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Does Graduate Business Education Contribute to Professional Accounting Success?

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SYNOPSIS: We investigate the value of graduate business education in learning tacit knowledge and achieving professional accounting success. Archival (n = 5,932) and survey (n = 2,941) data from managerial accountants employed at 2,525 North American companies in three industries (publishing, paper, and chemical) indicate that job performance evaluations (JPEs) of those who hold either a Master's of Accountancy (M.Acc.) or M.B.A. degree are generally higher than non-master's (NM) degree accountants. We find some evidence that professionals with master's degrees, as compared to NM professionals, have higher levels of two forms of tacit managerial knowledge (TMK): self and others. The results also suggest that M.Acc. and M.B.A. degrees contribute to success differentially throughout the professionals' careers. Specifically, a M.Acc. degree provides greater benefit than a M.B.A. degree in the early and middle career years, while an M.B.A. degree provides greater benefit than a M.Acc. degree in later career years. The results indicate that M.Acc. and M.B.A. degrees contribute to success by increasing specific types of knowledge and enhancing ones' ability to learn.

Keywords: tacit knowledge; education; professional success; job performance.

Data Availability: Access to the data is limited to researchers signing agreements that assure the participating organization's confidentiality. Contact the first author for a copy of the research instrument.

INTRODUCTION

Understanding the extent to which graduate business education contributes to professional accounting success is important for practical and theoretical reasons. Pragmatically, graduate business education is costly. For example, students not receiving financial aid at the Wharton Graduate School of Business pay annual costs (tuition, fees, room, and board) of $64,422 (The Wharton School 2003). Costs at top public graduate business schools are less, but still substantial. For example, the expected total annual cost

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without financial aid for an M.B.A. or Master's of Accountancy (M.Acc.) degree at The University of Texas ranges from $30,172 for in-state students to approximately $46,000 for out-of-state and international students (McCombs School of Business 2004).

In addition, some skeptics doubt the value of graduate business and accounting education to professional accounting success. For example, no existing North American jurisdiction requires a master's degree for CPA or CMA licensure. In some U.S. jurisdictions, CPA and CMA certifications do not require any university education.[1] Further, an Institute of Management Accountants study, "What Corporate America Wants in Entry Level Accountants," indicates that fewer than 3 percent of respondents preferred job applicants with master's degrees (of any kind) to those with bachelor's-only degrees (Siegel and Sorensen 1994, 1999).

Skepticism regarding the value of graduate business education is not restricted to accounting (Leonhardt 2000; Mintzberg and Lampel 2001; Mintzberg and Gosling 2002; Robinson 1994). For example, Pfeffer and Fong (2002, 78) state the following regarding the value of M.B.A. degrees:

> What data there are suggest that business schools are not very effective: neither possessing an M.B.A. degree nor grades earned in courses correlate with career success, results that question the effectiveness of schools in preparing their students.

Similarly, the cover of a recent *Business 2.0* magazine asks: "What's An M.B.A. Really Worth?" The answer appears in the abstract: "There's little real evidence that [an M.B.A. degree] will enhance your career" (Raskin 2002, 40; see also Seligman 2002; Mintzberg 2004). However as Pfeffer and Fong (2002) observe, the debate regarding the value of graduate business and accounting education has taken place largely in the absence of empirical evidence on the effects of education on professional accounting success.

A related pragmatic question is whether prospective business graduate students receive greater value from a "general" graduate business degree, as reflected by an M.B.A. degree, or a more technical M.Acc. degree. In considering the relative value of these alternatives, Albrecht and Sack (2000, 51) argue that many M.Acc. programs mandate primarily technical accounting content that is inconsistent with the evolving needs of business for "broadly trained accountants."

This study investigates the value of M.Acc. and M.B.A. degrees through the lens of three theoretical models: selection, learned knowledge, and life-long learning. We provide large-sample evidence related to the:

(1) relative contributions of M.B.A., M.Acc., and bachelor's degrees to professional success in accounting;
(2) relative contributions of M.B.A., M.Acc., and bachelor's degrees to learning the "tacit" knowledge needed for business success; and
(3) ability of the three theories to explain the observed benefits (if any) of graduate business education.

We next consider previous research exploring the contributions of graduate education to accounting and business success.

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[1] For example, the U.S. Institute of Management Accountants requires CMA candidates to have *one* of the following: (1) a bachelor's degree, (2) CPA or other professional certification, or (3) a score equaling or exceeding the 50th percentile on either Graduate Management Admissions Test (GMAT) or the Graduate Record Examination (GRE) (Institute of Management Accountants 2002). The U.S. Virgin Islands does not require university education of CPAs (U.S. Virgin Islands Dept. of Licensing and Consumer Affairs 2004).

THEORY AND HYPOTHESES

Does Graduate Business Education Increase Professional Success?

Some evidence suggests that graduate business education increases accounting success. For example, Alford et al. (1990) find that graduate education increases the speed and probability of promotion to CPA firm partner, although this effect was much greater among consulting and taxation than audit partners. Hunton and Wier (1996) use survival analysis and find that managerial accountants with master's degrees have higher promotion probabilities and lower turnover probabilities than those lacking master's degrees. Deppe et al. (1992) indicate that accounting program graduates with master's degrees pass the CPA exam more quickly and leave jobs less frequently than do those lacking master's degrees; however, salaries between groups differed before, but not after, the first promotion. Recent evidence suggests that CPA exam candidates with master's degrees outperform those with either 150 hours of university education or bachelor's-only degrees (National Association of State Boards of Accountancy 2002; Shafer et al. 2003). Finally, in a 111-year analysis (1880 through 1990) of Dutch accounting firm partners, Pennings et al. (1998) found that graduate education among firm partners contributed to firm survival.

Alternatively, some research casts doubt on the value of graduate business education. Ferris (1982) and Ferris and Larcker (1983) studied male accountants' JPEs at one large CPA firm office. They found that graduate business education had no effect on JPEs. Wright (1988) followed a cohort of M.B.A. and undergraduate recipients hired by an accounting firm over a nine-year period. Results indicated that M.B.A. program graduates received faster promotions but did not obtain higher raises or indicate lower turnover rates. Miller (1996, 2003) analyzed AICPA survey data regarding the supply of and demand for master's-degree graduates in public accounting. Consistent with managerial accounting survey evidence (see Siegel and Sorensen 1994), Miller (1996, 2003) suggests that M.Acc. programs produce a large and growing excess supply of graduates compared to public accounting firm demand.[2,3]

Theories Linking Graduate Business Education to Professional Success

Skeptics assert that graduate business education fails to contribute to professional success (e.g., see Pfeffer and Fong 2002). This statement suggests an expectation of *no difference* in the success of professionals with and without master's degrees.[4] We measure professional success using accountants' job performance evaluations, which an industry trade association designed, collected and compiled. JPEs have been found to strongly correlate with salaries and promotions both generally (e.g., see Lazear 1995, 1999) and in managerial accounting (e.g., Wier et al. 2002). Based on this argument, we hypothesize:

H1 (Skeptics' Assertion): Graduate business education has no effect on accountants' overall job performance evaluations.

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[2] Howard and Lubich (2003) argue that, for multiple reasons, Miller (1996, 2003) overstates the excess supply of M.Acc. graduates and understates the demand for such graduates.

[3] We are unaware of research that studies the demand for master's level education among professional accountants after the passage of the Sarbanes-Oxley Act (SOX). We speculate, without evidential support, that there is higher demand for M.Acc. and M.B.A. degree holders in the post- than the pre-SOX era.

[4] The lack of difference in success is strictly true only if accountants' choices to pursue or not pursue graduate business education are uncorrelated with differences in abilities.

Rejecting H1 will lead us to seek explanations as to why graduate business education might affect JPEs. We explore three process-based theories of why graduate business education may impact professional success: (1) selection model, (2) learned knowledge model, and (3) life-long learning (LLL) model.

Selection Model

The selection model argues that, because more intelligent individuals choose to pursue and are selected to acquire graduate business education, intelligence, not education, primarily explains the higher job performance and salaries of those with college degrees (e.g., Seligman 2002; U.S. Census Bureau 2002). Hence, the selection model asserts that higher JPEs for accountants with graduate degrees arise not from graduate business education, but instead from higher intelligence of those selected by graduate programs. In the current study, intelligence is measured as problem-solving ability. Prior research suggests that PSA (or "g" for general intelligence) explains a significant amount of performance variability in many domains (Jensen 1993; Schmidt et al. 1986), including external auditing (e.g., Bonner and Lewis 1990) and financial accounting (e.g., Burrell 1929). Therefore, the selection model predicts the following:

H2 (Selection Model): Graduate business education has no effect on overall job performance evaluations after controlling for problem-solving ability.

Learned Knowledge Model

The learned knowledge model posits that the primary benefit of graduate education is the specific knowledge learned in graduate school (e.g., Gainen and Locatelli 1995). Accounting proponents of this view often argue for a graduate curriculum focused on technical issues in financial accounting, taxation, and auditing. Some evidence supports a link between increases in specific knowledge and graduate business education. For example, the pre-electronic version of the CPA exam heavily emphasized technical accounting concepts. Consistent with the learned knowledge model, M.Acc. graduates were more successful on this largely technical exam than M.B.A. and professionals without master's degrees (NMs) (National Association of State Boards of Accountancy [NASBA] 2000, 1999).

In contrast to accounting graduate education, an M.B.A. curriculum usually focuses more on analytical thinking through quantitative models (e.g., expected utility and linear optimization models) and case-based reasoning. At the same time, we expect some improvement in analytical skills among M.Acc. graduates and some improvement in technical skills among M.B.A. graduates, relative to professionals who lack graduate degrees. Based on curricular differences, the learned knowledge model leads us to expect differences in technical versus analytical JPEs as follows:

H3a (Learned Knowledge Model): M.Acc. degree holders have higher *technical* job performance evaluations than do M.B.A. degree holders and professionals without master's degrees (NMs).

H3b (Learned Knowledge Model): M.B.A. degree holders have higher *technical* job performance evaluations than do professional accountants without master's degrees.

H3c (Learned Knowledge Model): M.B.A. degree holders have higher *analytical* job performance evaluations than do M.Acc. degree holders and professionals without master's degrees.

H3d (Learned Knowledge Model): M.Acc. degree holders have higher *analytical* job performance evaluations than do professional accountants without master's degrees.

Life-Long Learning (LLL) Model

The life-long learning model (LLL) argues that the primary benefit of graduate business education is that students "learn how to learn" (e.g., Gainen and Locatelli 1995). This view emphasizes the value of graduate education in developing "tacit" skills, such as leadership, goal setting, self-improvement, and relationship building. Boyatzis et al. (2002) provide evidence that graduate business education may increase tacit skills, as they find increases in self-management and relationship management skills in pre- and post-program comparisons of M.B.A. degree holders. However, existing research has not examined the effects of graduate education on tacit skill dimensions of job performance evaluations.

Testing for the effects of the life-long learning model requires measuring outcomes that are assumed *not* to be explicitly taught in graduate business education. Consistent with social learning theory (Bandura 1986, 1997), professionals are assumed to acquire "tacit" skills and knowledge not through formal instruction but rather by observing the actions and behaviors of mentors and colleagues and by observing others' reactions to their actions and behaviors (Sternberg and Wagner 1985; see also Tan and Libby 1997). The job performance evaluations of participants in our sample include measures of the following tacit skills: goal attainment, leadership among peers, leadership with subordinates, outside service, and self-improvement. Consistent with the LLL model, we predict the following with respect to these measures:

H4a (Life-Long Learning Model): Professional accountants with master's degrees receive higher *tacit skill* job performance evaluations than do professional accountants without master's degrees.

In addition to measuring "tacit skills" using JPEs, we also use a psychological measure of tacit managerial knowledge (TMK). TMK consists of the requisite skills for managing one's personal productivity and career, and building relationships with others. Sternberg and Wagner (1985) posit three types of TMK. The TMK of *managing self* involves maintaining one's personal productivity, which includes prioritizing and completing tasks, using goals to self-motivate, taking appropriate risks, and learning from observing others. The TMK of *managing others* involves developing and maintaining relationships with superiors, subordinates, and stakeholders, and maintaining useful and productive social relationships. The TMK of *managing one's career* requires an understanding of the determinants of one's professional success and demonstrating one's substantive contributions to superiors. It includes successfully promoting one's ideas and maintaining visibility among those who influence one's career.

Sternberg and Wagner (1985, 1987) provide evidence of the relevance of TMK to professional success among academics and business managers. Tan and Libby (1997) demonstrate the relevance of overall TMK (but not the three subscale measures) to the success

of senior- and manager-level external auditors' success in the Singapore office of a public accounting firm. However, the study of TMK is in its infancy. Our data provide evidence on the unexplored relation between graduate business education and TMK.

The life-long learning model predicts higher levels of TMK among professionals with master's degrees compared to professionals without master's degrees, as follows:

H4b (Life-Long Learning Model): Professional accountants with master's degrees have higher levels of measured tacit managerial knowledge than do professional accountants without master's degrees.

Table 1 summarizes our predictions.

Effects of Education over Time—Work Experience

In addition to testing the hypotheses, we also examine the effects of graduate education at different stages of an accountant's career. Accordingly, we include years of total work experience as an independent variable.[5] We also test for joint effects of education and work experience on our dependent measures. We next discuss our research method.

RESEARCH METHOD

Job Performance Evaluations (JPEs)

We obtained the cooperation of a North American accountants' industry association (MAIA) whose members included practicing managerial accountants in three industries (SIC codes 26, paper and allied products; 27, printing, publishing, and allied industries; and 28, chemicals and allied products). This association provided us with confidential job

TABLE 1
Summary of Model Predictions

Hypothesis	Underlying Model	Dependent Variable	Predictions
1	Skeptics' Assertion	Overall JPEs	M = NM
2	Selection	Overall JPEs	M = NM after controlling for PSA
3a	Learned Knowledge (LK)	Technical JPEs	M.Acc. > M.B.A. & NM
3b	Learned Knowledge (LK)	Technical JPEs	M.B.A. > NM
3c	Learned Knowledge (LK)	Analytical JPEs	M.B.A. > M.Acc. & NM
3d	Learned Knowledge (LK)	Analytical JPEs	M.B.A. > NM
4a	Life-Long Learning (LLL)	Tacit Skill JPEs	M > NM
4b	Life-Long Learning (LLL)	TMK	M > NM

JPE = job performance evaluation;
M = master's degree;
M.Acc. = Master's of Accountancy degree;
M.B.A. = Master's of Business Administration degree;
NM = no master's degree;
PSA = problem-solving ability; and
TMK = tacit managerial knowledge.

[5] Alternative measures of experience such as employee age and years of work experience with this employer are highly correlated with total years of work experience measure (correlations exceed .97 in our sample). Substituting these measures produces identical inferences as those reported in the tables.

performance evaluation data for its 5,932 members for the year 1996. The association includes 2,525 U.S. and Canadian companies and represents approximately 75 percent of North American managerial accountants working in these industries.

Beginning in 1976, the MAIA agreed to common JPEs for all member companies and began systematically collecting supervisors' annual evaluations of all members. The JPE dimensions are: (1) overall, (2) technical, (3) analytical, and (4) tacit skills (i.e., goal attainment, leadership among peers, leadership with subordinates, outside service, self-improvement). Ratings are on a 1 to 5 scale where 1 = very poor and 5 = very good.

We reviewed descriptions of the JPEs and promotion processes used by MAIA member companies.[6] Evaluation processes instruct supervisors to make annual evaluations relative to the requirements of each subordinate's current position. Annual promotion decisions are made subsequent to and based upon the JPEs.

The MAIA data identify accountants with M.Acc. and M.B.A. degrees. However, these data do not distinguish NM accountants from accountants with graduate-level university education but no master's degrees (e.g., accountants who fulfill the 150-hour requirement but do not obtain a master's degree). This data limitation biases the results against the hypotheses that predict differences in master's and non-master's degree holders (i.e., H3b, H3d, H4a, and H4b) and in favor of the null hypotheses (i.e., H1, H2), in that professionals with some graduate education are included in the NM group. An additional limitation, which we discuss later in the paper, is that we cannot identify the year in which participants received their graduate degree.

Survey Data

We used the MAIA's proprietary electronic mail system to distribute a research instrument to all members. The overall response rate was 49.6 percent.[7] We built the following controls into the software used to administer the instrument. To lessen the likelihood of respondents forwarding the instrument to others for completion, the instrument could only be returned from the association member's computer address. Only completed instruments could be returned. Items within sections were presented in random order. Respondents could not return to earlier sections of the instrument after completing them. The instrument consisted of six sets of measures, two of which are reported in this paper: (1) problem-solving ability and (2) tacit managerial knowledge. Table 2 provides demographic characteristics of the sample.

We measured PSA using an eight-item measure developed and validated in Bonner et al. (1992) and Bonner and Walker (1994).[8] Reliability (Cronbach's α = .444) is low, but similar to that observed in previous administrations of this instrument. We measured TMK using the 39-item version of Sternberg and Wagner's (1987) TMK instrument.[9] Factor analysis indicated that all items loaded consistent with the three factors identified by the test developers (i.e., career, self, and others). Cronbach's α indicated high reliability for all factors (career = .971, self = .973, others = .957).[10]

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[6] Our agreement with the participating MAIA prevents us from quoting from or citing these materials.

[7] There are no differences in the proportions of responses from staff, senior, and manager members in our sample. We also test for nonresponse bias and find no significant differences between respondents and nonrespondents in their industry, company size, gender, education level, professional certification, or rank ($p \geq .49$). Respondents replied to two solicitations sent one week apart. We find no differences between respondents to the first and second solicitations.

[8] Thanks to Professor Sarah Bonner for sharing, and advising us on how to best administer, this instrument.

[9] Thanks to Professor Richard Wagner for sharing, and advising us on how to best administer, this instrument.

[10] In addition, summed subcomponent scores (i.e., for career, self, and others) had low correlations ($.12 \leq r \leq .19$), indicating good discriminate validity.

TABLE 2
Sample Characteristics

	n	Mean	Std. Dev.	Range	25%	75%
Demographics						
% Male	5,932	67.5%	0.47	NA	NA	NA
Age	5,932	35.1	7.07	25–61	30.0	39.0
% with M.Acc. Degree	5,932	19.6%	0.40	NA	NA	NA
% with M.B.A. degree	5,932	21.8%	0.41	NA	NA	NA
Total Work Experience (Years)	5,932	6.76	5.67	1–20	4.17	8.92
Job Performance Evaluations (JPEs)						
Overall	5,932	3.41	1.048	1–5	3.0	4.0
Technical	5,932	3.52	1.166	1–5	3.0	5.0
Analytical	5,932	3.41	1.113	1–5	3.0	4.0
Tacit Skill	5,932	17.16	2.924	9–25	15.0	19.0
Tacit Managerial Knowledge (TMK)						
Career	2,941	63.13	19.886	14–105	47.0	75.0
Self	2,941	65.70	22.116	15–112	49.0	80.0
Other	2,941	16.73	6.201	3–28	12.0	20.0
Problem Solving Ability (PSA)	2,941	5.99	1.591	2–8	5.0	7.0

JPEs are supervisors' 1996 performance evaluations of the accountants in our sample.
TMK is measured using the 39-item version of Sternberg and Wagner's TMK instrument (Sternberg and Wagner 1987).
PSA is measured using the eight-item instrument developed and validated in Bonner et al. (1992) and Bonner and Walker (1994).

Models and Analyses

We analyze the data using multiple regression. The dependent variables and associated hypotheses appear in Table 1. The main independent variables are coded as dummy variables for M.B.A. degree (1, 0) and M.Acc. degree (1, 0). Significant results on *MBA* (*MAcc*) indicate differences in values of the dependent variable for an accountant with an M.B.A. (M.Acc.) versus no master's degree (NM). Our regressions also include independent variables for years of work experience and the interactions of *MBA* and work experience and *MAcc* and work experience.

PSA is a key control variable in testing H2, but the *PSA* data come from the survey while the JPE data are archival. When we include *PSA* as an independent variable in the regressions with JPEs as dependent variables, the sample size is reduced by approximately 50 percent. Accordingly, we include *PSA* only in the test of H2.

In the regressions reported in Table 3, we "center" the work experience variable for reasons that we explain in the Appendix. To center the work experience variable, we subtract the average years of work experience (6.76) from participants' actual years of work experience. In the regressions with the centered work experience variables, the *MBA* and *MAcc* coefficients represent the estimated change in the dependent variables at the average level of work experience.

We also estimate the values of the dependent variables at high and low levels of work experience. To do this, we run regressions that subtract the 90th percentile (17 years) and 10th percentile (2 years) levels of work experience from participants' actual work experience. The *MBA* and *MAcc* coefficients in these regressions represent the estimated levels of the dependent variables at these levels of work experience (see the Appendix). Table 4

TABLE 3
Regression Results

$$Y = \alpha + \beta_1 MBA + \beta_2 MAcc + \beta_3 WExp + \beta_4 MBA * WExp + \beta_5 MAacc * WExp + \varepsilon$$

(t-statistics in parentheses)

Dependent Variables	α Intercept	β_1 *MBA*	β_2 *MAcc*	β_3 *WExp*[a]	β_4 *MBA × WExp*	β_5 *MAcc × WExp*	Model Adj. R^2
Performance Evaluations (n = 5,932)							
Overall Performance	3.319***	.180***	.254***	.020***	.053***	.015	
	(189.260)	(5.281)	(7.269)	(4.187)	(5.417)	(1.538)	.030***
Technical Performance	3.468***	.021	.209***	.101***	.022*	−.012	
	(185.080)	(.574)	(5.581)	(19.853)	(2.100)	(−1.110)	.106***
Analytical Performance	3.330***	.129***	.252***	.072***	.047***	.005	
	(184.021)	(3.678)	(6.985)	(14.693)	(4.647)	(.520)	.084***
Tacit Skill Performance	16.750***	.696***	1.193***	.180***	.214***	.039	
	(360.026)	(7.708)	(12.851)	(14.271)	(8.299)	(1.462)	.123***
Tacit Managerial Knowledge (n = 2,941)							
Career	62.885***	1.028	.411	1.415***	−.283	−.050	
	(134.163)	(1.162)	(.438)	(11.230)	(−1.100)	(−.189)	.059***
Self	65.044***	1.075	2.132	2.196***	.601*	−.061	
	(130.762)	(1.145)	(2.143)*	(16.427)	(2.205)	(−.217)	.143***
Others	16.455***	.634*	.605	.533***	.241**	−.005	
	(116.391)	(2.375)	(2.139)*	(14.031)	(3.111)	(−.061)	.122***

***, **, * Indicates statistical significance at the p = .0001, .01, .05 levels, respectively (two-tailed test).
MBA = M.B.A. dummy (0 = no, 1 = yes);
MAcc = M.Acc. dummy (0 = no, 1 = yes);
WExp = work experience (in years).
[a] Centered variable (See Appendix for description of centering).

TABLE 4
Summary of Joint Effects of Education and Work Experience on Job Performance Evaluations and Tacit Managerial Knowledge

Row	Dependent Variables	Work Experience	Comparisons		
			M.Acc. & NM	M.Acc. & M.B.A.	M.B.A. & NM
1	*JPE*-Overall Performance (H1 & H2)	Low	M.Acc. > NM	M.Acc. > M.B.A.	n.s.
		Average	M.Acc. > NM	M.Acc. > M.B.A.	M.B.A. > NM
		High	M.Acc. > NM	M.B.A. > M.Acc.	M.B.A. > NM
2	*JPE*-Technical Performance (H3a & H3b)	Low	M.Acc. > NM	M.Acc. > M.B.A.	n.s.
		Average	M.Acc. > NM	M.Acc. > M.B.A.	n.s.
		High	n.s.	M.B.A. > M.Acc.	M.B.A. > NM
3	*JPE*-Analytical Performance (H3c & H3d)	Low	M.Acc. > NM	M.Acc. > M.B.A.	n.s.
		Average	M.Acc. > NM	M.Acc. > M.B.A.	M.B.A. > NM
		High	M.Acc. > NM	M.B.A. > M.Acc.	M.B.A. > NM
4	*JPE*-Tacit Skill Performance (H4a)	Low	M.Acc. > NM	M.Acc. > M.B.A.	NM > M.B.A.
		Average	M.Acc. > NM	M.Acc. > M.B.A.	M.B.A. > NM
		High	M.Acc. > NM	M.B.A. > M.Acc.	M.B.A. > NM
5	*TMK*-Self (H4b)	Low	n.s.	n.s.	n.s.
		Average	M.Acc. > NM	M.Acc. > M.B.A.	n.s.
		High	n.s.	M.B.A. > M.Acc.	M.B.A. > NM
6	*TMK*-Others (H4b)	Low	n.s.	n.s.	n.s.
		Average	M.Acc. > NM	n.s.	M.B.A. > NM
		High	n.s.	M.B.A. > M.Acc.	M.B.A. > NM

Differences are significant ($p \leq .05$) except in cells marked N.S.
JPE = job performance evaluation;
TMK = tacit managerial knowledge;
NM = no master's degree;
n.s. = not significantly different;
Low Work Experience = 10th percentile (2 years);
Average Work Experience = 6.76 (see Table 2);
High Work Experience = 90th percentile (17 years).

reports whether the coefficients are significantly different from 0 and one another ($p \leq .05$) in the high, average, and low regressions.

RESULTS

Table 3 presents the results of the regressions. In six of the seven regressions, the coefficient for *MAcc* is positive and significant, while the coefficient for *MBA* is positive and significant in four of the seven regressions. In all regressions, the coefficient for years of work experience is positive and significant. In six of the seven regressions, there is a significant positive work experience by *MBA* interaction coefficient. This interaction indicates that, with increases in experience, M.B.A. degree holders' JPEs and levels of TMK increase more than do those of M.Acc. degree holders (β_5 is insignificant in all regressions) and participants without master's degrees.

Hypothesis 1 predicts no effect from business graduate education on overall JPEs. Contrary to H1, at average and high levels of work experience, M.B.A. and M.Acc. degrees have positive effects on overall JPEs (see Tables 3 and 4). Also contrary to H1, at low levels of work experience, accountants with M.Acc. degrees have higher overall JPEs than do accountants lacking master's degrees. However, consistent with H1, at low levels of

work experience, M.B.A. degree holders have no higher overall JPEs than do participants who lack master's degrees.

Hypothesis 2 predicts no effect from graduate business education on overall JPEs, after controlling for *PSA*. The coefficient for *PSA* is not significant in the model predicting overall JPEs ($p = .50$). For this reason, we omit the *PSA* variable from Table 3. Further, including *PSA* in the regression has no effect on the significance of any other regression coefficients. Accordingly, the data generally reject H1 (skeptics' assertion) and H2.[11]

Hypothesis 3a predicts higher technical JPEs among M.Acc.s than M.B.A.s and NMs. Row 2 of Table 4 shows that M.Acc. professionals have higher technical JPEs than either M.B.A.s or NMs at low and average levels of work experience, consistent with H3a. However contrary to H3a, the technical JPEs of M.Acc. degree holders do not differ from NMs at high levels of work experience, and the technical JPEs of M.B.A. degree holders are higher than those of M.Acc.s at high levels of work experience. Accordingly, the data support H3a at low and average, but not high, levels of work experience.

Hypothesis 3b predicts higher technical JPEs among M.B.A. than NM professionals based on the learned knowledge model. At high levels of work experience, M.B.A. degree holders have higher technical JPEs than NMs, consistent with H3b. Contrary to H3b, M.B.A. degree holders do not differ from NMs at low and average levels of work experience. Accordingly, the data support H3b at high, but not low and average, levels of work experience.

Hypothesis 3c predicts higher analytical JPEs among M.B.A.s than M.Acc.s and NMs, based on the learned knowledge model. At average and high levels of work experience, M.B.A. degree holders have higher analytical JPEs than NMs, consistent with H3c. Also consistent with H3c, at high levels of work experience, M.B.A.s have higher analytical JPEs than M.Acc.s. At low and medium levels of work experience, M.Acc.s have higher analytical JPEs than M.B.A.s, contrary to H3c. Accordingly, the data suggest that M.Acc.s have higher analytical JPEs in early and middle career years, and that M.B.A.s have higher analytical JPEs in later career years.

Hypothesis 3d predicts higher analytical JPEs among M.Acc.s than NMs. The data support H3d at all levels of work experience. In summary, the data partially support H3a, H3b, and H3c, and fully support H3d.

Hypothesis 4a predicts higher tacit skill JPEs among accountants with, than among accountants lacking, a master's degree. With the exception of one cell in Row 4 of Table 4, the data support H4a. At low levels of work experience, professionals without a master's degree have higher tacit skill JPEs than M.B.A.s. Accordingly, five of the six relevant cells in Table 4 support H4a.

Hypotheses 4b predicts higher measured levels of TMK among master's degree holders compared with non-master's degree holders. The results for TMK-career, which are not shown in Table 4, fail to support H4b; none of the *MAcc* or *MBA* coefficients in the TMK-career regressions are significant for low, average, or high levels of experience. The results for TMK-self and TMK-others partially support H4b; specifically, five of 12 cells (nine cells of which are shown in Table 4) are consistent with H4b. At average levels of experience, M.Acc. degree holders have higher levels of TMK-self and TMK-others, and MBAs have higher levels of TMK-others, than NMs. At high levels of experience, M.B.A. degree

[11] We also ran models similar to those reported in Table 3 but including a PSA independent variable. PSA was significant only in the regression with "tacit managerial knowledge-other" as the dependent variable. Including PSA in this regression did not change the statistical significance of any of the other coefficients. Consequently, we conclude that PSA has no effect on the reported results.

holders have higher levels of TMK-self and TMK-others than NMs. For the remaining seven cells, there are no differences between master's degree holders and NMs in TMK-self and TMK-others.

Although not hypothesized, we find evidence of differences between M.B.A. and M.Acc. degree holders in tacit skill JPEs and TMK at differing levels of experience. M.Acc. degree holders have higher tacit skill JPEs at low and average levels of experience, while at high levels of work experience, M.B.A. degree holders have higher levels of tacit skill JPEs, TMK-self, and TMK-others.

DISCUSSION

Summary of Results

The data largely contradict the skeptics' assertion of *no difference* between holders of master's and bachelor's-only degrees on overall job performance. Specifically, 11 of the 12 cells (91.7 percent) in Table 4 show higher JPEs among M.Acc.s than NMs while, seven of the 12 cells (58.3 percent) show higher JPEs among M.B.A.s than NMs. One cell (low work experience: M.B.A. versus NM) shows higher JPEs among professionals without master's degrees. The data also fail to support the selection model's prediction of no effect from graduate business education on overall JPEs after controlling for problem solving ability.

The data provide mixed support for the learned knowledge and life-long learning model predictions. For technical JPEs, the results for five of the nine cells support the predictions of the learned knowledge model, while for analytical JPEs, the results for six of the nine cells support these predictions. For tacit skill JPEs, eight out of nine cells support the predictions of the life-long learning model, while for measured TMK, only five out of 18 predictions (27.8 percent) are supported.

In summary, the data generally fail to support the skeptics' assertion and the selection model, and they provide some support for the learned knowledge and life-long learning models. The data also suggest that the value of an M.B.A. or M.Acc. degree differs depending on years of work experience. Specifically, a M.Acc. degree provides greater benefit than a M.B.A. in the early and middle career years, while an M.B.A. degree provides greater benefit than a M.Acc. in later career years. Consequently, our data suggest that graduate business education provides value to a managerial accountants' success, but the specific benefit provided, and the timing of the benefit, depend on the type of degree.

Limitations

There are several important limitations of our study. We cannot determine when participants obtained their graduate business degrees, which may explain some differences in the early career value of M.B.A. versus M.Acc. degrees. For example, perhaps M.B.A. degree holders typically obtain their graduate degrees later in their careers than do M.Acc. degree holders. This difference in the timing of graduate education would explain the observed effects of higher early year payoffs from M.Acc. relative to M.B.A. degrees. In addition, we do not have data on professionals who obtain graduate education but do not obtain graduate degrees. Such cases weaken the power of our hypothesis tests.

Further limitations include the following:

- the time of our data set (through 1996) may fail to capture the results of the changing nature of M.Acc. programs (Williams and Sundem 1990, 1991);

- although evidence suggests that the prestige of the M.B.A.-degree-granting school may affect job success (Dugan et al. 1999), our data do not allow for tests of these effects;
- the low measured validity of the PSA measure may explain or partially explain the lack of support for the selection model; and
- accounting professionals choose to pursue specific graduate business degrees or choose not to pursue graduate business education at all. While we control for one aspect of these selections (i.e., intelligence), there may be other self-selection covariates (e.g., motivation, undergraduate degree major) that affect these choices, and would therefore affect our results.

Implications

Our results indicate statistically significant differences between managerial accountants with and without graduate business degrees. But are these differences practically significant? The data indicate that, on average, a graduate business degree is associated with an increase in JPEs of between one-quarter to one-half of a point on the five-point JPE scale. This represents a maximum change of about one-half a standard deviation (~20 percent) in JPEs from graduate business education. The results also suggest that graduate business education produces a change of about seven points in TMK-self and about three points in TMK-others. This represents a maximum change of about one-third to one-half a standard deviation (~11 percent) in TMK due to graduate business education.

To answer the pragmatic question of whether graduate business education "pays" would require comparing the benefits and costs of obtaining graduate education. While our data allow us to quantify benefits related to JPEs and measured TMK, we lack data on the costs of graduate education incurred by participants. In addition, we were denied access to compensation data by the MAIA. Consequently, we are unable to commonly scale the costs and benefits of graduate business education and thereby opine as to the ultimate pragmatic question related to graduate business education: are the substantial costs of graduate business education worth the one-half standard deviation increases in knowledge and job performance that we document?

Our results differ from those of Ferris (1982) and Ferris and Larcker (1983) who find that graduate business education had no effect on accountants' JPEs. Several important differences between those studies and ours could account for these differences. Our sample is much larger; we have 5,932 archival and 2,941 survey observations versus 250 observations in Ferris (1982) and 90 observations in Ferris and Larcker (1983). Also, our sample includes both men and women, while the Ferris/Ferris and Larcker studies are of men only.[12] Our data are from 2,525 North American corporations; the Ferris/Ferris and Larcker data sets are from one office of a public accounting firm. Finally, our data are from managerial accountants while the Ferris/Ferris and Larcker data analyze public accounting firm auditors. The many differences between the two studies make isolating a single cause for the observed differences problematic.

To summarize, we use a multi-method, multi-measure approach to investigate the value of graduate business education to managerial accountants' success. We find that graduate

[12] To test for possible gender and company size effects, we ran regression models for all of the dependent variables reported in Table 3 that also included independent variables for gender, company size, education, and the joint effects of gender by education and company size by education. Company size was coded as a three-level variable (1 = small, 2 = medium, 3 = large). The only significant independent variable in these models was education.

business education provides a maximum increase among managerial accountants of about 20 percent in job performance evaluations and about 11 percent in levels of tacit managerial knowledge. Further, the results suggest that the value of graduate business education varies with career stage. M.Acc.s have more value earlier in their careers, while M.B.A.s have greater value later in their careers.

APPENDIX

Centering a continuous regression predictor means that for each observation, the average of a variable is subtracted from its actual value (i.e., $X_i - X_{avg}$). This produces a variable with a mean of 0 but does not change the standard deviation. Note that centering is only relevant to continuous variables (e.g., work experience); dummy variables (e.g., *MAcc* and *MBA*) need not be centered.

There are two reasons for centering the continuous predictor variables in a regression that includes interaction terms. We discuss one of these reasons here. Readers interested in the other reason (called ill-conditioning) should see Marquardt (1980), Smith and Sasaki (1979), Tate (1984), and Lance (1988).

In regressions that include interaction coefficients between dummy variables and un-centered continuous predictor variables, the coefficients on the dummy variables (here, *MBA* or *MAcc*) can have either an unimportant, or no meaningful, interpretation. For example if we ran our regressions with an un-centered "years of experience" variable, the coefficient for *MBA* would be the value of an M.B.A. degree for participants with no work experience. However, none of our participants have 0 years of work experience; this data point lies outside the range of observations. By centering the years of experience variable, the coefficient for *MBA* represents the value of an M.B.A. degree for participants with the average level of work experience in the sample. Hence by centering, we transform the meaning of the coefficient value for the dummy variable from that of an outlier to that of the mean of the distribution. See Aiken and West (1991) for more information about centering.

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