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REVISITING THE DETERMINANTS OF STUDENT PERFORMANCE IN AN UNDERGRADUATE ACCOUNTANCY DEGREE PROGRAMME IN SINGAPORE

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ABSTRACT

The current study investigates the association of prior academic achievement, admission interview, critical thinking, mathematical aptitude and gender with successful academic performance in an undergraduate accountancy degree programme at a Singapore university. The purpose of revisiting the determinants of academic performance in the Singapore context is twofold. First, university accounting education in Singapore has changed greatly since Koh and Koh's earlier study (1999); the current study examines if determinants previously identified as significant continue to be so in the new setting. Second, the study tests the usefulness of admission interview in identifying applicants who achieve subsequent academic success. Data on students' performance throughout the whole accountancy degree programme are obtained from the university students' records database. The current study shows that prior academic performance, mathematical aptitude and gender continue to be significantly associated with successful academic performance in the new style of accountancy degree programme; admission interview and critical thinking are also significant determinants of subsequent academic success. The results imply that university administrators may efficiently shortlist applicants based on prior academic performance, but should employ wider selection criteria including interviews and measures of critical thinking ability.

Key words: Determinants of academic performance; admission interview; accountancy degree programme

Data availability: Contact the first author for information about the data.

INTRODUCTION

Examining the variables that affect the academic performance of accounting students in undergraduate accountancy degree programmes has attracted significant research interest for almost thirty years. Much of the work has focused on programmes in the US (Bergin, 1983; Buckless et al., 1991; Clark and Sweeney, 1985; Doran et al., 1991; Krausz et al., 1999) and the UK (Bartlett et al., 1993; Gammie et al., 2003; Gracia and Jenkins, 2002, 2003) although studies have also been done in Australia (Cooper, 2004; Hartnett et al., 2004; Rohde and Kavanagh, 1996), Hong Kong (Gul and Fong, 1993), Ireland (Byrne and Flood, 2008), Malaysia (Ayob and Selamat, 2011; Tho, 1994), New Zealand (Keef and Roush, 1997) and Singapore (Koh and Koh, 1999).

The motivation underlying this whole area of research has been to identify factors associated with successful academic performance, whether in entry-level accounting modules or over a whole accountancy degree programme. Given the limited places available in university-level accountancy degree programmes, understanding the relevant variables that influence the achievement of accounting students may significantly impact university admission policies to reduce the likelihood of admitting unsuitable students.

The purpose of revisiting the determinants of academic performance in the Singapore context is twofold. First, university-level accountancy degree programmes in Singapore are now very different from the programme studied in Koh and Koh's earlier study (1999), in terms of content, delivery and assessment (as described in more detail in the section immediately following). The current study examines if determinants previously identified as significant continue to be so in the new setting. Koh and Koh (1999) investigated six independent variables (prior academic achievement, prior accounting knowledge, mathematical aptitude, gender, national service and age). The current study shows that prior academic achievement, mathematical aptitude and gender remain significantly associated with academic performance. Prior accounting knowledge was excluded from the current study as the Singapore Ministry of Education has dropped the accounting subject from the pre-university admission examinations. National service and age were not included in the current study because of the high correlation with gender. In each cohort of students, almost all male students are older than the female students because male students who are Singapore citizens are required to fulfil two to two and a half years of military national service requirements with the Singapore Ministry of Defence.

Second, the current study tests the usefulness of the admission interview in identifying applicants who achieve subsequent academic success. Several studies have highlighted the association between admission tests and students' subsequent academic performance. Zwick (2007) suggests that admission tests are more useful in predicting subsequent academic success than relying on prior grades alone. West and Gibbs (2004) suggest several ways of assessing students' potential that include interviews together with student portfolios, essays, grades and class ranks. Burton and Ramist (2001) contend that admission policies that include a combination of such measures admit better quality students with more successful subsequent academic performance. Despite the recognition of the importance of more varied admission tests, our literature review suggests a lack of empirical evidence on the association between admission interviews and subsequent academic performance in an undergraduate accountancy degree programme.

Context of the Current Study

A Different Style of University and Accountancy Degree Programme

Over the period of the previous studies, changes in the business world, the accountancy profession and the body of accounting knowledge have been accompanied by changes in the scope and style of university accounting education. The current study was motivated by the desire to ascertain, as suggested by Byrne and Flood (2008), if the results of previous studies, undertaken in different countries, at different time periods, with different education systems, continue to hold true.

From the late 1970s to 2000, Nanyang Technological University ("NTU") and the National University of Singapore ("NUS") were the only two universities in Singapore, and NTU provided the country's only accountancy degree programme. The Koh and Koh (1999) study was based on data pertaining to students who graduated from NTU in 1990. At that time, the NTU accountancy degree programme comprised 24 courses taught over three years through a combination of lectures

(for groups of about 200-300 students) and tutorials (for groups of 25 students). Performance on each course was assessed solely through a three-hour final examination.

Singapore Management University (“SMU”) opened its doors in 2000 as an autonomous university focusing on business and management studies. Although it received funding from the Singapore government just as NUS and NTU did, it was given a much greater degree of freedom in offering programmes and designing courses. SMU was established specifically “to be an experiment in diversity” (SMU, 2006). Its mission was to provide a different university experience and education, with the goal of producing a different type of graduate – defined as creative, versatile and articulate team-players and leaders, with the ability to contribute effectively to the knowledge-based global economy.

SMU signed a Memorandum of Understanding with the University of Pennsylvania’s Wharton Business School (“Wharton”) in 1999, and its initial programmes in Business Management and Accountancy borrowed heavily from the tested Wharton model. This affiliation was an experiment to implement the US style of broad-based but focused education, compared to NUS and NTU which both employed more UK-based models of university education.

More specifically, SMU accounting students are required to read a total of 36 courses over four years, including a core curriculum of 17 courses in addition to their traditional accounting courses. The core curriculum comprises a university core (including courses such as Analytical Skills and Creative Thinking; Business, Government and Society; Ethics and Social Responsibility; and Leadership and Team Building), general electives in the Arts and Sciences, global and regional studies, technology and entrepreneurship electives, and career skills electives. Besides course work, all SMU students must complete a minimum of 12 weeks of internship, consisting of 10 weeks with a business or professional organization and two weeks of community work, in order to graduate. All courses are taught over a 16-week term, seminar-style, in sections ranging from 30 to 45 students each. In any term, multiple sections of a course may be taught by different faculty, who are encouraged to adopt an interactive pedagogy that typically includes class and small group discussion, presentations, role-playing and out-of-class learning. Performance on each course is assessed through different continuing assessments such as quizzes, presentations, project reports, class participation and final examinations. The NTU accountancy degree programme studied in Koh and Koh (1999) is delivered based on a lecture-style where students attended the same lecture for each course.

In summary, the SMU accountancy degree programme and pedagogical environment covered by the current study are different from the NTU accountancy degree programme studied in Koh and Koh (1999). The SMU accountancy degree programme was based on the US model, conducted in seminar-style over four years (36 courses) and required students to complete two weeks of community work. In contrast, the NTU accountancy degree programme was based on the UK model, conducted in lecture-style over three years (24 courses) and did not require students to complete any community work.

A Different Set of Entry-Point Variables

Besides the curriculum changes, SMU was also deliberately different in its approach to selecting its students. In 2001, when SMU recruited its first batch of accounting students, both NUS and NTU relied solely on grades obtained by applicants in the national General Certificate of Education (“GCE”) Advanced Level examinations (“A” level) to offer places on its programmes. The “A” level examination is an internationally recognized national examination conducted jointly by the Singapore Ministry of Education and the University of Cambridge (UK). It is the culmination of a two-year pre-university education programme. Students are admitted to the “A” level programme based on their results in the lower Ordinary “O” level examinations. Students sit for the “O” level examinations after completing six years in the primary school system and four years in the secondary school system.

In contrast, SMU Office of Undergraduate Admissions (“OUA”) went beyond “A” level examination performance to consider applicants’ achievements in other areas such as sports, community service and the arts. Each applicant shortlisted by OUA was then interviewed by either two faculty members of SMU School of Accountancy (“SOA”) or a faculty member and a senior student from the School. The shortlisting and interview processes were (and continue to be) very time-consuming. However, the literature suggests that interviews are useful as part of a more diversified approach to student selection, compared to relying on prior grades alone (Sundin and Ogren, 2006). Greater diversity in selection criteria has also been shown to enable better identification of applicants who subsequently perform successfully (Zwick, 2007). Thus the results of the current study provide empirical evidence on how useful interviews are in identifying students who perform successfully in an undergraduate accountancy degree programme.

The remainder of the current paper is organized as follows. The next section reviews relevant literature and develops the hypotheses. The subsequent sections describe the research method and present the results. The final section discusses the implications of the results, the limitations of the current study, and opportunities for future research.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This section summarizes the main findings of the previous research on determinants of accounting students’ academic performance and develops the hypotheses for the current study.

Prior Academic Achievement

Several studies provide evidence that accounting students’ prior academic achievements are positively related to their future performance (Gist et al., 1996; Koh and Koh, 1999). The rationale is that past performance serves as a proxy for a student’s commitment level, diligence and intelligence (Guney, 2009). Gammie et al. (2003) suggest that previous academic performance is a significant indicator of university performance. Similarly, the National Audit Office in the UK (2002) identifies prior academic achievement as an important predictor of performance at university. Duff (2004) also suggests prior academic achievement remains the best predictor of academic

performance. Some studies even suggest that prior academic achievement is the most significant determinant of performance throughout the three years of accounting students' degree studies (Byrne and Flood, 2008; Koh and Koh, 1999).

Although the SMU accountancy degree programme differs considerably from the style of programme studied by Koh and Koh (1999), the consistency of reported results suggests that prior academic achievement is expected to have a positive association with academic performance.

H1: Prior academic achievement is positively associated with academic performance.

Admission Interview

Most of the prior studies that have examined the relationship between admission interviews and subsequent performance have been in the medical and psychology disciplines because of the prevalence of interviews in the admission process for these areas of study. The results to date provide conflicting evidence. Blackman and Darmawan (2004) examined graduate-entry medical students' academic performance and concluded that interview scores that were used in the selection process were not related to the academic performance outcomes. Similarly in another study conducted on the Brown University medical programme, Smith (1991) indicated that selection interview performance had little relation with how students performed academically. Vargo et al. (1986) also indicated that admission interview rating was a less powerful predictor of academic performance than other admission criteria in the case of a US occupational therapy programme.

While such studies questioned the association between performance on admission interviews and subsequent academic performance, others supported using admission interviews in conjunction with other admission criteria (Zimdars, 2010). For instance, Sundin and Ogren (2006) maintained that a well-structured interview is a valuable complement to the traditional admission procedures. They even argued that admission interviews have a better prognostic value in terms of academic performance than an admission procedure that involves mainly high school grades.

Admission interviews are rarely administered for undergraduate accountancy degree programmes, hence the dearth of research on this variable within the accounting domain. A recent study on admission to a professional accounting programme in Canada highlighted that, besides technical competence, skills needed by public accountants in the workplace included cultural adaptation and communication (Morrill, 2012). Communication skills have been identified as one of the core competencies of a public accountant (AICPA, n.d.). It may be argued that performance on admission interviews reflects the individual's ability, at short notice, to communicate with others on a variety of subject matter. This may also serve as an indicator of a student's attitude and ability to participate actively and engage, which have been associated with better academic performance in the second and final year modules of an accountancy degree programme (Gracia and Jenkins, 2002). The mixed findings in the extant literature suggest the following hypothesis.

H2: Admission interview performance is not significantly associated with academic performance.

Critical Thinking

Prior studies show that critical thinking skills significantly impact students' academic performance (Bethune and Jackling, 1997; Jenkins, 1998; Springer and Borthick, 2007). Jenkins (1998) indicated that students with higher measures of critical thinking skills performed better in the examination of an auditing course. Springer and Borthick (2007) indicated that critical thinking skills are significantly and positively associated with higher examination scores in a junior financial accounting course. The reported results suggest that critical thinking is expected to have a positive association with academic performance.

H3: Critical thinking is positively associated with academic performance.

Mathematical Aptitude

Typically, accountancy degree programmes require quantitative and numerical skills as accounting methods and techniques involve calculations. However, prior studies have reported mixed results. Gul and Fong (1993) and Guney (2009) found that accounting students with strong mathematical aptitude performed significantly better on various undergraduate accounting modules. Koh and Koh (1999) reported the same finding for performance over a whole accountancy degree programme.

However, Bartlett et al (1993) and Gist et al (1996) did not find any association between mathematical aptitude and academic performance in an accountancy degree programme and in an introductory accounting module respectively. This may be because of the qualitative issues involved in applying accounting knowledge, as described above in the discussion on critical thinking skills. The mixed findings in the extant literature coupled with the different style of accountancy degree programme at SMU suggest the following hypothesis.

H4: Mathematical aptitude is not significantly associated with academic performance.

Gender

Previous studies that examined the relationship between gender and academic performance of accounting students report contradictory findings. Mutchler et al. (1987) found that female students outperformed the male students. They attributed this result to the higher motivation of female students who formed the minority of the students' population in that study. Tyson (1989) suggested that female students performed better due to their intrinsic desire to perform their tasks well. Gracia and Jenkins (2003) reported better performance by female students on the second year of a three-year undergraduate degree programme. On the other hand, Doran et al. (1991) reported better performance by male students in introductory accounting courses, but not in advanced

accounting courses. Koh and Koh (1999) found that the male students in their study outperformed the female students in the first and second year examinations over the three years of the university degree programme, but not in the third year. Duff (2004) found that the male students adopted a deep learning approach and performed better in the first year than the female students.

Many studies on gender have found no difference in performance. Gammie et al. (2003) found that gender is not a differentiating factor in respect of final year accounting undergraduate performance. Lipe (1989) reported that students' performance were not statistically associated with their gender. Keef and Roush (1997) examined students enrolled in a second-level management accounting course in New Zealand and did not find any evidence of gender differences in examination performance. Recent studies in the UK also show that gender is not significantly associated with academic performance (Byrne and Flood, 2008; Duff, 2004; Paver and Gammie, 2005).

Given the different results of various studies over different periods of time, in different countries, it is likely that gender in itself is not associated with academic performance. However, gender may be related to other factors such as motivation, engagement and learning approach. As with mathematical aptitude discussed above, the mixed findings in the extant literature and the new style of SMU accountancy degree programme suggest the following hypothesis.

H5: Gender is not significantly associated with academic performance.

RESEARCH METHOD

Sample and Data Collection

Table 1 presents the sample selection. As described above, SMU admitted the first batch of students into its Bachelor of Accountancy ("BAcc") degree programme in 2001. SMU's database of student records provided an initial sample of 2,609 student records spanning the period from 2001 to 2010. The current study was conducted on data from all students who had graduated from the BAcc degree programme at the time of the study.

There are several admission pathways to the BAcc degree programme. During the period from 2001 to 2010, the majority of students (84 percent) were admitted based on their results obtained in the "A" level. Nine percent were admitted based on their respective Polytechnics' diploma qualifications (there are five Polytechnic institutions in Singapore and each offers its own independent diploma programme). One percent of students were admitted based on International Baccalaureate diploma qualifications, and the remaining six percent were admitted based on other international qualifications. These three groups (totaling 411 students) which were admitted based on different admission requirements were excluded from the study sample. Only the "A" level group (2,198 students) was included.

The dependent variable in the current study is the students' academic performance over the whole BAcc degree programme in SOA. Thus, of the 2,198 students in the "A" level group, 1,137 students who had not yet graduated and were still active in the BAcc programme at the time of the

TABLE 1**Sample Selection**

| | |
|---|-------------------|
| Initial sample of students enrolled in the Bachelor of Accountancy (BAcc) programme at SMU School of Accountancy from 2001 to 2010 ^a | 2,609 |
| Less: Students who were admitted based on local Polytechnics' diploma qualifications | 226 |
| Less: Students who were admitted based on International Baccalaureate diploma qualifications | 18 |
| Less: Students who were admitted based on other international qualifications | <u>167</u> |
| Students who were admitted based on General Certificate of Education ("GCE") Advanced Level examinations | 2,198 |
| Less: Students who had yet to graduate from the BAcc programme at the time of the current study | 1,137 |
| Less: Students who were dismissed from the BAcc programme | 4 |
| Less: Students who withdrew from the BAcc programme | 188 |
| Less: Students with incomplete data | <u>46</u> |
| Final sample of students who graduated from the BAcc programme | <u><u>823</u></u> |

^aThe data were obtained from the University's database of student records.

current study were excluded. Also excluded were four students who were dismissed from the BAcc degree programme, 188 students who withdrew from the BAcc degree programme of their own accord and 46 students with incomplete data. This resulted in a final sample of 823 students.

Variables Definition and Measurement

Dependent Variable

The dependent variable in the current study is the students' academic performance over the whole SOA BAcc degree programme. Following completion of the BAcc degree programme, students are awarded a final cumulative grade point average ("GPA") score. The GPA is the quotient of total grade points divided by total courses attempted. Students typically complete 36 courses, although students given exemptions from some core courses may do less, while students who offer a second major or second degree will do more. The grade for each course is converted to a grade point. The grade notations are A+ (4.3), A (4), A- (3.7), B+ (3.3), B (3.0), B- (2.7), C+ (2.3), C (2.0), C- (1.7), D+ (1.3), D (1) and F (0).

Independent Variables

In the current study, the independent variables are prior academic achievement, admission interview, critical thinking, mathematical aptitude and gender. As explained above, the final sample

comprised 823 “A” level students. These students typically sat for three or four “A” level subjects and the General Paper (“GP”) subject. The university admission scores of these “A” level students include the results of their best three “A” level subjects and the GP subject. Prior academic achievement was measured by the results of the students’ two best non-Mathematics “A” level subjects, in order to isolate the effect of mathematical aptitude which will be discussed later. For example, if a student took the three subjects Physics, Chemistry and Mathematics, the prior academic achievement variable captured only the results of Physics and Chemistry. The “A” level subject grades of A to F were converted based on the SMU’s admission point system of A (12) to F (0). The maximum possible score for prior academic achievement was thus 24 (12 x 2 “A” level subjects).

The admission interview variable is measured by the students’ admission interview scores. All shortlisted applicants were required to attend an individual admission interview. Each admission interview was conducted either by two SOA faculty members or a faculty member and a senior student. The senior students selected as interviewers were student leaders who were all-rounded in their academic results and co-curricular activities. Student interviewers and new faculty members were required to attend an admission interview briefing session, during which they were specifically instructed to evaluate four qualities of the shortlisted applicants during the admission interview: (1) knowledge and passion in matters of interest to the candidate; (2) analytical reasoning; (3) attitude and emotional quotient and (4) ability to communicate.

Interviewers conducted typically six to eight admission interviews in a continuous session. The duration of each interview lasted typically between 20 to 30 minutes. Although interviewers were instructed to evaluate four specific qualities, they did not award individual scores for each quality. Each interviewer completed a separate admission interview assessment report for each student, awarding an overall score from 0 to 20, based on four ratings: (1) I strongly recommend the candidate (a score of 17 to 20); (2) I recommend the candidate (a score of 13 to 16); (3) I have reservations about the candidate (a score of 10 to 12) and (4) I do not recommend the candidate (a score below 10). In addition, interviewers were required to provide reasons to support their recommendation, reservations or rejection. The student’s admission interview score is the average of the scores awarded by the two interviewers.

Critical thinking is measured by the students’ results for the GP subject in the “A” level examinations. This subject aims to enable students to develop language proficiency and skills such as critical reading, clear and effective written communication, and the ability to evaluate information, arguments and opinions across a wide range of issues including politics, education, the media and the environment (SEAB, n.d.). The GP syllabus issued by the Singapore Examinations and Assessment Board states that candidates will be expected to demonstrate the ability “to acquire knowledge and understanding of diverse topic areas through extensive reading and independent study, analyse and evaluate issues across disciplines, express understanding as well as critical and creative thinking through informed personal responses and formulate cogent arguments.” (SEAB, n.d.). Candidates are tested on two papers. For the first essay paper, candidates will choose one out

of 12 diverse topics to “express an informed, critical, creative and relevant response to issues relating to the topic area” (SEAB, n.d.). The second paper is a comprehension paper “requiring candidates to demonstrate their ability to comprehend, explain, infer, evaluate and summarise.” (SEAB, n.d.) The grading system for the GP subject is different from the other “A” level subjects as it is an Advanced Ordinary level subject. Students were awarded grades from A1 to F9 for GP instead of A to F for the other “A” level subjects. The subject grades for GP were converted based on SMU’s admission point system of A1 (7) to F9 (0).

Mathematical aptitude is measured by students’ results for the Mathematics subject in the “A” level examination. Students were awarded grades from A to F for the Mathematics subject, which were converted based on SMU’s admission point system of A (12) to F (0).

The gender variable was coded as “1” for male students and “0” for female students.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of the dependent and independent variables. Table 3 reports the Spearman’s rho correlations¹ between the variables.

Tests of Hypotheses

Ordinary least squares multiple regression analysis was used to investigate the association of the five independent variables (prior academic achievement, admission interview, critical thinking, mathematical aptitude and gender) with successful academic performance over the whole undergraduate accountancy degree programme. Table 4 shows that the regression model is significant (F-value = 64.998, p-value < 0.001), indicating a good fit. The R^2 for the regression model is 0.285. Koh and Koh (1999) considered R^2 of 0.2 as adequate for evaluating the determinants of students’ performance. The model R^2 for Koh and Koh’s earlier study (1999) were 0.2415 (year 1 performance); 0.2132 (year 2 performance) and 0.2146 (year 3 performance). The model in the current study also exhibits low risk of potential multicollinearity problems as all the independent variables have variance inflation factors (VIF) below 10 (Myers, 1990).

H1: Prior Academic Achievement

Table 4 shows that prior academic achievement is highly significantly and positively associated with academic performance (p-value < 0.001), supporting Hypothesis 1. Despite SMU’s different style of accountancy degree programme, the results corroborate the findings of prior studies, that students with better prior academic achievement were observed to perform better over a whole degree programme (Al-Mutairi, 2011; Bartlett et al., 1993; Koh and Koh, 1999). Prior academic achievement also has the highest standardized beta, indicating that it is the most important determinant of academic performance in the current study.

¹ The Spearman’s rho is a non-parametric measure of correlation.

TABLE 2**Descriptive Statistics**

| Variables ^a | Mean | Std. Dev | Min. | Median | Max. |
|--|-------|----------|------|--------|------|
| <i>Panel A: Final sample of students who graduated from the BAcc programme (N = 823, 100%)</i> | | | | | |
| Academic performance ^b | 3.38 | 0.39 | 2.16 | 3.42 | 4.18 |
| Prior academic achievement ^c | 20.09 | 3.88 | 6 | 21 | 24 |
| Admission interview ^d | 15.33 | 2.62 | 5 | 15.75 | 20 |
| Critical thinking ^e | 4.25 | 1.50 | 0 | 5 | 7 |
| Mathematical aptitude ^f | 11.24 | 1.60 | 2 | 12 | 12 |
| <i>Panel B: Female students in the final sample (N = 514, 62.5%)</i> | | | | | |
| Academic performance ^b | 3.33 | 0.39 | 2.16 | 3.34 | 4.17 |
| Prior academic achievement ^c | 20.47 | 3.61 | 10 | 21 | 24 |
| Admission interview ^d | 15.61 | 2.62 | 7 | 16 | 20 |
| Critical thinking ^e | 4.33 | 1.49 | 0 | 5 | 7 |
| Mathematical aptitude ^f | 11.32 | 1.49 | 2 | 12 | 12 |
| <i>Panel C: Male students in the final sample (N = 309, 37.5%)</i> | | | | | |
| Academic performance ^b | 3.46 | 0.37 | 2.20 | 3.50 | 4.18 |
| Prior academic achievement ^c | 19.47 | 4.23 | 6 | 21 | 24 |
| Admission interview ^d | 14.88 | 2.56 | 5 | 15 | 20 |
| Critical thinking ^e | 4.13 | 1.50 | 0 | 5 | 7 |
| Mathematical aptitude ^f | 11.09 | 1.76 | 2 | 12 | 12 |

^a Higher variable values represent better academic performance, prior academic achievement, admission interview, critical thinking, and mathematical aptitude.

^b Academic performance is measured by students' final cumulative grade point average (GPA) score on graduation. The maximum possible score is 4.30.

^c Prior academic achievement is measured by students' results for the two best non-mathematics subject of the General Certificate of Education ("GCE") Advanced level examinations ("A" level). The maximum possible score is 24.

^d Admission interview is measured by the average admission interview score. The maximum possible score is 20.

^e Critical thinking is measured by students' result for the General Paper subject in the "A" level examinations. The grades A1 to F9 were converted based on the University's admission point system of A1 (7) to F9 (0).

^f Mathematical aptitude is measured by students' result for the Mathematical subject in the "A" level examinations. The grades A to F were converted based on the University's admission point system of A (12) to F (0).

TABLE 3**Spearman's rho correlations between variables (n = 823)**

| | Academic Performance ^a | Prior Academic Achievement ^b | Admission Interview ^c | Critical Thinking ^d | Mathematical Aptitude ^e | Gender ^f |
|--|--------------------------------------|--|-------------------------------------|-----------------------------------|---------------------------------------|---------------------|
| Academic Performance ^a | 1 | .467 (**) 0.000 | .266 (**) 0.000 | .242 (**) 0.000 | .226 (**) 0.000 | .174 (**) 0.000 |
| Prior Academic Achievement ^b | | 1 | .340 (**) 0.000 | .301 (**) 0.000 | .262 (**) 0.000 | -.108 (**) 0.000 |
| Admission Interview ^c | | | 1 | .305 (**) 0.000 | .072 (*) 0.038 | -.149 (**) 0.000 |
| Critical Thinking ^d | | | | 1 | .051 0.144 | -.070 (*) 0.046 |
| Mathematical Aptitude ^e | | | | | 1 | -.064 0.067 |
| Gender ^f | | | | | | 1 |

** Correlation is significant at the 0.01 level (2-tailed).

* Correlations significant at the 0.05 level (2-tailed).

^a Academic performance is measured by students' final cumulative grade point average (GPA) score on graduation.

^b Prior academic achievement is measured by students' results for the two best non-mathematics subjects of the General Certificate of Education ("GCE") Advanced Level examinations ("A" level).

^c Admission interview is measured by the average admission interview scores.

^d Critical thinking is measured by students' result for the General Paper subject in the "A" level examinations.

^e Mathematical aptitude is measured by students' result for the Mathematics subject in the "A" level examinations.

^f Gender is coded as "1" for male students and "0" for female students.

TABLE 4
Regression Analysis Results^a

| | Unstd. <u>Coefficient</u> | <u>Std. Beta</u> | <u>t-Statistic</u> | <u>p-Value</u> | <u>VIF</u> |
|--|------------------------------|------------------|--------------------|----------------|------------|
| Constant | 1.803 | | 16.638 | 0.000 | |
| H1: Prior academic achievement ^b | 0.036 | 0.360 | 10.870 | 0.000 | 1.251 |
| H2: Admission interview ^c | 0.019 | 0.131 | 4.021 | 0.000 | 1.215 |
| H3: Critical thinking ^d | 0.026 | 0.101 | 3.132 | 0.002 | 1.182 |
| H4: Mathematical aptitude ^e | 0.033 | 0.135 | 4.448 | 0.000 | 1.058 |
| H5: Gender ^f | 0.199 | 0.249 | 8.301 | 0.000 | 1.028 |
| $R^2 = 0.285$; Adjusted $R^2 = 0.280$; F-value = 64.998; p-value = 0.000 | | | | | |

^a The dependent variable is students' academic performance over the whole Bachelor of Accountancy (BAcc) degree programme. It is measured by students' final cumulative grade point average (GPA) score on graduation.

^b Prior academic achievement is measured by students' results for the two best non-mathematics subjects of the General Certificate of Education ("GCE") Advanced Level examinations ("A" level).

^c Admission interview is measured by the average admission interview score.

^d Critical thinking is measured by students' result for the General Paper subject in the "A" level examinations.

^e Mathematical aptitude is measured by students' result for the General Paper subject in the "A" level examinations.

^f Gender is coded as "1" for male students and "0" for female students.

For university administrators, this result underscores the importance of attracting students who have performed well in school-leaving examinations. It also appears to justify the use of prior academic achievement as an efficient and effective method to shortlist applicants. For students seeking admission to an accountancy degree programme, the results suggest that those with lower prior academic achievement must be prepared to work harder, accept a lower academic outcome in the degree programme, or seek a place in a less demanding programme.

H2: Admission Interview

Table 4 shows that admission interview performance is highly significantly and positively associated with better academic performance (p-value<0.001), thus rejecting Hypothesis 2. The literature review suggests a lack of empirical evidence on the association of admission interviews with subsequent academic performance in an undergraduate accountancy degree programme. This finding extends the literature.

At SMU, SOA has made admission interviews compulsory for all shortlisted applicants since the inception of the BAcc degree programme. The results provide support for SOA to continue to do so, despite the heavy resources involved in conducting such interviews. The results also suggest that admission interviews are most useful in circumstances where university administrators face difficulty in identifying students with higher potential for academic performance, for example when many applicants have the same scores for prior academic achievement.

H3: Critical Thinking

Table 4 shows that critical thinking is highly significantly and positively associated with academic performance (p -value = 0.002), supporting Hypothesis 3. This supports the findings of prior studies on the increasing importance for accounting students to engage in critical thinking as opposed to merely mastering technical material (Bethune and Jackling, 1997; Jenkins, 1998; Springer and Borthick, 2007).

The findings suggest that university administrators should explicitly incorporate some measure of critical thinking ability into their student selection process. Admitted students who did not meet a minimum grade of B3 for the GP subject area are required to take the academic writing course during the first year of the BAcc degree programme to develop such critical thinking skills. The academic writing course aims to equip students to critically analyse and interpret texts, acquire skills for intellectual debate through reading extended texts and synthesize logically similar and opposing views from a variety of texts.

H4: Mathematical Aptitude

Hypothesis 4 is rejected as Table 4 shows that mathematical aptitude is highly significantly and positively associated with academic performance (p -value < 0.001). As with prior academic achievement, despite SMU's different style of accountancy degree programme, the results corroborate the findings of prior studies which show that students with a stronger mathematical aptitude performed better in various accounting modules (Gul and Fong, 1993; Guney, 2009) and in the first and second years of a three-year accountancy degree programme (Koh and Koh, 1999).

The results suggest that the need for mathematical aptitude has grown over time, given the development and increasing sophistication of financial models and accounting practices, and therefore of accountancy education. Students applying for places in an accountancy degree programme should be alerted that they need strong quantitative and numeracy skills to achieve better academic performance.

H5: Gender

Hypothesis 5 is rejected as Table 4 shows that male students outperformed female students (p -value < 0.001). Despite SMU's different style of accountancy degree programme, this result is consistent with that of the Koh and Koh study (1999).

The male students in the current study sample were in the minority, forming just 37.5 percent. Koh and Koh (1999) reported that the minority in their study (male students) outperformed the majority (female students). Mutchler et al. (1987) also reported that the minority in their study (female students) outperformed the majority (male students). It has been suggested that the minority gender has a greater motivation to outperform the majority.

In the current study, the impact of gender may be confounded with age. Male students who are Singapore citizens are required to fulfil two to two and a half years of military national service requirements with the Ministry of Defence, immediately after they complete high school and before they enter into university. Singaporean female students enter directly into university immediately after the completion of high school. This results in almost all male students being two to two and a half years older than the female students in the same cohort. Prior studies have argued that older students exercise more maturity, commitment and discipline (Guney, 2009) and employ more effective deep learning approaches (Duff, 2004). Age and national service were not included in the analysis because of the high correlation with gender. The Spearman's rho correlation is 0.911 between gender and age and 0.967 between gender and national service.

Additional Analyses

As the sample included students from different year cohorts, year dummy variables were included as control variables in an additional regression model. The results (not reported) are consistent with the original regression model reported in Table 4. After the inclusion of the year dummy variables, prior academic achievement, admission interview, critical thinking, mathematical aptitude and gender remain significantly associated with academic performance.

The dependent variable in the current study is students' academic performance over the whole BAcc degree programme in SOA. Three additional regression analyses were conducted by replacing the dependent variable with students' academic performance at the end of Year 1, 2 and 3, respectively. The results for Year 1, 2 and 3 are reported in Table 5 (Panel A, B and C respectively). The results of the additional regression analyses in Table 5 are consistent with the original regression model reported in Table 4.

An independent-sample t-test was conducted to compare successful and unsuccessful students in the BAcc degree programme. The final sample of 823 students was divided into two groups (above or below the median) based on their final cumulative grade point average (GPA) score on graduation (median = 3.42). The "successful" group consists of 415 students who graduated from the BAcc programme with a final cumulative grade point average (GPA) score of 3.42 and above. The "unsuccessful" group consists of the remaining 408 students who graduated from the BAcc programme with a final cumulative grade point average (GPA) score below 3.42.

Table 6 shows that there is a significant difference in admission interview scores for successful students ($M = 15.92$, $SD = 2.45$) and unsuccessful students ($M = 14.74$, $SD = 2.66$); $t = 6.59$, $p = 0.000$. Successful students also scored significantly higher in prior academic achievement ($t = 12.262$, $p = 0.000$), critical thinking ($t = 5.872$, $p = 0.000$) and mathematical aptitude ($t = 4.692$,

TABLE 5
Additional Regression Analysis Results (by Year)

| | Unstd. Coefficient | Std. Beta | t-Statistic | p-Value | VIF |
|--|-----------------------|-----------|-------------|---------|-------|
| <i>Panel A: Academic performance as at end of Year 1^a</i> | | | | | |
| Constant | 1.716 | | 15.610 | 0.000 | |
| H1: Prior academic achievement ^b | 0.039 | 0.378 | 11.674 | 0.000 | 1.251 |
| H2: Admission interview ^c | 0.021 | 0.137 | 4.297 | 0.000 | 1.215 |
| H3: Critical thinking ^d | 0.026 | 0.099 | 3.135 | 0.002 | 1.182 |
| H4: Mathematical aptitude ^e | 0.031 | 0.123 | 4.121 | 0.000 | 1.058 |
| H5: Gender ^f | 0.246 | 0.297 | 10.114 | 0.000 | 1.028 |
| $R^2 = 0.316$; Adjusted $R^2 = 0.312$; F-value = 75.424; p-value = 0.000 | | | | | |
| <i>Panel B: Academic performance as at end of Year 2^a</i> | | | | | |
| Constant | 1.736 | | 15.732 | 0.000 | |
| H1: Prior academic achievement ^b | 0.037 | 0.356 | 10.856 | 0.000 | 1.251 |
| H2: Admission interview ^c | 0.021 | 0.140 | 4.331 | 0.000 | 1.215 |
| H3: Critical thinking ^d | 0.026 | 0.098 | 3.068 | 0.002 | 1.182 |
| H4: Mathematical aptitude ^e | 0.034 | 0.136 | 4.511 | 0.000 | 1.058 |
| H5: Gender ^f | 0.229 | 0.279 | 9.372 | 0.000 | 1.028 |
| $R^2 = 0.296$; Adjusted $R^2 = 0.292$; F-value = 68.800; p-value = 0.000 | | | | | |
| <i>Panel C: Academic performance as at end of Year 3^a</i> | | | | | |
| Constant | 1.702 | | 15.385 | 0.000 | |
| H1: Prior academic achievement ^b | 0.037 | 0.358 | 10.934 | 0.000 | 1.251 |
| H2: Admission interview ^c | 0.022 | 0.143 | 4.426 | 0.000 | 1.215 |
| H3: Critical thinking ^d | 0.026 | 0.099 | 3.111 | 0.002 | 1.182 |
| H4: Mathematical aptitude ^e | 0.035 | 0.141 | 4.683 | 0.000 | 1.058 |
| H5: Gender ^f | 0.228 | 0.276 | 9.312 | 0.000 | 1.028 |
| $R^2 = 0.300$; Adjusted $R^2 = 0.296$; F-value = 70.177; p-value = 0.000 | | | | | |
| ^a The dependent variable is students' academic performance at the end of Year 1 (Panel A), 2 (Panel B) and 3 (Panel C) of the Bachelor of Accountancy (BAcc) programme, respectively. It is measured by students' cumulative grade point average (GPA) score at the end of Year 1 (Panel A), 2 (Panel B) and 3 (Panel C) of the BAcc programme, respectively. | | | | | |
| ^b Prior academic achievement is measured by students' results for the two best non-mathematics subjects of the General Certificate of Education ("GCE") Advanced Level examinations ("A" level). | | | | | |
| ^c Admission interview is measured by the average admission interview score. | | | | | |
| ^d Critical thinking is measured by students' result for the General Paper subject in the "A" level examinations. | | | | | |
| ^e Mathematical aptitude is measured by students' result for the Mathematics subject in the "A" level examinations. | | | | | |
| ^f Gender is coded as "1" for male students and "0" for female students. | | | | | |

$p = 0.000$). These results provide further evidence that prior academic achievement, admission interview, critical thinking and mathematical aptitude have a significant association with successful academic performance in the SOA BAcc degree programme.

CONCLUSION

The current study provides evidence that prior academic achievement, admission interview, critical thinking, mathematical aptitude and gender are associated with successful academic performance across a whole undergraduate accountancy degree programme at a Singapore university. The results imply that university administrators may efficiently shortlist applicants based on prior academic performance, but should employ wider selection criteria including interviews and measures of critical thinking ability.

In the current study, prior academic achievement has the most significant association with students' academic performance. This finding is consistent with all previous studies in different countries and time periods. In particular, the results of the study, when compared to Koh and Koh (1999), show that prior academic achievement is a robust indicator of subsequent academic success even in very different styles of accountancy degree programmes in Singapore, separated by over twenty years.

A key objective of the current study is to examine the usefulness of admission interview in identifying applicants who achieve subsequent academic success. The results provide evidence that admission interviews are an additional valuable method of identifying students' potential for successful performance on an undergraduate accountancy degree programme. Most prior studies on the relationship between admission interviews and subsequent performance have been in the medical and psychology disciplines, with conflicting results. The current study thus extends the literature by providing empirical evidence on the positive association of admission interviews with subsequent academic performance on an undergraduate accountancy degree programme.

The current study shows that mathematical aptitude is significantly positively associated with successful academic performance, just as did Koh and Koh's earlier study (1999), despite the mixed findings reported by studies in the intervening period. The results suggest that strong quantitative and numeracy skills may be growing more important, possibly due to the increasing number and complexity of financial models in accounting.

Critical thinking is also significantly and positively associated with students' academic performance. This may be due to the growing complexity of accounting as a discipline as well as the new style of degree programme that requires higher level thinking skills.

The current study also shows that gender is a significant factor associated with students' academic performance. In the current study, the national service requirement for Singaporean male students results in almost all male students being two to two and a half years older than the female students in the same cohort. Prior studies have argued that older students exercise more maturity, commitment and discipline (Guney, 2009) and employ more effective deep learning approaches (Duff, 2004).

TABLE 6**Comparison Between Successful and Unsuccessful Students**

| Variables ^b | Successful ^a | | Unsuccessful ^a | | t | df | Sig. (2-tailed) |
|---|-------------------------|-----------|---------------------------|-----------|--------|-----|-----------------|
| | Mean | Std. Dev. | Mean | Std. Dev. | | | |
| Prior academic achievement ^c | 21.61 | 3.40 | 18.55 | 3.74 | 12.262 | 821 | 0.000 |
| Admission interview ^d | 15.92 | 2.45 | 14.74 | 2.66 | 6.590 | 821 | 0.000 |
| Critical thinking ^e | 4.55 | 1.43 | 3.95 | 1.50 | 5.872 | 821 | 0.000 |
| Mathematical aptitude ^f | 11.49 | 1.39 | 10.98 | 1.75 | 4.692 | 821 | 0.000 |

^a The final sample of 823 students is divided into two groups (above or below the median) based on their final cumulative grade point average (GPA) score on graduation (median = 3.42). The “successful” group consists of 415 students who graduated from the BAAcc programme with a final cumulative GPA score of 3.42 and above. The “unsuccessful” group consists of the remaining 408 students who graduated from the BAAcc programme with a final cumulative GPA below 3.42.

^b Higher variable values represent better prior academic achievement, admission interview, critical thinking and mathematical aptitude.

^c Prior academic achievement is measured by students’ results for the two best non-mathematics subjects of the General Certificate of Education (“GCE”) Advanced Level examinations (“A” level). The maximum possible score is 24.

^d Admission interview is measured by the average admission interview score. The maximum possible score is 20.

^e Critical thinking is measured by students’ result for the General Paper subject in the “A” level examinations. The grades A1 to F9 were converted based on the University’s admission point system from A1 (7) to F9 (0).

^f Mathematical aptitude is measured by students’ result for the Mathematics subject in the “A” level examinations. The grades A to F were converted based on the University’s admission point system of A (12) to F (0).

In the first six student cohorts that completed the SOA BAcc degree programme between 2004 and 2009, male students formed the minority of the student body and typically outperformed female students. It has been suggested in the extant literature that the minority gender has a greater motivation to outperform the majority (Koh and Koh, 1999; Mutchler et al., 1987). The current style of accountancy degree programme in Singapore requires a much higher degree of active student learning and participation. As such, it is possible that gender and age represent different levels of motivation and different learning approaches, which in turn cause the difference in academic performance.

The results of the current study may be limited by its particular circumstances of institution, country and period. In particular, external validity may be constrained by the unique circumstances caused by the national service requirements in Singapore, making generalizations of the findings to other settings difficult. The admission interview variable in the current study is measured by the students' admission interview scores. The student's admission interview score is the average of the scores awarded by the two interviewers. The University's database of student records did not capture the admission interview score of each interviewer. Thus, it was not possible to examine the agreement between the two interviewers.

The current study may be valuably extended in two directions. First, more evidence can be generated about the significance of admission interview as a variable associated with academic success. Such research could examine the usefulness of admission interviews in other disciplines. Given that admission interviews make a heavy demand on resources, research can also be carried out on the effectiveness of different types of admission interviews. Second, further research could test variables that reflect other dimensions of student motivation, attitude and engagement, such as involvement in co-curricular activities (for example, sports and the arts) and community involvement projects during the period of the degree programme.

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