The validity of University Entrance Examination and High school Grade point average for predicting first year university students' academic performance.

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Summary

University entrance exam scores and High School grade point average are two admission criteria that are currently used for higher education institutions in Ethiopia. It is essential to investigate the predictive validities of these two criteria, to ensure the precision of admission decisions. This study was conducted to examine the predictive validity of university entrance exam scores and high school GPA for college performance in different programs at Addis Ababa university; Differential validity was also measured across gender and school type (private vs public) .Predictive validity was evaluated as an index of the relationship between the predictors (High school GPA (HGPA) and the University entrance exam scores (UEEs) scores), and the criterion (first year college GPA). The sample used in the study consisted of 217 students from different study programs at Addis Ababa University. Statistical procedures utilized in the research included descriptive, bivariate correlation and regression analyses. Results obtained showed Both high school GPA and the University entrance exam scores significantly predict first year college GPA in general and for each study program (mathematics, Geology, statistics & computer science) as well . The combination of both predictors explained approximately 59 % (for mathematics), 16 % (for Geology), 34% (for statistics) and 37% (for computer science students) of the total variance in the first year college GPA. The comparison of the standardised regression coefficients revealed that University entrance exam scores have higher predictive power for all programs except for Geology, in which High school GPA predicted more. Differential validity and prediction results showed that for UEES, the validity coefficients and regression coefficients were significantly higher for private school students than public school students, which indicates the existence of differential validity and prediction of UEES across school. Sex differences in validity and prediction appear to be not significant. Finally it is recommended that the ministry of education and other admission personnel should give more emphasis to UEEs and review the appropriateness of using High school Grade point average to enhance predictive validity of college grade point average.

Table of content

Key words: high school GPA, Entrance Examination, predictive validity, differential validity, college performance.

Acronyms.

GPA: Grade Point Average

HGPA: High school Grade point Average

UEE: University Entrance Examination

EGSECE: Ethiopian General Education Certificate Examination

GMAT: Graduate Management Admission Test

GRE: Graduate Record Exam

SAT: Scholastic Aptitude test

TOEFL: Test of English as a foreign language

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1. Introduction

1.1. Background

Even though it differs from country to country, students in many nations are required to sit for national examination to join their academic institution. Some institutions administer certain types of well-established globally recognized examinations. For instance most of the US colleges and universities require that all their applicants take one or more standardized tests such as SAT (Scholastic Aptitude Test), GRE (Graduate Record Examination), GMAT (Graduate Management Admission Test) and TOEFl (Test of English as a foreign language), while others administer locally-developed examinations to screen students for pursuing their academic career (Atkinson, 2001). Working on predictive validity of high-stake tests is not a new trend. As long as students are screened in to undergraduate or graduate courses through the admission tests, studying the influence of these tests on the future achievement of the students is of utmost importance. The nature of these tests, in fact indicates that educational experts discover to what extent admission tests can predict the academic success of the students in future.

Higher education in Ethiopia has shown a dramatic expansion in the last 10 years with a substantial increase in students' enrolment of approximately by 15 % each year (Education abstract, Ministry of Education, 2011/12). Despite the increase in number of students completing secondary schools, the capacity of post-secondary institution is still limited, and there is a need to decide which student is more qualified and most likely to succeed in these institutions. It is also believed that enrolling under-qualified students in a university leads to a misuse of resources, and similarly, failing to recruit the most able candidates has negative impacts on a discipline in long term.

At the end of each year, students completing secondary and preparatory programs are expected to sit for national examinations such as the Ethiopian General secondary Education Certificate Examination (EGSECE) and university entrance Examination (UEE), Conducted by the National Agency for Examinations (NAE). For the purpose of this paper, National examinations are viewed as external school examinations open to the general public and conducted by these examination bodies. The scores (EGSECE, entrance examination scores) are used as the basis for admission in different universities in the country. The cutting scores may vary from year to year depending on the capacity of the universities. These measures are used in post-secondary

education not because of their validity or their predictive power of college performance but they are used to limit the number of applicants to match the capacity of the universities in the country. It is also assumed that by raising the admission criteria (cutting scores), more qualified individuals will join the universities.

Candidates admission or placement into Ethiopian universities irrespective of whether the university is federal, state or private owned depends on meeting the cut-off mark set by Ministry of Education. It is believed that these entry qualifications and entrance examinations will positively predict candidates' performance in the university.

1.2. Statement of the problem

The Ethiopian Ministry of Education, which is responsible for the award of certificates and placement of students in the universities, has been facing a lot of criticisms due to the fact that university graduates have poor quality (Telila, 2010). Several professionals and researchers in education have claimed that the magnificent days of high academic performance and enviable achievement among Ethiopian undergraduates have reached a vanishing point (Telila, 2010). It is also disturbing to note that graduates from Ethiopian universities who happen to go for further studies abroad are often made to face further examination before being admitted.

As a remedy, there have been persistent calls from different quarters for the re-evaluation of the present modes of selecting candidates for admission into the various degree programs . This is with a view to determining the credibility of each of the admission criteria. Such criticism which is the result of the observed mismatch between candidates' performance in national examinations and their subsequent achievement in university degree programs is still continuing and has eventually resulted in the exit screening exercise. This exercise is designed to provide graduates with exit examination related to their profession. Students who are graduated from university are provided with an opportunity to take an examination prepared by "Centre for certificate of competence". The content of the exam is specific to a profession and includes practical exams related to that profession. The primary purpose of this exam is to make sure that graduates have a certain level of competence. Up on successful completion of the examination, graduates will be awarded a certificate of competence.

Investigation into the predictive validity of public national examination on students' future academic performance in different context is well researched in different countries. Many research findings of studies in the area of predictive validity that have been conducted over the past several years can be found in Gonnela et.al (2004), Rothstein (2004), Geiser and Santelics (2007), and Elert (1992). For instance Geiser and Santelics (2007) study reveals that high-school grade point average (HSGPA) was the best predictor of freshman grades. They also concluded that the finding has an implication for admissions policy and argues for greater emphasis on the high-school record, and a corresponding less-emphasis on standardized tests, in college admissions. Elert (1992) reviewed many research studies that investigated the validity of some predictors in predicting academic success and he reported that high school grades were twice as good a predictor of college success as standardized entrance test scores. In An empirical study of the predictive validity of grades using 3 decades of longitudinal data, Gonnela et.al (2004) demonstrated that small differences in number grades (which are not pass/fail) are statistically meaningful, and The strength of predictive validity and the ability to identify at-risk students in medical schools depends upon assessment systems such as number grades, and pass ∕fail (P∕F) systems.

However there is little or no empirical evidence on a national scale in Ethiopia on the national examination as predictors' of university students' academic performance, and this study aims to fill this gap.

Considering that high school GPA, and university entrance examination scores are very important criteria for admission to higher Education and therefore have serious consequences for students, it is crucial to investigate whether high school grade point average in Ethiopian general education certificate examination EGSECE, and University entrance examination scores accurately predict the future academic success of students at universities in Ethiopia. Exhaustive research on this topic has not produced any study specifically focused on the predictive validity or the psychometric quality of EGSECE, and/or University entrance examination. This study will be conducted to investigate the validity evidence for using grade point average of EGSEC, and University entrance exam scores for admission decisions by institutions of higher education in Ethiopia. The effects of gender, school type and students program of study on the predictive validity of these two admission criteria will be examined. The overall aim of this study is,

therefore, to examine the extent to which high school grades and University entrance exam scores predict university students' academic performance in Ethiopia.

1.3. Significance of the study.

The findings of this study can be valuable in many ways. First, they may guide admissions personnel and decision-makers at the Ministry of Education and Scientific Research in identifying whether the high school grades on national and university entrance Exam scores are accurate predictors of academic performance of students attending higher education institutions. It may help them in the development of future admission plans and student retention programs at Ethiopian universities and colleges. Further, the results of this study can help high school counsellors at the Ministry of Education assist with the college transition needs of their graduating students, by being able to better identify students at risk for dropping out. Second, the findings might guide the educational stakeholders in Ethiopia to review the testing policy as well as the quality of high school assessments and college entrance tests. Third, this study might bridge a research gap in the study of academic performance of students attending postsecondary institutions in Ethiopia and thus serves as a motivation for future research to be conducted in this area. For example researchers can consider other non-cognitive factors in addition to cognitive factors as a predictor variable.

Besides, there is a debate, in the literature, about which of standardized test scores; grade point average of high school or standardized examination should be weighed more heavily when making admission decisions. A considerable number of studies reported that high school grade point average more accurately predicts academic success in colleges than standardized tests and any other factor (Snyder, Hackett, Stewart, & Smith, 2002; Fleming & Garcia, 1998; Fleming, 2002; Hoffman, 2002; Zheng et al., 2002; Gose, 1994; Peltier, Laden, & Martranga, 1999; Lawlor, Richman, & Richman, 1997). On the other hand, other research show that standardized tests, such as Scholastic Aptitude Test (SAT), are significantly related to the college success (Camara & Echternacht, 2000). Lohfink and Paulsen (2005) also found that college entrance test scores have strong correlation with the performance of a student in higher education institutions. Therefore the findings of this study may have a contribution for the existing debate, adding knowledge about which predictor is more significant in predicting students' college performance.

1.4. Definition of terms

Academic performance: a reference to how well a student performs in academic knowledge and skills which is reflected by that student's cumulative grade point average (GPA).

Correlation coefficient: a statistical index of the linear relationship between two variables or measures. Coefficients range from −1.00 to +1.00 with values near zero indicating no relationship and values far from zero indicating a strong relationship; positive correlations mean that high values on both variables occur jointly while negative correlations mean an inverse relationship exists between the variables(Young, 2001). In test validity studies, correlation coefficients between a predictor and a criterion are often called validity coefficients (Neil & Kristin, 2007).

Criterion: an outcome or dependent variable or test score. In this study, the criterion is the first-year college grade point average.

Differential prediction. A finding where the prediction equations obtained from analysis are significantly different for different groups of examinees (young, 2001).

Differential validity: refers to a situation where the computed validity coefficients are different for different groups of examinees (Young, 2001).

High school GPA: a percentage score that is calculated based on the total weighted scores obtained from the high school general examination results of all subjects studied at the final year of high school.

Predictive validity: one of the aspects of test validity as originally defined by the American Psychological Association. It is most commonly used to describe the relationship between a predictor such as a test score and a criterion such as a grade point average.

Predictor: an independent variable used to forecast a criterion variable. In this study, the used predictors are High school GPA and University entrance exam scores.

University Entrance examination. An exam used to assess the student's readiness for admission into higher education institutions in Ethiopia

2. Review of Related literature

2.1. Higher education In Ethiopia

The first higher education institution in Ethiopia, the University College of Addis Ababa, was established in 1950. In spite of the country's need to expand the higher education sector, little progress was made in the subsequent 50 years. Until 1995, for example, there were only two public universities and sixteen affiliated and independent junior colleges in the country. Following the government's decentralization effort to expand the higher education system in regional states, several more universities were added increasing the total number of universities to nine in addition to the three higher education institutions that are under different Federal government entities and the eight teacher training colleges under the Regional Governments (Yizengaw, 2007). In 2004, the Ministry of Education began building an additional 13 universities, several of which started classes in 2007 (University Capacity Building Program, 2008).Over the last decade the number of higher education institutions in Ethiopia has grown considerably reaching to thirty one this year (Education Abstract, 2012/13). In the 2013 academic year, 130,961 students were enrolled in second year, across all public universities (MOE, 2012/13). The total number of students enrolled in Ethiopian higher education has also grown rapidly in the last five years with enrolments increasing from 170,799 in 2008 to 376,658 in 2013 (education abstract 2012/13). Despite these increases, however, the total participation rate in higher education remains low. Only about 7.8% percent of the traditional age cohort is currently attending tertiary institutions, which by Sub-Saharan African standards is low (World Bank, 2010). While women's participation in higher education has been growing, by 2012, about 28 percent of all students were women (Education abstract, 2012/13).

While a new policy calls for admission to higher education on the basis of entrance examinations held by individual higher education institutions, students continue to be selected and assigned a university on the basis of results obtained in national university entrance exam (UEE), and high school GPA. In principle, all applicants are eligible for admission to higher education. However, due to space limitations, not all are admitted to public institutions. Student placement is based on a minimum cut-off using the results of the university entrance examination scores (UEES) and High school GPA from secondary school examination. In practice, therefore, the cut-off point is determined by the space available in public universities and it differs from year to year. For

instance high school GPA of 2.75 was the cut-off point for male students and High school GPA of 2.50 for female students in 2013. To be admitted to public higher education institutions in the country, Students were expected to score a minimum of 285 in the university entrance examination. Access is reserved to the high achievers who tend to be from well-organized public or private secondary schools.

2.2. Prediction of academic achievement in post-secondary education

Until recently, most universities in Ethiopia use high-school grade point averages to decide which students to accept, in an attempt to find the brightest and most dedicated students (Education Abstract, 2004/5). In this process, the basic assumption is that a high-school student with a high grade point average will achieve high grades at university.

Predictive validity evidence indicates how well an assessment can predict scores obtained at a later day through the use of either the same measure or a different measure. Predictive validity is defined as how accurately test data can predict criterion score that are obtained at a later time (American educational association, American Psychological association and national council on measurement in education, 1999). Predictive validity is crucial when a test is used to predict the likelihood of some future performance. It indicates the extent to which an individuals' future performance on the criterion is predicted from prior test performance (Messick, 1989; Crocker & Algina, 1986).

Only a limited number of studies has been conducted on predictors of future academic attainment in Ethiopia (Amare, 2005, Aboma, 2008). However several studies have been conducted to investigate the best predictors of future academic performance in US and other developed countries' post-secondary institutions. In spite of these studies there are no complete explanations of variance of academic achievement in these institutions (Sackettet al., 2001). People who are responsible for admission need some standards on which to base their admission decisions. They have usually relied on cognitive predictors such as high school GPA and standardized test score to differentiate between applicants.

The related literature indicates that, apart from the demographic factors such as gender and ethnicity, studies in this field have concentrated on two broad categories: cognitive predictors

and non-cognitive predictors (Fan, Li, & Niess, 1998; Schwartz & Washington, 2002; Ting, 1998). Cognitive predictors cover such areas as high school academic performance and college entrance test scores, while, non-cognitive predictor relates to two main attributes: personality characteristics (such as self-motivation, self-directedness, dedication to studies and social skills) and environmental factors (such as size of schools, location of schools, parental education and socio economic status) (Wolfe & Johnson, 1995; Johnson, 2002; Mulvenon, Stegman, Ganley & McKenzie, 2002; Barnett, Ritter, & Lucas, 2003).

Several studies have been conducted to determine more accurate predictors of future academic success in postsecondary institutions. Some researchers gave priority to cognitive predictors (Kuncel et al., 2005; Kuncel, Nisbet, Ruble, & Schurr, 1982; Kuncel, Hezlett, & Ones, 2001, 2004; Kuncel, Credé, & Thomas, 2007), whereas others prefer using non cognitive variables and claim that they are important for the prediction of students' academic success (Duran, 1986; Tracey & Sedlacek, 1984; Sedlacek, 2004). Several researchers offer empirical evidence to support the role of cognitive ability as a valid predictor of college performance. For instance, Schmitt et al. (2009) reported that standardized test scores (SAT/ACT) and high school GPA were primary predictors of cumulative college GPA whereas non-cognitive measures best predicted behaviours such as class absenteeism. Similarly, Adebayo (2008) found that high school GPA was the best predictor of first semester college GPA; better than high school percentile rank and ACT scores. Noble and Sawyer (2004) and Sawyer (2007) offer further clarification by noting that high school GPA reflects some non-cognitive factors and is a better predictor of retention. Whereas standardized test scores like the ACT composite are somewhat distinct and are better predictors of college performance. Alderman (1999) also showed that high school GPA is a better predictor of future academic success than other factors such as the demographic variables of race, gender, or socioeconomic status. Finally, in examining multiple, large data sets, Sackett, Kuncel, Arneson, Cooper, and Waters (2009) concluded that cognitive tests (ACT/SAT) are strongly correlated (r=.44) to college GPA. Thus, there is strong support for the role of standardized tests of cognitive ability in predicting some of the variance in college performance.

2.3. Gender and prediction of college performance

For any educational or psychological test, the validity of the instrument for its intended purposes should be the primary consideration for users of that test (Bachman and Palmer, 1996). However, questions regarding test validity often yield complex answers. In particular, given populations of examinees that differ on important demographic variables such as sex, ethnicity, or socioeconomic status, is the validity of the test invariant across groups? This topic of research commonly referred to as differential validity (young, 2001). As described by Linn (1978), differential validity refers to differences in the magnitude of the correlation coefficients for different groups of test-takers, for instance male and female.

A number of studies have been conducted on differential validity, as well as on the combination of both on college admissions tests such as the SAT and GRE. Many researchers have reviewed differential validity studies (Burton & Ramist, 2001; Morgan, 1989; Wilson, 1983; Young, 2001). For instance, Young (2001) reviewed about 50 studies that examined differential validity in predicting future performance across gender and ethnicity. He found consistent results across the various studies. His findings indicated that females' college performance was not often well predicted.

An explanation for this finding has been offered by many researchers. For example, Burton and Ramist (2001) explained that test scores do not necessarily under predict females' future academic performance, but rather, the actual grades obtained by females are higher than predicted because females tend to enrol in easier courses. Some studies that have adjusted prediction equations for differences in college grading patterns have shown that the appearance of bias is indeed reduced or completely eliminated (Elliot & Strenta, 1988).

It is important to mention that differences across institutions, program of study, and courses may alter the findings relative to differential validity in postsecondary institutions. Given the many conflicting results of differential validity and differential prediction studies, these issues continue to be of interest to many researchers, and they need to be investigated whenever it is plausible (Linn, 1994)

2.4. Gender and Assessment

The literature reveals that males and females differ in their performance on various high school subjects and standardized tests. In a review of past research on gender differences in test

performance, Wilder and Powell (1989) surveyed studies that addressed undergraduate, graduate, and professional school entrance tests, validity studies, national studies, verbal ability tests, and quantitative ability tests. Specific testing programs discussed in the studies reviewed included the National Assessment of Educational Progress, National Longitudinal Study, High School and beyond, and the SAT. They found that females outperformed males on verbal ability and achievement tests while males outperformed females on mathematics tests. Although the study revealed that disparities existed between males and females, it also mentioned that these disparities were diminishing slowly over time.

Willingham and Cole (1997), in a comprehensive examination of gender differences, found that gender differences occur across different testing programs and in different subject areas. According to their findings, females tend to achieve better grades in school while males tend to receive better scores on standardized tests. Although some researchers have reported contradictory findings, the results regarding specific tests have generally shown that males tend do better in mathematics and science-related subjects while females perform better on verbal subjects (Azen, Bronner, & Gafni, 2002). Hyde, Fennema, and Lamon (1990) conducted a meta-analysis study and showed that while girls tend to do slightly better in mathematics compared to boys in elementary and middle school, this disparity switches in high school and college, with males tending to do much better than females.

2.5. School type and student achievement

Public education is universally available, with control and funding coming from the state, local or federal government. Public schools are free in general and, in most cases, offer a wide range of student opportunities toward either college preparation or the workforce. But Private schools generally have lower student-teacher class ratios than public schools and teachers foster strong relationships with both students and parents. Teacher feedback is expected and is far more frequent than in most public schools. Private school facilities are often more modern and technologically advanced. Because of this they have a better reputation. The good thing about public schools is that they usually charge little tuition. The bad thing is that they are often underfunded and influenced by political winds and shortfalls. They are also financed through federal, state, and are part of a larger school system, which functions as a part of the government

and must follow the rules and regulations set by politicians. In contrast, private schools must generate their own funding, which typically comes from a variety of sources. The potential benefits of private schools come from their independence. They do not have to follow the same sorts of regulations and bureaucratic processes that govern public schools.

In terms of student achievement in private and public schools, conflicting results are reported by different researchers. Several authors have sought to control for school selection in modelling the treatment effect of private schools. For instance, Evans and Schwab (1995, 1996), Sander and Krautmann (1995), Sander (1996, 1997), Goldhaber (1996) and Neal (1997) compare the effects of public and private schools on standardized test scores, high-school dropout probabilities, and other outcomes. The results are mixed. Evans and Schwab (1996) and Neal (1997) find strong evidence that private schools increase student achievement, especially for minorities and initial low achievers, but Sander (1996) finds no significant effect.

Adamuti-Trache, Bluman & Tiedje's (2013) study looked at first year physics and calculus students and found that public school graduates scored an average of about two to three per cent higher than private school graduates. They suggest that the lack of individual attention on students in public schools may actually give students an advantage in the tougher university environment.

In US, the presence of a private school effect was first studied by James Coleman and his colleagues in a 1982 study (Coleman, Hoffer & Kilgore, 1982). That study confirmed that, even after taking into account key background characteristics of students (mainly their socioeconomic status), students attending private high schools, on average, outperformed students attending public high schools.

More recently, Lubienski and Lubienski (2005) used hierarchical linear modelling, a technique that takes into account the multilevel nature of the data, to compare the achievement of public and private school students. It found that when student background, mainly SES, was taken into account, students attending public schools actually outperformed students at private schools.

In the UK, the Higher Education Funding Council for England/ HEFCE (2003) emphasized that an important, but less well known subject of research into university admissions is the school type effect. The school type effect is a difference between private school and state school

students in their degree performance, relative to the grades the students achieved in the final school leaving examinations sat at 18 years of age (HEFCE, 2003). In particular, research on the school type effect shows that for a given set of A-level grades, the degree performance of private school students is lower than that of state school students (Smith & Naylor, 2001; HEFCE, 2003).

Jimenez and Lockheed (1995) compared private and public secondary education students in 5 developing countries including Columbia, Philippines, Thailand, Dominican Republic, and Tanzania. The cross-sectional study showed that private education students outperformed public school students on standardized exams and that private education was better resourced and more organized providing students with more efficiently delivered instruction

2.6. Research on predictive validity
In this part, studies conducted in different countries will be discussed briefly, starting with USA

Researchers interested in the relationship between academic achievement in high school and successes in higher education have studied the utility of grades and assessment measures to indicate university performance. Many studies have been conducted in USA to see the relationship between SAT, ACT, MCAT and college achievement on a wide sample (Breland, KuKubota & Bonner, 1999; Garton, Dyer, King and Ball, 2000; House, 2000; Geiser and Studly, 2002; Armstrong and Carty, 2003).The results of those studies show that there is significant relationship between the predictors and dependent variable. In a study of MCAT's predictive validity for medical school students performance, Donnon, Oddone Paolucci and Violato (2007) have found that the biological science subtest as the best predictor of medical school students in the preclinical years. Elert (1992) reviewed many research studies that investigated the validity of some predictors in predicting academic success and he reported that high school grades were twice as good a predictor of college success than standardized entrance test scores. He stated that standardized entrance test scores contributing approximately 5% to the prediction model. Camara and Echternacht (2000) also reported that studies that have been conducted about the predictive validity of high school performance, and the achievement is the best predictor of future classroom achievement. In 1985, Jacobs studied the predictive validity of relative High School Rank (HSR) and the SAT scores of 4,145 freshmen at Indiana University. He stated that HSR was the best single predictor of college GPA. It is consistently found that high school

grades are the best predictor of academic success in colleges (Amando, 1991; Connor, 1992). Ramist, Lewis, and McCamley-Jenkins (1993) conducted a study using data from thirty eight colleges with a total sample of 446,379 students to examine the predictive validity of high school performance and SAT scores. They found that high school performance predicts better than the SAT scores but adding SAT scores to the model increases the validity coefficient by almost .10 beyond high school performance They reported that using both high school performance and SAT scores jointly increases the validity coefficient significantly by about 0.10. This means that using both high school performance and standardized entrance scores improves the accuracy of prediction. More than 2,000 studies conducted by 685 colleges with the assistance of the College Entrance Examination Board's Validity Study Service stated that total SAT score accounts for 18% of the variance in a first year college GPA (Anastasi, 1988). The argument on using standardized test scores focuses mainly on the weight given to each one when making admissions decisions. Researchers have conducted numerous studies on the predictive validity of high school GPA and the SAT as criteria for college admissions. Some researchers have argued that standardized tests add little information to prediction equations beyond high school grade point average or high school rank in-class (Moffatt, 1993; Myers & Pyles, 1992; Cowen & Fiori, 1991). Others suggested that achievements in classrooms, for example high school grade point average, are the best predictors of future academic achievements in colleges (Hu, 2002; Baron & Norman, 1992; Beecher & Fischer, 1999; Berdie, 1960; Lenning, 1975; Morgan, 1990; Myers & Pyle s, 1992; Noble, 1991; Ramist, Lewis, & McCamley, 1990; Rowan, 1978; Sawyer & Maxey, 1979).

Recently, Winter and Dodou (2011) investigated the extent to which high school grades predict first year grade point average (GPA) and completion of Bachelor of Science (B.Sc.) programs at a Dutch technical university. The regression analysis of the results showed that the natural sciences and mathematics factor (loading variables: physics, chemistry and mathematics) was the strong predictor of first year GPA and B.Sc. completion, the liberal arts factor was a weak predictor, and the language factor had no significant predictive value. In the same study differences were identified across B.Sc. programs, with programs that relied strongly on Natural sciences and Mathematics enrolling better performing students. Gender was not predictive of first year GPA.

Very recently, entrance examination alone and in combination with high school GPA was found to be a relatively poor predictor of medical students 'academic performance and its predictive validity is reported to decline over the academic year of the school (Farrokhi-Khajeh-Pasha et al, 2012). Alshumrani (2007), on the other hand, found that High school grades and general aptitude test scores were individually and jointly significant predictor of first year college GPA of Saudi undergraduate students. Another study on six programs in Turkish higher education indicates that the significant predictors of students' freshman GPA were placement scores which are used for placement of agricultural engineering, civil engineering and social studies education (Karakaya and Tavsancil, 2008). A study on eight core disciplines in Africa revealed that although generally public examinations poorly predicts students' university academic achievement, when compared individually, the West African Senior School Certificate Examination (WASSCE) was the best single predictor of students cumulative grade point average (Obioma & Salau, 2007).

In conclusion, the prediction of college success is an old issue that has been discussed for decades. An enormous number of studies had been conducted to determine the most appropriate predictors that accounts for the vast majority of the variance on the college GPA. These studies investigated cognitive predictors, such as high school GPA, high school rank in class, high school percentage, SAT and ACT. Non - cognitive factors, such as personality traits and demographic characteristics were studied as well. However, the college GPA variance is not completely explained. Studies reported that the most appropriate predictors explain about 59% of the variance in the freshmen GPA. This means that almost 41% or more of the variance in the freshmen GPA is not explained yet. There are several differences between the predictive studies in terms of the design, sample size, variables included in the study, environment and country that should be considered when using the results. This study focuses on the predictive validity of secondary school examination and the university entrance Test on first year of freshmen students in Ethiopia.

2.7. Predictive validity of an assessment.

According to McAlpine (2002), a valid assessment is one which measures that which it is supposed to measure. For example a mathematics assessment which insisted that answers has to be written in German would not be a valid assessment as there is a good chance that we would be

testing students' knowledge of German rather that their abilities in mathematics. It is important when designing an assessment that we consider whether it does actually asses what we intend it to. There are different types of validity such as content, construct, predictive, etc. The American Standards for Educational and Psychological Testing states that predictive validity indicates how accurately test data can predict criterion scores, or scores on other tests used to make judgments about student performance, obtained at a later time (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999, pp. 179–180). For example we might predict that someone who scored an A in mathematics might perform better in a degree course in mathematics than someone who failed or got less score. If that is the case, the assessment can be considered to have predictive validity. This type of validity is most important when the primary purpose of the assessment is selection. Therefore ensuring predictive validity means ensuring that the performance of a student on the assessment is closely related to their future performance on the predicted measures.

3. Methodology.

This chapter provides a detailed description of the methodology that was used in this study. The chapter includes the purpose of the study and research questions, research design, sample and data collection procedures, variables and data analysis techniques for the study.

3.1. Purpose of the Study

The purpose of this study was to investigate the predictive validity of both high school grade point average and university entrance test scores used as criteria in the admission process to postsecondary institutions in the Democratic Republic of Ethiopia. The study intended to examine if adding university entrance exam scores to high school exam scores could increase the prediction power as measured by first-year college grade point average. In addition, the predictive validity of high school GPA and university entrance exam scores will be examined across gender, school type and program of study.

3.2. Research Questions

Specifically the objectives of the study is to determine the extent to which score in University entrance examination conducted by National Assessment agency and high school GPA could predict future academic performance of first year university students (as measured by

Cumulative Grade point Average). And to determine whether, sex, and type of school attended by students influence the predictive validity of predictor variables on university performance. Therefore regarding the prediction of college student academic performance, the following three research questions were formed.

1. Are the high school GPA and university entrance examination scores significant predictors of first year college GPA for the different programs at Addis Ababa University? Does the addition of university entrance scores enhance the prediction of the college performance?

2. What is the most powerful predictor in forecasting the first year academic performance for each program of study in the sample? University entrance examination or high school GPA of secondary school examination?

3. Do high school grade point average and university entrance exam scores have differential validity/prediction across gender and type of high school attended?

3.3. Research Design

This research was designed to examine the predictive validity of high school grade point average and university entrance examination scores in predicting students' college academic success, as measured by first-year college grade point average. High school GPA , university Entrance exam scores (UEE), gender, school type and program of study were chosen as independent variables and first-year college GPA, was selected to serve as criteria (dependent variables) .In order to answer the main research questions, linear multiple regression analyses was employed.

3.4. Population and Sampling

The total population of this study included all first year students enrolling in Addis Ababa University in the academic year 2013. The sample includes 217 (45% females) students enrolled in different study programs (Mathematics, computer science, Geology and statistics) in the academic year. The average age of the students was 19. The information and records of all students who are admitted in the year was obtained from the admission files of the university's' registrar office. So the study was conducted using information obtained from the institution's

database. The data, which include high grade point averages from the secondary school examination agency, University entrance test scores, major in colleges, and students' demography were directly extracted from the files of students in the university.

3.5. Study Variables

3.5.1. Predictor Variables

The main independent variables that were utilized in this study are high school Grade point average, University entrance examination scores, Gender, school type (private vs public) and college major. Each of the predictor and criterion variables is described below.

3.5.1.1 High school GPA

High school grade point average refers to the mean average score over all subjects taken at the end of high School Year. It is obtained from the General Secondary Examinations agency. This includes the subjects; physics, chemistry, biology, English, mathematics, history, Geography, Civics and ethical education and Amharic. To be able to join college or preparatory program, a minimum overall GPA is set by the Ministry of Education each year depending on the capacity of the college programs.

3.5.1.2. University Entrance Examination (UEE)

The University entrance tests are examinations designed to measure a student's readiness for future University academic success. These entrance tests are composed of a combination of different subtests. These subtests are English, Physics, Chemistry, Biology, General Science, Civics and ethical education and Mathematics. These tests are prepared by expert professors at Addis Ababa University and administered at the end of each year. Each subtest consists of a range of 45–100 multiple-choice items of four or five alternatives. The university entrance exam are administered around the same time (on May) every year. The scores of the college entrance tests are used along with high school grade point average to make significant decisions about students' potential to succeed in their college studies. The maximum percentage score on the entrance test is 700%. Despite the fact that the pass-point is 350%+, there is no restriction to this

limit. There could be possibilities to make it below this percentage depending on available places in the universities in the country.

If a student scores 70% in English, 60% in Math, 50% in chemistry 55% in Biology, 65% in Civics Ethical Education, 70% in General Science and 75% in Physics, then the student's total percentage score on the Seven tests is added and compared to a perfect score of 700%, meaning that the student's total percentage score is 445% on this given entrance exam.

3.5.2. Criterion Variables

Robbins and colleagues (2004) identified that students' college grade point average and persistence are two major domains of college student outcomes. Because first-year college grade point average provides an indication of college performance, the present study included first-year cumulative GPA across semester for the same sample in order to examine the relative contribution of high school GPA and University entrance exam scores in predicting students' college performance, measured by first year College Grade point average. The college grade point average refers to the average grade point that students obtain based on a scale with a maximum of 4 points and a minimum of 0 points. It is calculated for each student every semester.

3.5.2.1. First-year College Grade Point Average

Research shows that first-year College GPA is the most commonly used criterion variable in the predictive validity studies of college admission procedures (Wilson, 1983). Pascarella and Terenzini (1991) stated that "First-year grades are probably the single most revealing indicator of . . . successful adjustment to the intellectual demands of a particular college's course of study" (p. 388). Camara and Echternacht (2000) found that first-year College GPA is the most frequently used criterion in predictive studies. They noted that first-year college GPA is favoured because it is a well-defined criterion. First-year college GPA scores are easily retrieved from university records, and it is available relatively soon after students finish high school. Willingham (1985) found that high school grades are highly correlated with first-year GPA as well as cumulative GPA over time. Thus, the first-year college GPA could be considered as a good predictor of subsequent years.

3.6. Methods of Data Analysis

The data analysis for this study included both descriptive and inferential statistics. Descriptive statistics will be computed for predictor variables (Grade point average of secondary school examination and University entrance examination scores), and for the criterion variable (first-year college grade point average). Frequencies for demographic variables (gender and program of study) were also tabulated.

Multiple regression analysis was used to answer the research questions. The analysis evaluated whether High school grade point average was an accurate predictor in predicting college academic success and whether adding of University entrance test scores improved the prediction validity as measured by first-year college GPA. High school Grade point average of Secondary education examination and University entrance examination scores were further examined for differential validity across subgroups (gender and School type). The hypotheses in the study was tested at the 0.05 level of significance. All the analyses were conducted using Statistical Packages for Social Science (SPSS 20) software

4. Analysis

This chapter focuses on the results of the data analyses. It includes four sections that are organized according to the plan of analyses and the order of the research questions as described in the previous chapter. The first section presents the purpose of the study. The second section provides descriptive analyses for the sample and the variables in the study. The third section focuses on the findings from correlation and multiple regression analyses of the data. Finally, a summary of the findings of the study is provided.

The purpose of this study was to examine the validity of high school GPA and college entrance examination in predicting college academic performance at the Addis Ababa University in Ethiopia. The research questions focused on the predictive power of these two variables on the criterion variable, first year college grade point average (FGPA), the study also aimed to determine the most accurate predictor of college academic success: University entrance examination or High school GPA. The Following were the three research questions of study:

1 Are High school GPA and Entrance exam scores significant predictors of first year college GPA for each program in the sample? Does the addition of entrance exam scores enhance the prediction?

2. Which admission criteria predicts better, High school GPA or Entrance exam Scores?

3. Do high school GPA and college entrance exam score have differential validity across gender and high school type (private vs public)?

Descriptive Statistics: Descriptive statistics (mean, standard deviation, and frequency) were utilized to describe the participants and to compare their performance on the basis of selected variables. The variables selected for comparison are High school GPA from General secondary education certificate examination (GSECE), Scores from University entrance examination (UEE) and first year university grade point average (FUGPA).

Statistics of the Sample: The sample used in this study was 217 (42% female) students. The participants had been admitted to four programs. In the sample, the highest percentage, 30.8% (67 students) are majoring in Geology, while the lowest percentage, 21.2% (46 students) are specializing in Computer science (Figure 2). The college academic majors of the remaining students were 26.3% (57 students) from statistics program; and 22% (47 students) from Mathematics. Regarding type of high school attended, the sample included 88 (41%) students from private school and 129 (59%) students from public schools. Table 1 illustrates detail distribution of the participants in the sample.

Table 1. Distribution of Students Based on demographic variables

Group variables		Number	Percent
Department	Computer Science	46	22.0%
	Geology	67	30.8%
	Mathematics	47	21.2%
	Statistics	57	26.3%
Gender	male	126	58%
	female	91	42%
School Type	private	88	41%
	Public	129	59%

4.1 Descriptive Statistics of Academic Performance Outcomes.

See Tables 2 - 5 for an overview of the descriptive statistics on academic performance (including breakdowns by gender, school type and study program).

High school Grade point average: High school GPA is an average score that is c based on the total weighted scores obtained from the high school general examination results of all subjects studied during final year of high school. The overall mean of high school GPA for the total sample was 3.20 (SD=.51). This means that on average students received 3.20 points out of 4 in their senior year of high school. The high school GPA for female and male students were; 3.30 and 3.06 respectively. This presents a statistically significant differences (see Table 3) and indicates that males perform better that females in High school GPA. The mean score was also computed for students based on the school type (private vs Government owned/public). Students coming from private schools have mean score of 3.26 while those coming from private schools have mean score of 3.16, which is not a significant difference (see Table 4).

University entrance exam score: college/university entrance scores refer to a test used to assess the student's readiness for admission into a higher education. It is computed based on students test score for 7 subjects, each having maximum of 100 marks. Therefore the maximum score for

each student would be 700. In this study, the mean score of entrance exam for total sample was 390.06. For gender, females (M=377.68, SD=53.35) have a lower mean score than males (M=392.93, SD=58.86). Students coming from Private schools achieved better mean scores (M=402.63) than those coming from government owned schools (M=381.54). Both differences are statistically significant (see Tables 3 and 4).

First year university GPA; When we look at the criterion variable, the students mean score on first year grade point average was 2.99 (SD=0.44) for the total sample. Based on gender, male students achieve a higher mean score on first year College GPA (M=3.12, SD=0.39) than female students (M=2.81, SD=0.45), which is a statistically significant difference When looking at the descriptive statistics by school type, it is clear that students of private schools received almost the same mean score on first year college GPA (M=3.00, SD=0.49) as government funded schools students (M=2.98, SD=0.41).

Table 2. Descriptive Statistics of the study variables for total sample

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
CollegeGPA	217	2.00	400	2.99	.44
HGPA	217	2.00	4.00	3.20	.51
UEES	217	300.00	582.00	390.06	55.26

HGPA=High school Grade point average

UEES= university Entrance exam scores

Table 3. Descriptive Statistics of the study variables and T- test for equality of means for male and female students.

Group Statistics for gender						T-test for equality of mean	
	sex	N	Mean	Std. Deviation	Std. Error Mean	t	Mean difference
HGPA	male	126	3.30	.46	.0417	3.498**	.246
	female	91	3.06	.54	.0567		
UEES	male	126	392.93	58.86	5.244	1.990*	15.25
	female	91	377.68	53.35	5.593		
College GPA	male	126	3.12	.39	.0350	5.146***	.304
	female	91	2.82	.45	.0476		

***=statistically significant at .001 level (two-tailed)
**= statistically significant at 0.01 level (two-tailed)
*=statistically significant at 0.05 level (two-tailed)

Table 4. Descriptive Statistics of study variables for public and private schools

Group Statistics for school type						T-test for equality of means	
	Schooltype	N	Mean	Std. Deviation	Std. Error Mean	t	Mean difference
College GPA	private	88	3.00	.49	.0526	.246	.015
	public	129	2.98	.41	.0365		
HGPA	private	88	3.26	.54	.0584	1.294	.094
	public	129	3.16	.48	.0429		
UEES	private	88	402.64	65.53	6.986	2.618*	21.097
	public	129	381.54	45.46	4.019		

*=Statistically significant at .05 level (two-tailed)

Table 5 showed the mean and standard deviations of the study variables for each study program or academic discipline in the sample. The mean percentage score of College GPA varied based on students' majors. The highest mean score was at computer department (M=3.13, SD=0.44).while the lowest mean score was at statistics department (M=2.79, SD=0.45).the results also showed that the mean score of university entrance exam score for students of computer science is higher. This may be due to the fact that students joining this department are expected to have higher scores in UEE.

Based on Gender, the mean scores indicated that male students scored significantly higher than female students on both predictors; high school Grade point average and university entrance test score. The mean score for students who studied in private schools was significantly higher than the mean score for students who studied in Government funded high schools only for the entrance exam score.

Table 5. Descriptive Statistics of study variables for each study programs in the sample

Variables	Study program	N	Minimum	Maximum	Mean	Standard Deviation
College GPA	Mathematics	47	2.40	4.00	3.05	.42
	Geology	67	2.00	3.74	3.02	.39
	Statistics	57	2.10	3.91	2.79	.45
	Computer	46	2.00	3.85	3.13	.44
HGPA	Mathematics	47	2.40	4.00	3.23	.47
	Geology	67	2.00	3.88	3.19	.47
	Statistics	57	2.00	3.85	2.87	.46
	Computer	46	2.60	4.00	3.57	.40
UEES	Mathematics	47	316.00	571.00	383.53	51.05
	Geology	67	300.00	478.00	381.01	45.45
	Statistics	57	300.00	568.00	367.31	46.33
	Computer	46	307.00	571.00	421.95	64.04

4.2. Correlation and Regression Analysis.

Three research questions were developed for this study. They were answered through the computation of bivariate correlation coefficients and multiple regression analysis to determine how much variation in first year university grade point average is explained by the two independent variables (high school GPA in EGSECE and University Entrance exam scores).

In this study the predictive validity of high school grade point and university entrance exam scores as for first year university performance was also examined for different programs. Pearson

product correlation was also used to determine the relationship between the predictors (High school GPA and UEES) and criterion variable (First year college performance)

The correlation coefficient (r_{xy}) between high school grade point average and first year college GPA, and University entrance exam scores with first-year university GPA are presented in Table 6. The statistical significance of the correlations between pairs of study programs is reported as well. The results indicated that there was a positive significant correlation between high school Grade point average and first year GPA for each program in the sample. The results also showed that there were significant correlations between the entrance exam scores and first year GPA for all programs except for geology, r_{xy}=.145, P=0.222). The strongest significant relationship between Entrance exam score and first year GPA relates to mathematics students (r_{xy} =0.766, p<0.01) and computer science students (r_{xy}=.751, P<.01), while the weakest significant relationship relates to statistics students (r_{xy} =0.288, p<0.05). Across the programs, the magnitude of the relationship between high school GPA and first year college GPA hardly differed from the relation between the entrance exam score and GPA (.535 vs. .521). For high school GPA no significant differences were found between study programs for the correlations with first-year GPA. With regard to the correlations between the Entrance exam score and first-year GPA significant differences between study programs were found. Only the difference between Geology and Statistics was not statistically significant.

The correlation coefficient of the relationship between high school GPA and university entrance exam scores with first year GPA was also computer by Gender and school type, and are presented in Table 7. The correlation between predictor variables and first year GPA were found to be significant for both male and female. The same finding was observed for Private and Government funded school students.

Table 6. Correlations coefficients between predictor variables and First-year GPA for each program and total sample

Study program	N	HGPA (r_{xy})	Significance of difference b/n programs(Z_{HGPA})	UEES (r_{xy})	Significance of difference b/n programs(Z_{UEES})
Mathematics	47	.595**	Z=1.367	.766**	Z=4.394***
Geology	67	.395*		.149	
Mathematics	47	.595**	Z=.831	.766**	Z=3.517***,
Statistics	57	.475**		.288*	
Mathematics	47	.595**	Z=.684	.766**	Z=1,961*
Computer science	46	.492**		.530**	
Geology	67	.395*	Z=-.535	.149	Z=-.792
Statistics	57	.475**		.288*	
Geology	67	.395*	Z=-.614	.149	Z=-2.232*
Computer science	46	.492**		.530**	
Statistics	57	.475**	Z=-0.109	.288*	Z = -1.437
Computer science	46	.492**		.530**	
Total sample	217	.535**		.521**	

***.difference between correlations is significant at .001 level (two-tailed)
**. Difference between correlations is significant at the 0.01 level (two-tailed)
*. Difference between correlations is significant at the 0.05 level (two-tailed)

4.2.1. Differential validity

Validity coefficients (bivariate correlation) obtained for high school GPA and University entrance exam scores are examined for evidence of differential validity between male and females; private and public schools and among different study programs. Table 7 showed the validity data for the two predictor variables across the four study programs. Comparisons for the correlation coefficients derived for high school GPA indicated no significance difference among

the different study program. However, the tests of significance revealed that for University entrance exam scores, the correlation coefficients with first-year GPA differed between study programs. The only non-significant difference relates to the contrast between Geology and Statistics. The correlation coefficient between university entrance exam and College GPA was highest for mathematics students. The variation of correlation coefficients between University entrance exam scores and first-year GPA among study programs suggests that there is a need to inspect the contents of University entrance exam.

Differential validity for gender and school type was another aspect of this study that has been dealt in the analysis. Table 7 shows the comparison of the correlation coefficients across gender and school type. In general the correlation coefficients appeared to be significant for all groups. The significance of the difference in correlations between male and female and also between private and Public school students was investigated. The results indicated that there is no significance difference between male and female, as well as between private and public school students for high school GPA. However, considering the university entrance examination, the correlation coefficient was significantly higher for private than for public school students ($Z = -4.066$, $P<.001$).

Table 7. Correlations coefficients between predictor variables and First-year GPA for gender and school type

Group Variables		N	HGPA (r_{xy})	Significance of difference b/n groups(Z_{HGPA})	UEES (r_{xy})	Significance of difference b/n groups(Z_{UEES})
Gender	F	91	$.570^{**}$	Z=1.273	$.501^{**}$	Z = 0.652
	M	126	$.438^{**}$		$.566^{**}$	
School Type	G	129	$.458^{**}$	Z= - 1.769	$.272^{*}$	Z= -4.067***
	P	88	$.631^{**}$		$.691^{**}$	

***= correlation is significant at .001 level (two-tailed)
**. Correlation is significant at the 0.01 level (two-tailed)
*. Correlation is significant at the 0.05 level (two-tailed)

Multiple regression analysis was performed to answer all research questions. The first research question asked if high school grade point average and university entrance exam scores were

significant predictors of first year university grade point average and whether the addition of entrance exam scores to high school GPA improved the prediction power of first year performance. Linear multiple regression analyses was implemented to examine the predictive validity of high school GPA and Entrance exam scores in general and for each program separately. High school GPA and university entrance exam scores were entered in blocks, Model 1 and model 2 respectively. The change in R^2 (coefficient of determination) was appraised to see if the Entrance Exam scores provided incremental information for the prediction of first year University GPA.

In model 1, the first year Grade point average was regressed on High school grade point average for total sample and for each program separately. Table 8 and 9 present the regression coefficients and the proportion variance (R^2) in first year grade point average accounted for by high school GPA for the total sample and for each program. F-test results showed that high school GPA was a statistically significant predicator in general and for each program as well. When we look at regression analyses results for each study program, high school GPA made its highest statistically significant contribution for mathematics students ($F(1,46)=24.7$, $p<0.01$, $R^2=.355$) and its lowest statistically significant contribution for Geology students ($F(1,65)=15.95$, $p<.01$, $R^2=.156$).

Table 8. Standardised Regression Coefficient and Percent of Variance in First-year College GPA Explained by High School GPA for total sample

Coefficients[a]						
Model		Unstandardized Coefficient		Standardized Coefficient	t	R^2
		B	Std. Error	Beta		
1	HGPA	.466*	.050	.535*	9.285	.286
a. Dependent Variable: CollegeGPA						

*= Statistically significant at 0.01 level (two-tailed). HGPA=high school Grade point average.

Table 9.Regression Coefficients and Percent of Variance in First-year College GPA Explained by High School GPA for each program.

Study program	N	Regression Coefficient B_{HGPA}	R	R^2
Mathematics	47	.530*	.595	.354
Geology	67	.367*	.395	.156
Statistics	57	.473*	.475	.226
Computer science	46	.551*	.492	.242

*= statistically significant at 0.05 level (two-tailed), HGPA= high school grade point average

Predictor; HGPA

The second part of the research question was intended to examine if the addition of university entrance exam scores increased the predictive power of college performance.

Model 1 (Table 8) showed that High school GPA was a statistically significant predictor of first year University GPA for all program of study in the sample. Table 10 presents the regression coefficients for high school GPA and university entrance exam scores in model 2, where the university entrance exam scores variable was entered along with the high school GPA.

The addition of university entrance exam scores as a predictor in model 2 made a statistically significant contribution to R^2 in general and for three programs in particular the sample. The table also presents the percentage of explained variance (R^2) in first year university GPA that is accounted for by the two predictor variables and the change in R^2 in model 2 after the entrance exam scores were added. The results indicated that the addition of the entrance exam sores was important because it accounted for a considerable amount of additional variance in first year university GPA. However the relative importance of including university entrance exam scores was not statistically significant for Geology students.

Meanwhile, comparison of the standardized coefficients revealed that university entrance examination scores have higher regression coefficients than high school GPA in three of the four programs. Since regression coefficients indicate the relative predictive impact of the predictor variables on the criterion, the entrance exam scores have higher predictive power for the majority of the programs.

Table 10.Regression Coefficients and Percent of Variance in First-year College GPA Explained by High School GPA and University Entrance Exam Scores

Coefficients[a]						
Study Program	N	Predictors	Standardized coefficients (beta)	t	R^2	R^2 Change
Computer	46	HGPA	.331	2.497*	.372	13%
		UEES	.395	2.982**		
Geology	67	HGPA	.375	3.162**	.163	1%
		UEES	.084	.707		
Mathematics	47	HGPA	.069	.481	.588	23%
		UEES	.715	5.001**		
Statistics	57	HGPA	.317	2.631*	.343	12%
		UEES	.376	3.116**		
Total sample	217	HGPA	.358	5.497**	.361	8%
		UEES	.326	5.014**		

**, significant at .001 level, * significant at .05 level
Predictors; HGPA, UEES
HGPA=High school Grade point average
UEES= university Entrance exam scores

4.2.2. Differential prediction by Gender and school type.

The third research question was to see if the predictive validity of high GPA and university entrance exam score differs across gender (male/Female) and school type (private /government). This helps to test whether different prediction equations should be used with different subgroups of students (Gulliken and Wilks, 1950). Regression coefficients are helpful indicators of the relative strength of the predictor variables. These coefficients may be interpreted as number of points that a dependent variable (First year University GPA) changes for a unit change in the predictor variable (high school GPA) (Jim Frost, 2014). For instance a student's first year university GPA increases by .55 points for every unit increase in high school GPA for computer science students (Table 9). Correlation coefficients, Regression coefficients and coefficients of determination (R^2) were computed for male and female, and as well as for private and public school students. Differential validity is one of the aspects of validity associated with the

differences in the magnitude of the correlation coefficients for different groups of test-takers, for instance male and female (Linn, 1978). In this study Differential validity was assessed by computing the correlation between Predictors and the criterion variable by subgroup. If the correlation coefficient varies by subgroups, then the test is said to exhibit differential validity. Differential prediction was also assessed by comparing the regression coefficients of subgroups (gender and school type) for high school GPA and university entrance exam scores.

The relationship between High school GPA and First year college GPA and also the relation between University entrance exam scores (UEES) and First year college GPA was computed by gender and school type (private vs. public). For gender, the results showed that considering High school GPA, the validity coefficient (correlation coefficient) for females was found to be 0.570. For males, the correlation was smaller, namely 0.438. However there was no statistically significant difference (Z=1.273, p> .05). As for University entrance exam scores there is a different pattern with a larger correlation for male (r = 0.566) compared to females (r= 0.501), although it is not a statistically significant difference. Therefore it is not possible to conclude that there exits differential validity for gender. More detailed results are provided in Table 7.

Regarding school type, the results also indicated that High school GPA significantly correlated with University GPA, with a correlation coefficient of 0.631 for private school students. The correlation coefficient for public school students was found to be 0.458, smaller than public school students with a difference of 0.173. However the difference is not statistically significant. University entrance exam scores, on the other hand, had a higher correlation with First year university GPA for private school students (r =0.691) than public school students (r =0.272); the difference was statistically significant (Z= -4.066, p<0.01), which implied that there is differential validly across school type, regarding university entrance exam scores.

 The results of the regression analysis for male and female and for private and public school students on high school grade point average and Entrance exam scores are reported in Table 11. Regression coefficients were computed for male and female, as well as for private and public school students on both predictor variables. The regression coefficients were compared across gender and school type for both high school GPA and university entrance exam scores. In each case it was assessed if a significant interaction effect could be detected of both predictor variables (high school GPA and university entrance exam) with gender or school type. For this

purpose interaction terms (product of gender or school type with a predictor variable) were computed. The results are presented in Tables 12 through 15.

The results from the comparison test for male and female are shown in Table 12 and 13. For High school GPA, although the magnitude of the standardized regression coefficient for females (Beta=.421) is higher than males (Beta=.208), the comparison test showed that the difference is not statistically significant (t=1.111, p=.268). More details can be found in Table 12. The resulting regression coefficient on University entrance exam scores for male and female indicated that there is no significant difference between the two groups (t= -.846, p =.399).

The comparison results of regression coefficients for public and private school students are presented in Table 14 and 15. The regression coefficients were found to be not significantly different (t=1.802, p=.073) for private and public school students on high school GPA. However, with regard to university entrance exam scores, the result revealed that regression coefficient estimates were found to be significantly different (t = 2.161, p <.05) for private and public school students. This implies that university entrance exam scores were found to be more predictive of college GPA for private school (Beta =.484) students than public schools (Beta = .181).

The result regarding the coefficients of determination (R^2) showed that both High school GPA and university entrance exam scores are significantly strong predictors of college performance for female (R^2 =.359,) students than for male students (R^2=.353).Similarly both high school grade point average and University entrance exam scores were significant strong predictor of college grade point average for private school (R^2=.532) students than public school (R^2=.233) students.

Table 11. Regression coefficient and variation explained by High school GPA and University entrance examination on first year GPA for Gender and school type.

| Group variables | N | Predictor | Coefficients | | |
			Standardized Coefficients (beta)	t	R^2
Female	91	HGPA	.421	3.851**	.359
		UEES	.238	2.177*	
Male	126	HGPA	.208	2,490*	.353
		UEES	.463	5.534**	
Private	88	HGPA	.314	3.163**	.532
		UEES	.488	4.946**	
Public	129	HGPA	.376	4.438**	.233
		UEES	.182	2.091*	

**.significance at 0.01 level, *.significant at 0.05 level
Predictors: HGPA, UEES (university entrance exam scores). Dependent Variable: College GPA.

Table12. Comparison of regression coefficients between male and female students for High school GPA

| Model | Coefficients | | | |
| | Unstandardized Coefficients | | t | Sig. |
	B	Std. Error		
(Constant)	1.345	.221	6093	.000
HGPA	.477	.071	6.756	.000
Sex	.567	.320	1.773	.078
SexHGPA	-.110	.099	-1.111	.268
Dependent Variable: CollegeGPA				

Table 13. Comparison of regression coefficients between male and female in the sample for University entrance exam scores.

Coefficients				
Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	1.053	.293	3.594	.000
UEES	.005	.001	6.063	.000
Sex	.587	.363	1.614	.108
SexUEE	-.001	.001	-.846	.399
Dependent Variable: CollegeGPA				

Table 14. Comparison of regression coefficients between private and public schools for High school GPA.

Coefficients				
Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	1.768	.219	8.063	.000
HGPA	.385	.068	5.633	.000
School Type	-.617	.329	-1.877	.062
STypeHGPA	.182	.101	1.802	.073
Dependent Variable: CollegeGPA				

Table 15. Comparison of regression coefficients between private and public schools students for university entrance exam.

Coefficients				
Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	1795	.282	6.368	.000
UEES	.003	.001	4.261	.000
School Type	-.892	.379	-2.355	.019
STypeUEE	.002	.001	2.161	.032
Dependent Variable: CollegeGPA				

5. Discussion

This chapter provides a summary and interpretation of the findings. Conclusions and implications derived from the findings are also reported in this chapter. The limitations of the study are presented, and recommendations for further research are also suggested.

5.1. Summary

It is well described in the literature that the usefulness of any assessment is judged by its effectiveness in achieving its purposes (Bachman and Palmer, 1996). In this study the focus was on the admission system for Addis Ababa University in Ethiopia. High school grade point average in secondary education examination and university entrance examination scores are two admission criteria commonly used for university placement in Ethiopian universities. High school Grade point average provides admission personnel with summary of students' achievement in high school, and university entrance exam scores provide them with an index of students' potential to perform well in university. Admission personnel need to have the most proper criteria to ensure valid and fair admission decisions. Any measure that is commonly used for selection has direct and indirect effects throughout the educational system and that measure needs to validate or justify that use. The admission decision can make a critical impact on student' future and on the quality of the output of education system. Therefore the question of whether high school GPA and college entrance exam scores used as admission criteria are sufficient predictors of future academic success should be always be validated to ensure fair admission decisions. There are many types of validity evidence: predictive validity is one of them. A measure is said to have predictive validity in such a way that it predicts students' future academic success.

This research intended to investigate the predictive validity of high school grade point average of secondary school certificate examination and university entrance exam scores used to as admission criteria to post-secondary education in Ethiopia. The study also examine adding University entrance exam scores to high school GPA would increase the power to predict first year university Grade point average. The predictive validity was also examined across gender and school type (private and Government funded).

The study included a sample of 217 students from the faculty of science, at Addis Ababa University. Bivariate correlation, t-test and Hierarchical multiple linear regression technique

were utilized to help answer the research questions. Descriptive analyses were also included to provide general information about participating students' outcome variables.

5.2. Interpretation of the findings

Considering the total sample, descriptive statistics for the predictor variables (high school GPA and University entrance exam score) and the criterion variable (first year university GPA) were first obtained. The results of t- test indicated that male students' mean score were found to be higher than that of female students' mean scores on the predictor variables as well as on the criterion variables. Similarly private school students mean scores were found to be significantly higher than that of private school students' mean scores on the University entrance exam (t=2.618, p < .05). However there was no significant difference between mean scores of private and public school students on high school GPA and college GPA. The findings also showed that students majoring in computers science had higher mean scores than those in other majors. This is due to the fact that computer science relatively requires high scores on high school GPA and entrance examination.

It is evident from literature that male and female students differ in their performance on various high school subjects' areas, standardized tests and testing programs. Even though some of the findings are contradictory, the results regarding specific tests have generally shown that males tend do better in mathematics and science-related subjects while females perform better on verbal subjects (Azen, Bronner, & Gafni, 2002).In this study male students in Addis Ababa university also outperformed female students in High school GPA, university entrance exam scores and first year College GPA.This may have been due to the fact that males generally perform better on science subjects than females (Azen, Bronner, & Gafni, 2002). Hyde, Fennema, and Lamon's (1990) findings also indicates that females tend to do slightly better in mathematics compared to boys in elementary and middle school, this difference changes in high school and college, with males students performing much better than females. The findings of this study also showed that private school students' achievement was found to be higher than

government school students. This result may be due to the fact that private schools in Ethiopia has better facilities in terms of teaching materials and teacher's quality. These results are similar to Jimenez and Lockheed's (1995) comparative study on private and public secondary education students in 5 developing countries, which concluded that private education students outperformed public school students on standardized exams and that private education was better resourced and more organized providing students with more efficiently delivered instruction. But Adamuti-Trache, Bluman & Tiedje's (2013) recent findings showed different results. They found that public school graduates scored an average of about two to three per cent higher than private school graduates taking data from first year physics and calculus students. Lubienski and Lubienski (2005) had also compared the achievement of public and private school students, and found that students attending public schools outperformed students at private schools while controlling for student background, mainly SES (socio economic status). Another research in UK also confirmed that for a given set of A-level grades, the degree performance of private school students is lower than that of state school students (Smith & Naylor, 2001; HEFCE, 2003).

Question1. Are the high school GPA and university entrance examination scores significant predictors of first year GPA for different programs in the sample? Does the addition of university entrance scores enhance the prediction of the college performance?

Multiple regression analyses were conducted to answer this research question. The significance of high school grade point average was examined first for each program separately. Then in a subsequent regression model, university entrance exam scores were entered as a second predictor to investigate their incremental effect on the prediction power.

The results indicated that high school GPA was a statistically significant predictor in general and for each program of study in the sample, except for mathematics. The addition of the entrance exam scores to high school GPA improved the prediction power in general and the three study programs. The importance of adding entrance exam scores was observed in all programs except for the Geology program. When both high school GPA and University entrance exam scores

were included in the regression analysis, University entrance exam tends to show the highest standardized coefficients. The only exception relates to the Geology program.

These findings are similar to the findings of many studies which indicated that high school GPA and college entrance test scores are generally significant predictors of students' academic performance during their undergraduate studies (Klugh & Bierly,1959;. Snyder, Hackett, Stewart, & Smith, 2003; Kim, 2002; Kuncel, Hezlett, & Ones, 2004; Ramist, Lewis, & McCamley-Jenkins, 1994; Kuncel et al., 2005; Kuncel, Credé, & Thomas, 2007). Mathiasen (1984) reviewed more than 60 studies and concluded that high school GPA and standardized entrance test scores are the best predictors of college performance when predicting first-year college GPA. Similarly, the findings of Ramist, Lewis, & McCamley-Jenkinss (1994) confirmed that the association between high school GPA and first-year college GPA showed a moderate correlation of .39. In addition, the study showed the correlation coefficients between college entrance test scores and first-year college GPA to be .49.

Similar to many studies, the prediction power of college success was enhanced by adding college entrance test scores to high school GPA (Camara & Echternacht, 2000). Therefore using both high school GPA and college entrance test scores could help admissions personnel to make more accurate predictions and more appropriate admission decisions than using high school GPA alone (Eimers & Pike, 1997; Willingham, 1985; Mouw & Khanna, 1993).

Question 2. What is the most powerful predictor for first year academic performance for each programs of study in the sample? University entrance examination or high school GPA of secondary school examination?

The results of the regression analysis indicate that the addition of the entrance exam scores to high school GPA improved the prediction power for all programs in the sample. However when the predictor variables are regressed separately, the result showed that both make a similar contribution. But high school GPA accounted for more variance in first-year GPA than University entrance exam Scores for Geology (B=.375) students. These finding corresponds to most of the previous research which found that high school GPA explains more of the total variance in first-year college GPA than standardized entrance tests (Geiser and Santelics, 2007;

Zheng et al., 2002; Hoffman, 2002; Camara & Echternacht, 2000; Hu, 2002; Willingham, 1985; Zwick & Sklar, 2005).

Regression coefficients are helpful to identify the relative impact each predictor variable has on criterion variable. In order to see the most powerful predictor, it is essential to see standardized regression coefficients. In this study, Standardized Regression coefficients were computed on each predictor variables for each study programs. The outcomes of the regression analyses indicated that university entrance exam scores have a stronger impact than high school GPA for program of study except for Geology. This finding could lead to conclude that university entrance exam scores have more predictive power than high school GPA when considering separate programs. However High school GPA was found to be strong predictor of College GPA for mathematics students and also for the total sample. These findings need further investigation to see why the entrance exam scores have higher predictive power for separate programs and less predictive power when considering for the total sample. However, many studies have findings which indicate that high school GPA is more important in prediction of college performance than entrance exam. For instance Geiser and Santelics (2007), in a study of predictive validity of high school GPA and standardized test, indicated that high-school grade point average (HSGPA) was the best predictor of freshman grades. They concluded that the finding has an implication for admissions policy and request for greater emphasis on the high-school record, and a corresponding less-emphasis on standardized tests, in college admissions. However the findings of the present study leads to a different conclusion that giving less emphasis to entrance exam might, negatively, affect the admission decision. In a review of many research studies, Elert (1992) investigated the validity of some predictors in predicting academic success and he reported that high school grades were twice as good a predictor of college success as standardized entrance test scores.

Question 3: Do high school grade point average and university entrance exam scores have differential validity across gender and type of high school attended.

If a prediction by a test score is not similar for different subgroups of examinees, then the test is considered as biased (Johnson, Carter, Davison, and Oliver, 2001). In this study, differential prediction and differential validity by high school GPA and university entrance exam scores was assessed. The procedure involves a test of differences of regression coefficients between subgroups and as well as a test of differences of validity coefficients (correlation coefficients) between the groups.

The finding for male and female students showed that regression coefficients were not significantly different on both predictor variables. This finding is different from the results of young (2001). He reviewed and analysed many studies of differential prediction of admission tests and found consistent results of differences in prediction among different subgroups. His findings on gender indicated that there was a consistent significant difference between male and female students.

Differential prediction analyses for students coming from private and public school students were also conducted. The results indicated that regression coefficients were not significantly different on high school GPA. There was, however, a significant difference between public and private school students with regard to the regression coefficients of university entrance exam, which implied that existence of differential prediction for school type. The existence of differential prediction indicates a lack of fairness in test's use. It is important for a test to be free from bias in selecting different groups of examinee for admission decision.

Differential validity result showed that the validity coefficients between male and female are not significantly different on both high school GPA and university entrance exam scores. This finding is again different from those reported in previous research (Bridgeman et al., 2000; Ramist et al., 1994; Young, 2001). The study by Ramist, Lewis and McCamley-Jenkins (1994) examined the differential validity and prediction of standardised test and High school GPA. They found that for the total group, the standardized test scores were positively correlated with first year university GPA. However they found that the correlation varies by subgroups, for instance as for gender, they found that the standardized test was more predictive of first year university GPA for Females (r=.58) than males (r=.52).

Regarding school type, it was also revealed that the magnitude of the correlation between High school GPA and University GPA was not different for private and public school students. However the validity coefficients were significantly different for private and public school students on university entrance exam scores. This implies the existence of differential validity of university entrance exam scores across school type. The magnitude of the correlation between university entrance exam scores and the criterion was higher for private school ($r_{xy}=.691$) than for public ($r_{xy}=.272$) school students.

5.3. Limitation of the study

The limitation of this study is that it was done with data from one faculty. Having more data from different faculties or university would provide additional information about predictive validity of high school GPA and admission Exam across faculties.

5.4. Conclusion and Recommendations

High school grade point average from Secondary education certificate examination and University entrance examination scores are commonly used as admission criteria for predicting future academic performance in higher education in Ethiopia. High school grade point average reflects students' performance at the end of high school in different subjects. University entrance exam scores are based on subjects that are regarded as essential prerequisite for college level courses.

In terms of evaluating the predictive validity of admission criteria in Ethiopia, other researchers have conducted a study to see the predictive validity of university entrance exam scores. Nevertheless this study is the first study that investigates the predictive validity of both high school Grade point average and university entrance exam scores for college performance. Concerning predictive validity of high school GPA and university entrance exam scores, this study contributes to the body of knowledge and can be considered as significant.

Finally, it is concluded that based on the findings of this study, that the ministry of education and other admission personnel should give more emphasis to the University entrance examination because UEES has strong correlation with the criterion variable and great predictive power of university performance. Another finding of the study is that the validity coefficients and regression coefficient were found to be not significantly different for male and female. However, validity confidents and regression coefficients were significantly different for private and public school students on university entrance exam scores, which indicate the existence of differential validity and prediction among certain subgroups. Therefore differences among high school type (private vs state) should also be taken in to consideration during the admission process to allow for more equal opportunities to all and have fair admission decision.

Recommendation

Prior research has dealt with the predictive validity of University entrance test scores in Ethiopia (Amare, 2005; Aboma, 2008). However the present study has dealt with the predictive validity of both high school GPA and entrance exam scores. Hence, this study may serve as a baseline for further research to better understand the nature of the predictive validity of the two predictor variables, high school GPA and university entrance exam scores.

Since a great amount of variance in the criteria variables is unexplained by the predictor variables in this study, there is room for more research to study the unexplained portion of academic performance. Admission committees could admit students based on other factors. These factors may include motivation and interest, high school class size, and socioeconomic status to account for more variance.

Research which examines more factors (cognitive and non-cognitive) that are related to students' college performance can help inform the admission process so that universities receive students who are more likely to stay and succeed at their institutions.

This study examined differential validity and differential prediction using validity coefficients and regression coefficients respectively, across high school type and gender; further research on the main causes of high school type differences in prediction needs to be conducted to better understand this source of bias. Future research could also examine whether the predictive

validity of these two admission criteria is consistent across university, faculty and high school major (e.g., Arts, Science).

Finally, university entrance exam in Ethiopia is designed to measure what students have learned in high schools rather than the necessary skills (e.g., problem solving, reasoning) needed to perform well in college. Therefore a study evaluating the content of this exam, in relation to skills required in college, is necessary.

References

Aboma.O. (2008). Predicting First Year University Students' Academic Success. Electronic Journal of Research in Educational Psychology, 7(3), 1053-1072.

Adelman, C. (1999). Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment. Washington, DC: U.S. Dept. of Education.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (Joint Committee). (1999). Standards for educational and psychological testing. Washington, DC: Authors.

Amare. F. (2005).The predictive validity of higher education entrance examination scores for freshman students' academic achievement in Addis Ababa University. Unpublished masters' thesis, Addis Ababa University, Ethiopia.

Adamuti-Trache, Bluman & Tiedje (2013).Student Success in First-Year University Physics and Mathematics Courses: Does the high-school attended make a difference? *International Journal of Science Education.* 35(17), 2905–2927.

Astin, A. W. (1977). Four critical years. San Francisco: Jossey-Bass.

Atkinson, R. H. (2001, February 18). Standardized tests and access to American universities: UC and the SAT. Speech available in the following web address: http://www.ucop.edu/ucophome/commserv/sat/speech.html.

Bachman, L. F., & Palmer, A. (1996). Language testing in practice. Oxford: Oxford University Press.

Blumberg, P. (1984). Predicting student success from non-cognitive variables. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

Bridgeman, B., McCamley-Jenkins, L., & Ervin, N. (2000).Predictions of freshman grade-point average from the revised and re-entered SAT I: Reasoning Test (College Board Research Report No. 2000-1). New York: The College Board.

Burton, N. W., & Ramist, L. (2001). Predicting long term success in undergraduate school: A review of predictive validity studies. Princeton, NJ: Educational Testing Service.

Camara, W. J., & Echternacht, G. (2000). The SAT I and high school grades: Utility in predicting success in college. College Board Research Notes (RN-10). New York: College Board.

Cleary, T. A. (1968). Test bias: Prediction of grades of Negro and White students in Integrated colleges. Journal of Educational Measurement, 5, 115-124.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16297–334.

Cronbach, L. J., Schoeneman, P., & McKie, D. (1965). Alpha coefficients for stratified tests. Educational and Psychological Measurement, 25, 291-312.

Eimers, M. T. & Pike, G. R. (1997). Minority and nonminority adjustment to college: Differences or similarities? Research in Higher Education, 38(1), 77-97.

Elliott, R., & Strentra, A. C. (1988). Effects of improving the reliability of the GPA on prediction generally and on comparative predictions for gender and race particularly. Journal of Educational Measurement, 25, 333-347.

Evans, William N., and Robert M. Schwab. 1996. "Who Benefits from a Catholic School Education? " Mimeo, University of Maryland.

Fan, T., Li, Y., & Niess, M. (1988). Predicting academic achievement of college computer sciencemajors. Journal of Research on Computing in Education, 31(2), 155-172.

Farver, A. S., Sedlacek, W. E., & Brooks, G. C. (1975). Longitudinal prediction of university grades for blacks and whites. Measurement and Evaluation in Guidance, 7, 243–50

Fente, Henok Semaegzer. (2008). Challenges of Higher Education in Ethiopia. News VOA.com.Retrieved 2/2/2014. http://www.voanews.com/horn/archive/2008

Friedman, B. A., and Mandel, R. G. (2010). The Prediction of College Student Academic Performance and Retention: Application of Expectancy and Goal Setting Theories. Journal of college student retention: Research, theory & practice, 11(2), 227-246.

Frost (2013). How to Interpret Regression Analysis Results: P-values and Coefficients. Tips and techniques for statistics and quality improvement. Retrieved from, http://blog.minitab.com/blog/adventures-in-statistics/how-to-interpret-regression analysis-results-p-values-and-coefficients, on July, 2014

Geiser, .S & Santelices, M, V. (2007). Validity of high-school grades in predicting student success beyond the freshman year: High-School Record vs. Standardized Tests as Indicators of Four-year College Outcomes

Gonnela, J., Erdmann, J. & Hojat, M. (2004). An empirical study of predictive validity of number grades in medical school using 3 decades of longitudinal data: Implications for a grading system, Medical Education, 38(4), 425 – 434.

Gulliksen, H. (1950).Theory of mental tests. New York: John Wiley and Sons

Hezlett, S. A., Kuncel, N., Vey, M. A., Ahart, A. M., Ones, D. S., Campbell, J. P., & Camara, W.J. (2001, April). The effectiveness of the SAT in predicting success early and late in college: A comprehensive meta-analysis. Paper presented at the annual meeting of the National Council on Measurement in Education, Seattle, WA.

Higher Education Funding Council for England (HEFCE) (2003) Schooling effects on higher education achievement (HEFCE).

Hu, N. B. (2002). Measuring the Weight of High school GPA and SAT Scores with Second term GPA to Determine Admission/ Financial Aid. Paper Presented at the Annual Meeting of the Association for Institutional Research. 42nd, Toronto, Ontario, Canada.

Johnson, J. W., Carter, G. W., Davison, H. K., & Oliver, D. H. (2001). A synthetic validity approach to testing differential prediction hypotheses. Journal of Applied Psychology, 86, 774-780.

Kim, M. M. (2002). Historically Black vs. White institutions: Academic development among Black students. Review of Higher Education, 25(4), 385-407

Klugh, H. E., & Bierly, R. (1959). The School and College Ability Test and High School Grades as Predictors of College Achievement. Educational and Psychological Measurement, 4, 625-626.

Kuncel, N. R., Credé, M., & Thomas, L. L. (2007). A comprehensive meta-analysis of the predictive validity of the Graduate Management Admission Test (GMAT) and undergraduate grade point average (UGPA). Academy of Management Learning and Education, 6, 51-68.

Kuncel, N. R., Credé, M., Thomas, L. L., Seiler, S. N., Klieger, D. M., & Woo, S. E. (2005).A meta-analysis of the Pharmacy College Admission Test (PCAT) and grade predictors of pharmacy student success. American Journal of Pharmaceutical Education, 69, 339-347.

Lubienski, S. T., & Lubienski, C. (2005). A New Look at Public and Private Schools: Student Background and Mathematics Achievement. Phi Delta Kappan, 86 (9) 696-699.

Linn, R. L. (1994). Fair test use: Research and policy. In M. G. Rumsey, C. B. Walker, & J. H. Harris (Eds.), Personnel Selection and Classification, 363–375. Hillsdale, NJ: Lawrence Erlbaum.

Linn, R. L. (1978). Single-group validity, differential validity, and differential prediction. Journal of Applied Psychology, 63, 507–512

Lohfink, M. M. & Paulsen, M. B. (2005). Comparing the determinants of persistence for first-generation and continuing-generation students. Journal of College Student Development, 46(4), 409-428.

Mathiasen, R. E. (1984). Predicting college academic achievement: a research review. College Student Journal, 18, 380-386.

McAlpine, M.(2002).Principles of Assessments. Robert Clark centre for technological education, university of Glasgow

Morgan, R. (1989). Analysis of the Predictive Validity of the SAT and High School Grades from 1976 to 1985. College Board Research Report No. 89-7. New York: The College Board.

Mouw, J. T., & Khanna R. K. (1993). Prediction of academic success: A review of the literature and some recommendations. College Student Journal 27(4 or 3), 328-336.

Neal, Derek. 1997. "The Effect of Catholic Secondary Schooling on Educational Attainment."Journal of Labour Economics 15 (1): 98–123

Neil J. Salkind & Kristin Rasmusse (2007).Encyclopaedia of Measurement and Statistics. Pub. Date:DOI: http://dx.doi.org/10.4135/978141295264

Osburn, H. G. (2000). Coefficient alpha and related internal consistency reliability coefficients. Psychological Methods, 5(3), 343-355

Pascarella, E. T., & Terenzini, P. T. (1991). How College Affects Students: Findings and Insights from Twenty Years of Research. San Francisco: Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. Journal of Higher Education, 51(1), 60-75.

Pike, G. R., & Saupe, J. L. (2002). Does high school matter? An analysis of three methods of predicting first-year grades. Research in Higher Education, 43(2), 187-207.

Peterson, C. H., Casillas, A., & Robbins, S. B. (2006). The student readiness inventory and the big five: Examining social desirability and college academic performance. Personality and Individual Differences, 41, 663-673.

Ramist, L. (1984). Predictive validity of ATP tests. In T.F. Donlon (Ed.), College Board technical handbook for the Scholastic Aptitude and Achievement Tests, 141-170. New York: College Entrance Examination Board.

Ramist, L., Lewis, C., & McCamley-Jenkins, L. (1994).Student group differences in predicting college grades: Sex, language, and ethnic groups (College Board Research Report No.93-1). New York: The College Board.

Robbins, S., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychological and study skill factors predict college outcome? A meta-analysis. Psychological Bulletin, 130, 261–288.

Rothstein, J. (2004). College performance predictions and the SAT, Journal of Econometrics, 121, 297-317.

Schwartz, R, & Washington, C. (2002). Predicting academic performance and retention among African American Freshmen. NASPA Journal, 39(4), 354-370

Smith, J. & Naylor, R. (2001) Determinants of degree performance in UK universities: statistical analysis of the 1993 student cohort, Oxford Bulletin of Economics & Statistics, 63, 29–60

Snyder, V., Hackett, R. K., Stewart, M. & Smith, D. (2003). Predicting academic performance and retention of private university freshmen in need of developmental education. Research & Teaching in Developmental Education, 19(2), 17-28.

Tinto, V. (1975) Dropout from Higher Education: A Theoretical Synthesis of Recent Research. Review of Educational Research, 45(1), 89-125.

Ting, S. (1998). Predicting first-year grades and academic progress of first-generation and low-income families. Journal of College Admission, 158, 14-23

University Capacity Building Program. (2008). University Capacity Building Program and Student Enrolment in Higher Education. Retrieved on 01/24/14. www.ucbp-ethiopia.com.

Wilson, K. M. (1983). A review of research on the prediction of academic performance after the freshman year (College Board Rep. No. 83-2). New York: College Entrance Examination Board.

Willingham, W. W. (1985). Success in college: The role of personal qualities and academic ability. New York: College Entrance Examination Board.

World Bank. (2008). Education at a Glance: Ethiopia. Washington, DC: World Bank.

Winter. J. C. F. De, & Dodou. D. (2011). Predicting Academic Performance in Engineering Using High School Exam Scores. International Journal of Engineering Education. 27(6), 1343–1351.

Young, J. W. (2001). Differential validity, differential prediction, and college admission testing: A comprehensive review and analysis (College Board Rep. No. 01-6).New York: College Entrance Examination Board.

Young, J. W. (1991). Improving the prediction of college performance of ethnic minorities using IRT-based GPA. Applied Measurement in Education, 4, 229-239.

Yizengaw, T. (2007). "Implementation of Cost Sharing in the Ethiopian Higher Education Landscape: Critical Assessment and the Way Forward." Higher Education Quarterly 61(2): 171-196.

Zewdu Desta (2001). The Emerging Private Higher Education Institutions of Addis Ababa, Addis Ababa University (Unpublished Master's Thesis)

Zheng, J. L., Saunders, K. P., Shelley II, M. C., & Whalen, D. F. (2002). Predictors of academic success for freshmen residence hall students. Journal of College Student Development, 43(2), 267-283.

Zwick, R., & Sklar, J. C. (2005). Predicting college grades and degree completion using high school grades and SAT scores: The role of student ethnicity and first language. American Educational Research Journal, 42, 439-464.