the Board's examinations. Candidates who enrol in the Final Stage CPA examinations are mainly those who have completed a three-year bachelor degree programme or its equivalent in accounting and enjoy exemption to sit for the final stage examinations. Currently, graduates from 19 higher learning institutions offering an undergraduate degree in accounting or its equivalent enjoy such exemption (NBAA, 2013). Consequently, the number of candidates sitting the final stage examinations is larger than in the preceding stages. Success in these examinations, and

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[‡] Business Management Review pp 14-34 ISSN 0856-2253

three years of practical experience, are the principal prerequisites for entry into the profession of public accountancy in Tanzania.

Although candidates are increasing, examination pass rates have persistently remained low (see Table 1 below). This is contrary to the performance of the candidates in universities/colleges examinations. The lower passing rate is certainly one of the causes for the few Certified Public Accountants in the country after 77 examination sessions held since May 1975. By November 2012 the National Board of Accountants and Auditors had been able to produce a total of 4,790 Certified Public Accountants since the Board's first professional examinations in May 1975 (NBAA, 2013).

Table 1: Final stage CPA examination pass rates for the past 8 sessions

	Nov-09	**May-10**	**Nov-10**	**May-11**	**Nov-11**	**May-12**	**Nov-12**	**May-13**
Module E	17.2%	14.4%	16.1%	14.4%	19.2%	14.8%	15%	31.3%
Module F	18.5%	19.5%	21%	21.1%	29.7%	25.1%	15.6%	35.5%

Source: NBAA, 2013

Prior studies indicate that candidates' performance in examinations may be influenced by school and prior family and community experiences. School experience have been noted to include candidates' experiences such as scholastic aptitude, amount of university coursework, gross point average (GPA), school attended, and retention of knowledge (Leathers, 1972; Reilly & Stettler, 1972; Leathers & Sullivan, 1978; Stettler, 1978; Dunn & Hall, 1984; Kapoor, Chan & Jensen, 1992; Kapoor & Islam, 2005). The literature reviewed has shown that among the different factors studied, candidates' GPA was the single most important factor in predicting candidates' performance in CPA exams. Other factors of major importance were scholastic aptitude, hours spent studying accounting and general studies, coursework completed, and school attended. Age exhibited no significant evidence to prove its relationship with candidates' examination scores.

Most of the studies used in this review were all carried out in the United States with the exception of Kapoor *et al.* (1992) and Kapoor and Islam (2005) which were carried out in Canada. Researchers could not find studies that have been undertaken in regions with specific challenges in professional education and examination. In these regions such as Sub-Saharan Africa, the level of general education and participation rate in higher education is among the lowest in the world. It should be interesting to undertake a study that examines the factors influencing the performance of candidates in the professional accounting examinations in developing countries. A study in Tanzania will provide an indication whether similar conclusions could be reached in this context. Nevertheless, the reviewed studies provided a good starting point towards accomplishment of research objectives.

This study therefore examined the influence of academic achievement on candidates' accounting professional examinations performance in Tanzania. In particular, the study focused on the influence of the attributes that students derive from university/college education on their first-time final stage NBAA CPA examinations performance. The results of this study are expected to be useful to students, training institutions, National Board of Accountants and Auditors (NBAA), counsellors, and the profession at large. First, information about the relationship between candidates' academic achievement and examination performance is meant to enable accounting trainers to provide more effective training and counselling to students regarding preparing for examinations. Improved training may enable candidates to prepare better, thereby improving performance and reducing the number of those repeating the examination. Second, higher learning institutions offering accounting education could make use of these relationships to review university/college entry requirements. Also the results of the study could be used as the basis of reviewing the quality of accounting courses in particular institutions, especially on the course content, modes of course delivery, quality of the examinations offered, and credit hours offered. Third, knowledge of these relationships could provide the National Board of Accountants and Auditors (NBAA) with a basis for evaluating the present requirements to sit for the examination and for justifiably imposing additional requirements. Fourth, a comparison of the expected relationships between academic achievement and CPA examination performance and those found to exist in the study is meant to provide a basis for evaluating the validity of the examination. Finally, the study findings contribute to existing literature by providing experience from the Sub-Saharan region where researches of this kind are rare.

The rest of the article is organised as follows. The next section presents literature review followed by a section on the methodology employed. There is also a section presenting results of the analysis and discussion of the research findings. The univariate analysis of the dataset is presented first and the characteristics of the data are discussed, followed by the analysis and discussion of the results of the regression analysis. The concluding remarks finalise the paper.

LITERATURE REVIEW

The concept of academic achievement is defined as the achievement, by individuals, of objectives related to various types of knowledge and skills. These objectives are socially established based on age, prior learning and capacity of individuals with regard to education, socialisation and qualification (CRIRES, 2006). The level of academic achievement has in most cases been measured in terms of students' examination or test scores (examination performance) – an indication of the extent to which a student has mastered knowledge (Miron & Nelson, 2001; Rivkin, Hanushek & Kain, 2005). Although, using examination or test scores does not amount to an explicit approach available for measurement of academic achievement, research provides few, if any, alternative approaches (Miron & Nelson, 2001).

Academic achievement at any point is a cumulative function of current and prior family, community, and school experiences (Rivkin *et al.*, 2005). This suggests that undergraduate academic achievement, as measured by college examination performance, is something that is built upon students' overall life experiences. Candidates' CPA examination performance has been being referred by many studies as the examination marks scored by candidates in such examinations (Leathers, 1972; Reilly & Stettler, 1972; Leathers & Sullivan, 1978; Stettler, 1978; Dunn & Hall, 1984; and Kapoor *et al.*, 1992). Candidates' performance in CPA examination, similar to college examination performance (a measure of college academic achievement), may be a function of post-graduation experiences in addition to cumulative function of current and prior family, community, and school experiences. This study explains the influence of candidates' college academic experiences (an explanatory variable of undergraduate academic achievement) on his or her CPA examination performance. The reason for focusing on college academic experience is because of the fact that data is readily available while data for family, community, and post graduation histories is rare (Rivkin *et al.*, 2005).

Based on the fact that college academic experiences have influence on academic achievement (Rivkin *et al.*, 2005), it is thus hypothesised that CPA examination performance may as well be influenced by prior college academic experiences. Researchers such as Leathers (1972), Reilly and Stettler (1972), Leathers and Sullivan (1978), Stettler (1978), Dunn and Hall (1984) and Kapoor *et al.* (1992) have identified a number of candidates' college characteristics that are considered to have influence on candidates' professional examinations performance. This section examines the literature on these academic attributes which are mainly associated with school (college undergraduate) experiences.

Candidates' attributes influencing professional examinations performance

A CPA examination is intended to be a measure of mastery of knowledge, skills and abilities used by practicing Certified Public Accountants (CPA) (Ruthkopf, 1982). This means an examination is a test of both practical and academic knowledge acquired with respect to accounting and related subjects (Dunn & Hall, 1984). The following attributes are considered appropriate to provide an indication of the academic achievement a candidate has acquired at the college: scholastic aptitude, amount of university coursework, gross point average (GPA), school attended, and retention of knowledge (Leathers, 1972; Reilly & Stettler, 1972; Leathers & Sullivan, 1978; Stettler, 1978; Dunn & Hall, 1984; Kapoor *et al.*, 1992).

Scholastic aptitude

Scholastic aptitude refers to threshold of inherent ability and background in basic skills. Students without these basic intelligence abilities are unlikely to succeed to complete the degree requirements at the university (Reilly & Stettler, 1972). Therefore, students who can demonstrate sufficient ability and intelligence will probably succeed

in any field of endeavour that requires mental ability. That's why many universities and organisations depend largely on aptitude tests when admitting students or recruiting new employees.

Examinations comprise a variety of essays, problems, and multiple choice questions. These require strong analytical, mathematical, and verbal skills for successful performance. A candidate must therefore possess some minimal level of ability and skills to provide a reasonable opportunity to successfully complete the examination (Dunn & Hall, 1984). Therefore, scholastic aptitude is highly positively correlated to examination performance.

Studies by Reilly and Stettler (1972), Stettler (1978) and Dunn and Hall (1984) using nearly similar variables of Least Squares Multiple Regression Models with varying samples and sample sizes revealed that there was a highly positive correlation between scholastic aptitude and examination scores with statistical significance. In addition, Reilly and Stettler (1972) found that scores in Mathematics Aptitude Tests proved to be highly significant than Verbal Aptitude Tests in explaining candidates' examination performance with the exception of law subject performance where verbal aptitude claimed superiority over mathematics. In contrast, Leathers (1972) found that scores in Verbal Aptitude tests were highly significant than mathematical scores in explaining candidates CPA examination performance. This means candidates with greater scholastic aptitude tend to earn higher examination scores.

University coursework

The amount of coursework a candidate has completed at the university is a measure of the extent of academic knowledge the candidate has covered (Dunn & Hall, 1984). The main focus of the CPA examination is on measuring accounting and related knowledge. It is therefore expected that there should be positive association between the amount of coursework completed and examination performance (Kapoor *et al.*, 1992). Specifically, candidates with more university/college accounting hours are more likely to be successful in passing the CPA exam (Raghunandan, Read & Brown, 2003).

Although there is no limit on the number of hours which are sufficient to make candidates either pass or fail the exam, most literature concludes that the more credit hours a candidate completes, the more likely she/he is to pass the exam, and vice versa. However, the American Institute of Certified Public Accountants (AICPA) in 1988 established a 150 semester hour requirement for candidates to sit for CPA examination (Read, Raghunandan, & Brown, 2001; Raghunandan *et al.*, 2003).

The results of a study by Read *et al.* (2001) and Raghunandan *et al.* (2003) indicated that candidates with a greater number of both accounting hours and total hours of college education (150 hours in this study) are more likely to pass the examination. In addition, Dunn and Hall (1984) and Kapoor *et al.* (1992) found strong statistical evidence that the amount of accounting coursework completed at the university has

positive association with candidates' examination performance. In contrast, Reilly and Stettler (1972) found no significant evidence to back this argument.

Kapoor *et al.* (1992) and Kapoor and Islam (2005) further discovered that additional coursework hours completed on general education have a moderately beneficial effect on candidates' performance and especially on conceptual papers. This was a surprising result to them as they couldn't find out why general studies have the effect they do. This was further supported by Briggs and He's (2012) findings that jurisdictions with a 150 credit-hour requirement have materially higher pass rates in areas of Auditing and Regulation, but not in the areas of Financial Accounting and Reporting or Business Environment and Concepts.

Gross Point Average (GPA)

Having completed many hours of coursework it is not sufficient to prepare a candidate for professional examinations. The candidate needs to demonstrate a high level of coursework mastery, to prove how good he/she is. Gross Point Average (GPA) provides information about the level of coursework mastery. Candidates with better mastery of coursework are expected to perform well in their professional examinations as they are considered to posses enough academic knowledge which is what the exam tests.

In order to find out the contribution of GPA, Kapoor *et al.* (1992) and Kapoor and Islam (2005) made use of four GPA variables: the overall, accounting, general studies and business related subjects in undergraduate studies. This was different from the US studies done by Dunn and Hall (1984) and Reilly and Stettler (1972) who made use of accounting GPA and overall college GPA, respectively. Kapoor *et al.* (1992), Dunn and Hall (1984), and Kapoor and Islam (2005) both concluded that accounting GPA is the most important predictor variable of examination performance with high positive correlation and statistical significance. The same conclusion was drawn by Reilly and Stetller (1972), Zook and Bremser (1982), Tittard and Russell (1989), Ashbaugh and Thomson (1993) and Brahmarsene and Whitten (2001) for overall college GPA. The observation indicated that candidates with higher GPAs tend to score higher in professional examinations.

School attended

It is generally recognised that educational standards and therefore quality of education may vary from school to school. "The variation is commonly reflected in student opinions about the 'difficulty' of coursework at different schools" (Reilly & Stettler, 1972). It may therefore be vital to find out where the coursework was undertaken, the knowledge that might provide additional knowledge about the candidate's academic knowledge.

Dunn and Hall (1984) found evidence that schools have significant influence on the candidates' performances because of significant differences in programme quality.

They noted that certain schools exhibited evidence of unusual high performance while others showed unusually poor performance. Reilly and Stettler (1972) reached the same preliminary conclusion which had to be qualified however because according to them there were significant confounding relations between school attended and completion of CPA review based on the sample used. They were therefore unable to offer separate conclusions for each variable. The sample used by Dunn and Hall (1984) did not bring about this confounding problem.

Retention of academic knowledge

Attainment of academic knowledge is not exclusively enough to enable a candidate do well in the examination. Retention of academic knowledge is important to attain such an objective and is measured based on the number of years one has been out of school. Dunn and Hall (1984) argued that other factors held constant, the longer a candidate stays out of school, the less academic knowledge he/she is likely to retain. The assumption made here is that a person at school is continuously taking tests while the one out of school is undertaking none. Therefore, examination performance will be inversely related to years out of school.

A study conducted by Reilly and Stettler (1972) found out there was poor correlation between years out of school and examination scores. However, the study did not provide any test of significance for the same. Dunn and Hall (1984) on the other hand observed a negative correlation between the variables; however, the test of significance proved that the correlation was significant only in the case of law and theory scores. In explaining this observation, Dunn and Hall (1984) opined that may be "law and theory portion of exams are more text book oriented than either audit or practice and would be most adversely affected by absence from school" (p.683). Therefore, this evidence is not enough to make a firm conclusion on the association of the variables.

Age

The more aged and mature candidates become, they create a more responsible attitude towards examination preparation therefore, age might have direct relationship with candidates' examination scores (Dunn & Hall, 1984). Results in the study of Dunn and Hall (1984) presented statistical significant evidence only on law but failed to comment on this result however, and they found no further evidence against the claim. Reilly and Stettler (1984) similarly found 'extremely low' correlation between age and exam scores. In contrast, Gustin and Corazza (1994) and Brahmarsene and Whitten (2001) found there was significant positive relationship between age and CPA examination performance. No relationship was therefore capable of being portrayed between age and candidates' examination scores.

Ethnicity

Many other factors such as geographical origin and other demographic characteristics are supposedly considered to have influence on candidates' examination performance

in professional examinations (Kapoor *et al.*, 1992). However, many of these factors cannot be examined due to unavailability of data.

Other factors

As stated earlier, the study concentrated mainly on school experience. However, candidate's academic and practical knowledge acquired cannot solely explain the candidate's examination performance; other post graduation factors might need to be considered as well. The effort exerted by the candidate in preparing for examinations is needed to refresh the candidate's memory, and hence help the candidate to pass. This is what Dunn and Hall (1984) refer to as motivation to prepare for an examination and defines it as an "explicit preparation that may serve to refresh a candidate's memory and provide reinforcement of topics previously studied". The argument here is that, the more motivated a person is in preparing for exams, the greater the chances for passing such exams. Preparation for examination can be viewed from three variables: time used for self study, completion of CPA review, and age. The study only considered the age variable in its analysis.

Synthesis

The literature reviewed has shown that among the different factors studied, candidates' GPA was the single most important factor in predicting candidates' examination performance. Other factors of major importance were scholastic aptitude, hours of accounting and general studies, coursework completed (except in Reilly and Stettler, 1972), and school attended (refer to the exception in Reilly and Stettler, 1972). Age exhibited no significant evidence to prove its relationship with candidates' examination scores.

Research model

Based on the discussion above, the performance in the accounting professional examinations is expected to be influenced by candidates' scholastic aptitude, Gross Point Average, amount of university/college coursework completed, university/college attended, retention of academic knowledge (years since completion of university/college) and age.

The following operational model has been used in the research:

$$EXS = f(SA, GPA, CW, SCH, YRSOUT, AGE)$$

Where: EXS is the average score on all parts of the examination or the score on one of all the parts; SA is Scholastic Aptitude Test score; GPA is Gross Point Average obtained at the university/college; CW is amount of coursework completed by the candidate at the university/college; SCH is academic institution attended (university/college) by the candidate; YRSOUT is time since completion of university/college; and AGE is age of the candidate.

The variables scholastic aptitude, Gross Point Average, amount of coursework completed were expected to have positive relationship with examination scores with statistical significance. The rest of the variables were expected to have positive relationship with examination scores except for retention of knowledge which was expected to have negative relationship with scores.

METHODOLOGY

This study aimed to determine the effect of university/college education on the candidates' passing rates for Certified Public Accountants examinations offered by the National Board of Accountants and Auditors. The study assessed the joint impact of candidates' attributes on CPA examination scores using several multiple regression models. The model adopted was similar to those used in the studies of Reilly and Stetller (1972), Dunn and Hall (1984), and Kapoor *et al.* (1992).

The NBAA final stage CPA examination has six papers: Management Accounting, Taxation, Entrepreneurship, Auditing, Financial Accounting and International Finance. Therefore, eight multiple regression equations were fitted for each dependent variable, i.e. the individual scores for each of the six papers which comprise the final stage exams, the number of courses passed, and the average of total marks awarded.

This study ignored the scholastic aptitude test (SA) variable in its analysis. Instead the study depended on the results provided by GPA. The reason for doing this is based on fact that basic intelligence abilities are necessary requirements for successful completion of degree requirements at the university. Therefore, a candidate who successfully completes the degree must have passed the scholastic aptitude test.

The variables, GPA and amount of coursework completed at the university/college, were assessed by extending the analysis into several components of overall variables. That is, GPA variable was assessed based on two components: overall GPA and accounting GPA. Amount of university/college coursework completed was assessed by considering four variables: total coursework hours, amount of accounting hours, general business education hours (excluding accounting) and general education coursework hours completed at the university/college. The aim was to find out if the individual components of the main variables had special relationships with dependent variables, apart from the overall main variable effect.

After considering the three modifications stated above, the modified statistical model then was as follows:

$$EXS = f\left(GPA_{av}, GPA_{ac}, CW_{av}, CW_{ac}, CW_{biz}, CW_{gen}, SCH, YRSOUT, AGE\right)$$

Where: EXS is the average score on all parts of the examination or the score on one of all the parts (Management Accounting, Taxation, Entrepreneurship, Auditing, Financial Accounting and International Finance); GPA_{av} is the overall GPA obtained at the university/college; GPA_{ac} is the accounting GPA obtained at the university/college; CW_{av} is the overall amount of university/college coursework completed; CW_{ac} is the accounting amount of university/college coursework completed; CW_{biz} is the general business amount of university/college coursework completed; CW_{gen} is the general education amount of university/college coursework completed; SCH is academic institution attended (university/college) by the candidate; YRSOUT is time since completion of university/college; and AGE is age of the candidate.

Assuming that the functional relationship between the exams scores and independent variables is additive, the regression equation becomes:

$$EXS = A + aGPA_{av} + bGPA_{ac} + cCW_{av} + dCW_{ac} + eCW_{biz} + fCW_{gen} + gSCH + hYRSOUT + iAGE + u$$

Where: *a,b,c,d,e,f,g,h,* and *i* are the regression coefficients of the independent variables, A is the constant, and *u* is the error term. All the coefficients were expected to be positive except for *h* which was expected to be negative. Moreover, the GPA and CW coefficients (*a, b, c, d, e* and *f*) were expected to be statistically significant.

Description of the variables

***Scores*:** These are scores in percentage obtained by a candidate in a particular examination or the average score of all the scores of examination parts. The scores for November 2005 examination were not available and therefore the class marks of the grades intervals were used instead. Otherwise, the scores of the remaining sessions were available and used during the analysis.

Gross Point Average: GPA provides information about the candidates' mastery of knowledge acquired at the university/college. Therefore, the GPA was expected to have positive relationship with examination scores. The candidates' university/college GPAs were used to surrogate the variable and the candidates' university/college transcripts presented to the NBAA were used to obtain this information. Some candidates presented statements of provisional results which had no GPA. The grades on the statements were used to calculate the GPA. The accounting GPA was calculated using the accounting subjects grades found on the transcript.

Amount of university/college coursework: University/college coursework completed is a measure of knowledge acquired by candidates. Amount of university coursework completed was therefore expected to have positive relationship with examination

scores. The number of semester hours the university/college offers to candidates undertaking a degree or advanced diploma in accounting was used as proxy of coursework variable.

School attended: Schools maintain different educational standards and therefore quality of education offered. This makes the knowledge acquired by candidates from different schools differ, and therefore affects their examination scores. Each institution was treated as a separate dummy variable. A candidate was given 1 if she/he had studied in a particular school and 0 if not.

Retention of knowledge: The longer a candidate stays out of school the less academic knowledge he/she is likely to retain, and therefore low examination pass rate is expected. The retention of knowledge was measured by number of years since completion of university/college until the candidate sat for Module E examination.

Age: The more aged and mature candidates become they create a more responsible attitude towards examinations. Therefore, age was expected to have positive relationship with candidates' examination scores. The age information was derived from the candidates' registration forms or transcripts completed by candidates at the time of registration with NBAA.

Sample

The sample included candidates who had written the NBAA CPA examinations, both Module E and F, for the first time between May 2005 and November 2007. The decision to take four consecutive examination sessions (May 2005 – November 2007) was to obtain a significant number of first time examinees because many of the candidates in a session are repeaters. The sample was also limited to those taking the examination for the first time because such candidates are taken for several reasons. First, there was a need to obtain a representative cross-section of candidates. Only poorer candidates are represented in subsequent examinations since the good candidates will have already passed the examination. Secondly, selecting only first-time candidates made it possible to examine the remaining variables without the influence of prior test experience. Thirdly, there was high probability that during subsequent examinations the candidate would not be taking all three (one module) or six (two modules at once) parts of the examination, which would mean the sample sizes for each score would differ.

Data collection

In this study, two main sources of secondary data were used. First, the study used information provided by the NBAA about the candidates' examination scores, the schools attended, age, candidates' university/college GPAs, years since completion of university/college. The transcripts and candidacy registration forms presented by candidates registered for the examination were used to obtain the information. All the examination results (scores and grades) were available except examination scores for

November 2005 examinations. Second, information about amount of university/college coursework completed by candidates was obtained from respective university or college.

Data verification and cleaning

There were 230 candidates who had written the NBAA CPA examinations, both Module E and F, for the first time between May 2005 and November 2007. The NBAA could provide the required information for 100 candidates only. On reviewing the candidates' files, some transcripts were missing, or did not contain all the required information. Therefore, the last data set after the screening process contained 78 observations.

Data analysis

The individual candidates' data was subjected to ordinary least squares multiple regression estimation technique. The model was estimated using a computer package called EViews Version 5.0.

Multicollinearity

Table 2 below presents a correlation matrix for the various independent variables. As reported in Table 2, several of the variables were highly correlated. The presence of such high correlation between various independent variables suggests that the regression models might be affected by multicollinearity. If so, then variance estimates might be inflated with a consequence of understating the significance levels of statistical tests. To avoid this effect, the variables SCH3, GPA*ac*, CW*ac*, and CW*biz* were removed from the equation.

Table 2: Correlation matrix

	SCH1	**SCH2**	**SCH3**	**SCH4**	**GPA *overall***	**GPA*ac***	**CW*ac***	**CW*biz***	**CW*gen***	**CW *overall***	**AGE**	**YRSOS**
SCH1	1.00											
SCH2	-0.42	1.00										
SCH3	-0.38	-0.16	1.00									
SCH4	-0.53	-0.23	-0.21	1.00								
GPA*overall*	-0.02	0.47	-0.46	-0.02	1.00							
GPA*ac*	-0.07	0.49	-0.41	-0.01	**0.93**	1.00						
CW*ac*	0.06	**0.82**	-0.58	-0.32	0.57	0.54	1.00					
CW*biz*	0.65	0.28	-0.62	-0.53	0.39	0.35	0.69	1.00				
CW*gen*	0.69	-0.33	**-0.70**	0.02	0.17	0.11	0.22	0.68	1.00			
CW*overall*	0.58	0.36	**-0.70**	-0.45	0.45	0.40	**0.78**	**0.98**	0.69	1.00		
AGE	-0.21	-0.11	0.00	0.35	-0.10	-0.03	-0.26	-0.31	-0.16	-0.31	1.00	
YRSOS	-0.11	0.00	-0.11	0.22	0.07	0.17	0.00	0.18	0.23	0.16	0.03	1.00

Heteroskedasticity test

When using Ordinary Least Squares regression technique, it is necessary to ensure that the assumption that error terms have a constant variance is met. This will be true if the observations of the error term are assumed to be drawn from identical distributions. Therefore, the White Heteroskedacity test was conducted for each equation. The eight equations did not portray heteroskedasticity [meaning they were homoscedastic] except management accounting equation. Therefore, in order to fix the problem, White Heteroskedasticity-Consistent Standard Errors test was conducted to improve upon OLS estimates.

Normality test

Normality test of residuals is undertaken to ensure validity of hypothesis testing results. That is, where residuals are normal, it assures that the p-values for the t-tests and F-test will be valid. Shapiro Wilk Test of normality was undertaken to determine the normality of residuals. The results indicated the W value of 0.977726 and p value of 0.17060. Since the p values are higher than 0.05, the data is normally distributed.

RESULTS

This section presents results of the analysis and discussion relating to relationship between NBAA's CPA examination candidates' performance and undergraduate academic achievement. The univariate analysis of the dataset is presented first and the characteristics of the data are discussed, followed by the analysis and discussion of the results of the regression analysis.

Univariate analysis

Retention of academic knowledge

Table 3 below shows that most of the candidates sampled had graduated from university/college within half a year at the time of sitting the exam for first time. Based on the literature, this trend is good since 'years out of school' is inversely proportional to examination performance.

Table 3: Distribution of candidates based on years out of school

Years out of school	Percentage of candidates
6 months	**88**
18 months	**7**
30 month and above	**5**

[Source: NBAA]

As proof to this claim, candidates who sat for the examination 30 months or longer after graduation passed at most two subjects out of six. This shows that candidates' ability to retain academic knowledge is lost over time and therefore reduces ability to pass examinations.

Coursework completed

In this study schools were differentiated mainly by the coursework hours they offered and the adoption of semester or term system. All universities offer more than 120 hours of total coursework, and use semester system while colleges which use the term system offer as low as 54 hours and not more than 87 hours as shown in Table 4 below.

Table 4: Coursework hours offered by different schools

	Coursework hours			
	Accounting	General Business	General Education	Overall
School 1	36	75	12	123
School 2	50	75	5	130
School 3	24	30	0	54
School 4	36	39	12	87
School 5	33	87	18	138
School 6	27	36	6	69
School 7	30	33	3	66

[Source: NBAA]

The data shows that hours of coursework completed have impact on the performance of candidates in the CPA examinations as shown in Table 5 below.

This data suggests that candidates from university (in particular school 1 and 2) perform better than college candidates. Candidates have the possibility of getting at least referral at first sitting, by 39% if from school 1, 31% if from school 2 and 18% if from college. Apart from performing better than other schools, school 1 has the majority of candidates, more than 48% of the sample. This means graduates from this school are highly motivated or are confident to sit for CPA examinations compared to graduates from other schools.

Table 5: Comparison of schools' performances

No. of subjects passed	**School 1**		**School 2**		**Colleges**	
	No. of candidates	**%**	**No. of candidates**	**%**	**No. of candidates**	**%**
0	1	3	0	0	4	14
1	3	8	0	0	3	11
2	9	24	5	38	11	39
3	10	27	4	31	5	18
4	8	22	3	23	3	11
5	5	14	1	8	2	7
6	1	3	0	0	0	0
	37		13		28	

[Source: NBAA]

GPA

Performance of candidates in the CPA examination is also highly related to candidates' GPA. The data shows that candidates with higher GPA perform better than those with lower GPA as shown in Table 6 below.

Candidates with a pass degree show extremely poor ability to perform in the first sitting. Candidates with a GPA of at least 3.9 are likely to pass at least four examination parts in the first sitting. School 2 shows poor relationship between performance and GPA compared to school 1 and college – they have very high GPAs; however, they perform poorly compared to other schools' candidates who seem to have relatively lower GPAs.

Table 6: Relationship between GPA and performance (by schools and overall)

No. of subjects passed	Average GPA			
	School 1	School 2	Colleges	Overall
0	2.8		2.6	2.7
1	3.2		2.7	3
2	3.4	4.1	3	3.5
3	3.47	4.1	3.6	3.7
4	3.7	4.26	3.7	3.9
5	3.96	4.3	4	4.1
6	4.6			4.6

[Source: NBAA]

Age

A candidate's age was expected to have positive relationship with examination performance. However, Table 7 below shows contradicting results – that examination performance is negatively related to age. This can be explained by the fact that increased personal and work responsibilities at higher age reduce time to prepare for examination.

Table 7: Relationship between age and examination performance

No. of subjects passed	Average age
0	39
1	29
2	28
3	28
4	27
5	26
6	25

[Source: NBAA]

Regression results

Regression results for the eight equations are presented in Table 8. Individual model's R^2 values were 0.29 for Entrepreneurship and Financial Accounting III; 0.28 for Auditing and International Finance; 0.46 for number of subjects passed; 0.45 for average scores; 0.13 for Taxation; and 0.07 for Management Accounting. These R^2 values are similar to those obtained by Reilly and Stettler (1972) and Kapoor *et al.* (1992) though lower than those of Dunn and Hall (1984). The R^2 values in the Management Accounting and Taxation regression results were too low and could not be compared with any other results from previous studies. The values suggest that the independent variables are able to explain a relatively small proportion of the variability in examination scores. The regression P-values of predictors and F-statistic of regression equation for both subjects, on the other hand, were not significant implying that none of the independent variables of the models were able to explain variations in the examination scores. In addition, the adjusted R^2 for Management Accounting was negative, meaning that its model contains predictors that do not contribute sufficiently to the prediction of the model.

These results call to question the examination validity of Management Accounting and Taxation. It is likely that the examination is testing what is not intended. Another explanation could be inability of university and college instructors to deliver the required content in an understandable way. In general, the results imply there is discrepancy on the content tested by NBAA and that taught at university and college.

Regression results for the variables chosen as proxies for academic knowledge were mixed and some were against the expectations. Overall GPA coefficient was positive and significant in each regression equation as expected except for Management Accounting and Taxation which were positive but not significant. With the exception of Management Accounting and Taxation whose examination validity questionable based on these results, candidates with higher GPA tend to obtain higher examination scores. These results are consistent with the literature reviewed earlier.

The coefficients for measures of the amount of total coursework completed were negative on all regression equations contrary to the expectations. The coefficients were statistically significant only on International Finance and number of subjects passed equations. This shows that overall coursework hours completed has declining marginal benefit on the examination performance. The results contradict the conclusions reached by Dunn and Hall (1984), and Raghunandan *et al.* (2003).

The General Education coursework hours completed showed positive association with the examination scores on all regression equations. The coefficients were statistically significant on the Auditing, International Finance, number of subjects passed, and average scores equations. These results are similar to the findings of Kapoor *et al.* (1992) and Kapoor and Islam (2005), who found out that additional coursework hours completed on General Education have moderately beneficial effects on candidates'

performance and especially on conceptual papers. Since Auditing is one of the conceptual papers, the results provide evidence of significant positive relationship between General Education coursework and examination performance.

Table 8: Estimated regression coefficient terms for each examination - Part-I (Levels of significance are in parentheses)

Variables	Entrepreneurship	Management Accounting	Taxation	Auditing	International Finance	Financial Accounting III	Number of Subjects Passed	Average
Model R^2	0.29	0.07	0.13	0.28	0.28	0.29	0.47	0.45
SCH1	-1.59	-2.17	-7.41	-0.26	-11.34	-4.26	-0.07	-5.28
	(0.7418)	(0.8555)	(0.5012)	(0.9712)	(0.168)	(0.513)	(0.9326)	(0.1926)
SCH2	2.05	-1.67	-4.61	15.58	20.60	-1.26	2.59	2.59
	(0.798)	(0.9461)	(0.8319)	(0.2728)	(0.204)	(0.9214)	(0.1211)	(0.7442)
Colleges	-9.92	-9.01	-9.29	-17.04	-28.23	-8.82	-2.35	-13.77
	(0.1237)	(0.3407)	(0.3495)	**(0.0099)**	**(0.0003)**	(0.135)	**(0.0026)**	**(0.0003)**
GPA *overall*	5.68	3.77	2.77	6.30	9.64	9.47	1.39	7.00
	(0.0408)	(0.3069)	(0.4320)	**(0.0076)**	**(0.0004)**	**(0.0001)**	**(0.0000)**	**(0.0000)**
CW*gen*	1.10	0.49	1.42	2.73	4.20	0.65	0.44	1.71
	(0.2107)	(0.8094)	(0.4539)	**(0.0295)**	**(0.0038)**	(0.5613)	**(0.0031)**	**(0.016)**
CW*overall*	-0.18	-0.06	-0.10	-0.42	-0.69	-0.09	-0.07	-0.24
	(0.2596)	(0.8873)	(0.8018)	(0.1038)	**(0.0194)**	(0.6911)	**(0.0125)**	(0.1022)
AGE	-0.19	-0.10	-0.16	0.13	0.07	0.08	-0.01	-0.02
	(0.1659)	(0.182)	(0.2341)	(0.1403)	(0.5036)	(0.3229)	(0.1279)	(0.6146)
YRSOS	-0.01	2.50	-2.70	-0.66	-0.04	1.49	-0.16	-0.06
	(0.9888)	(0.445)	(0.1597)	(0.5969)	(0.98)	(0.1878)	(0.2592)	(0.9287)

The coefficient of variables used as indicators of school presented expected results. While some schools showed positive coefficients, other showed negative coefficients which were significant for some equations. This means some schools performed better than others, showing there are different standards from school to school. The results are consistent with results from studies by Reilly and Stettler (1972) and Dunn and Hall (1984). However, this study did not include completion of CPA review course in the analysis; therefore, it was not possible to detect any confounding problems between completion of CPA review and school attended as discovered by Reilly and Stettler (1972).

The review of coefficients for the indicator variable used to represent retention of academic knowledge provides no evidence of the relationship between retained knowledge and examination performance. The results were different from expectations as coefficients were mixed – some positive and others negative. There was no significant relationship found between the retention of academic knowledge and examination performance. These findings are contrary to the conclusions reached by Reilly and Stettler (1972) and Dunn and Hall (1984). The fact that almost 95% of candidates sampled had sat for the examination within less than six months after graduation, can be one of the reasons for this result.

The variable representing age presented mixed results compared to expectations. The coefficients of the variables were expected to be positive; however, they appeared to be negative except for Auditing, International Finance and Financial Accounting III equations. The relationships were not significant either. The findings are in consistent with the conclusion reached by Reilly and Stettler (1972) though contradicting with results of the study by Dunn and Hall (1984) who found there was positive relationship, which was significant in law regression only.

Therefore, the analysis conducted shows that among the different factors studied, candidates' GPA (overall) was the single most important factor in predicting candidates' exam performance. Another factor which showed significant relationship with examination performance was General Studies coursework (in Auditing, International Finance, number of subjects passed and average scores). Colleges demonstrated poor results and it was significant in some subjects. Years out of school and age exhibited no significant evidence to prove their relationship with candidates' examination scores.

CONCLUSION AND RECOMMENDATIONS

Results reported present evidence that with the exception of Taxation and Management Accounting subjects, overall GPA has significant positive association with examination performance. General Education coursework exhibited positive relationship with examination performance but significant on Auditing and International Finance only. Overall coursework completed portrayed unexpected negative relationship with examination performance, significant on International Finance and number of subjects passed. Variables representing school attended were significant in several instances, indicating that performance is associated with the school attended. The number of years out of school was found to have the expected non-significant negative relationship with examination on all equations except for Management Accounting and Financial Accounting III. No significant evidence was found of the association between examination performance and the variable of age.

The results imply that undergraduate academic achievement, as measured by overall college GPA, is highly related to CPA examination performance. Similarly,

undergraduate good performance in General Education is also useful in helping a candidate perform well in conceptual examinations such as Auditing. The results provide evidence that delay in taking the examination will produce negative effects on performance. This suggests that the examinations measure more theoretical than practical aspects. The findings in this study, that there is very significant positive association between overall GPA (except in Management Accounting and Taxation), General Education coursework, and candidates' examination scores raise questions about the Taxation and Management Accounting examination validity as a measure of academic accounting knowledge. As hinted earlier, it is possible that either the examination is testing to the wrong thing, or the ability of university and colleges instructors to deliver the required content in an understandable way is questionable. In general, the results show a discrepancy between the content tested by NBAA and that taught at university and college.

Therefore, undergraduate students wishing to undertake CPA examinations are advised to take note of the importance of General Education coursework and make sure that they pass this subject with a good GPA. It is unfortunate some colleges do not offer General Education courses such as Development Studies; while other colleges offer shallow coverage of such courses in their undergraduate accounting programmes. These findings emphasise the importance of universities and colleges to provide additional hours of General Education. Since there is no evidence that delaying to take the examination has any benefit, candidates should be encouraged to take the examination as close to graduation as possible. The NBAA might choose to use prediction models, such as the one developed herein to aid candidates in evaluating the adequacy of their preparation for the exam. Candidates could supply the necessary information to be entered into a prediction model and, based on their predicted scores, decide whether or not they need additional preparation before sitting for the examination. The approach could also be used by the Board to screen candidates and thereby reduce the cost of administering the examination.

Although the R^2 values obtained in this study were close to those reported by Reilly and Stettler (1972) and Kapoor *et al.* (1992), the fact that the R^2 values were relatively small indicates that a large proportion of variation in examination scores is explained by other factors other than those which have been used in this study. Therefore, it is believed that if other post-graduation variables and prior family and community experiences were added to the model, they would improve the models' predictive ability as well as provide better theoretical explanation of the results obtained. In addition, the reliability of conclusions reached about the association of these attributes with examination performance may be increased by broadening the sample to include repeating candidates who as a general rule would be expected to have more experience, are older, and that they would have been out of school longer. Finally, more direct and specific measures of motivation, test-taking ability, etc., should contribute to an improvement in the amount of variance explained. Another study ought to be

conducted based on the new syllabus of the NBAA examinations which started in 2008.

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