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An Empirical Look at Criteria for Admission to an Undergraduate Business Program

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LITERATURE REVIEW

AACSB International recognizes in its standards the importance of admission policies designed to support the achievement of the school's mission. The AACSB indicates that a variety of information can be used in making admission decisions and includes "scholastic achievement, leadership experience, scores on standardized exams, work record, and other indices" (AACSB, 2003).

Standardized exams are often used as a measure of scholastic achievement for university admittance at both undergraduate and graduate levels. There has been substantial research on the admittance criterion for graduate level business programs. While studies have looked at demographic characteristics of students such as their age, sex, race and years of work experience, the most consistent finding has been that GMAT scores and undergraduate GPA measures are predictors of student performance (GPA) in the MBA program (Adams and Hancock, 2000; Ahmadi, Raiszadeh and Helms, 1997; Wright and Palmer, 1997Yang, Lu, 2001). One study of MBA admission criteria examined the incoming students GPAs in the common business core classes as well as their overall GPAs and found that the core class GPA was a slightly better predictor of graduate GPA than the overall undergraduate GPA.

Few studies have looked at criteria for business program admissions at the undergraduate level although a number of studies have looked at related issues. One related study focuses on the admittance of students transferring from community colleges (Kim, 2001). The results have been mixed but in general have indicated evidence of transfer shock, while indicating no significant GPA difference at graduation. Other studies have focused on predictors of performance in specific courses such as the junior level finance course (Borde, Borde and Modani, 1998); the marketing course (Borde, 1998) or upper division accounting courses (Danko-McGhee and Duke 1992). Results indicate that a number of factors such as age, gender, prior GPA, and performance in high school are related to subsequent performance in these classes. Other studies have focused on individual classes as predictors of performance in undergraduate business majors. One such study (Brown, McCormick, and Abraham, 2002) indicates that the principles of macroeconomics course can be used as an early predictor. This study included non-core courses that vary depending on the major followed by the student.

Two past studies have looked rather directly at the issue of defining effective admission criteria for undergraduate business programs. One study focused on admission to accounting programs and found that GPA at 45 semester hours in conjunction with other variables proved to be a strong predictor of success (Clark and Sweeney, 1985). Another study used a composite GPA for five sophomore level courses required for admission to the business college and found a strong predictive value for this variable (Pharr, Bailey, and Dangerfield, 1993). They also found that performance in these sophomore level required courses to be a stronger predictor of performance in the business major than ACT and SAT scores achieved prior to university admission.

ADMISSION CRITERIA FOR UNDERGRADUATE BUSINESS PROGRAMS

This study examines alternative criteria for admission to undergraduate business major programs. We are specifically interested in a multi-level admission system in which students are admitted to the University as freshmen, but are admitted to the business major only after completing a set of preliminary course work. While admission criteria for MBA programs have received considerable attention and a few studies have looked at specific proposed admission criteria for undergraduate business programs, there are no available studies that systematically examine what types of admission criteria are being used in undergraduate business programs and how extensively various forms of qualifying criteria are being used.

To determine what types of criteria are used, the authors examined the online catalogs of ten of the largest public universities in the four corners states. Three of these schools allow freshmen to enter as business majors, the remainder require students to apply to enter the professional business program after completing a number of hours at the university level. All of those schools allowing freshmen to enter as business majors imposed heightened entrance requirements.

Those schools allowing freshman admission to the business major used a weighting of a standardized test score (ACT or SAT) and high school grader point average (GPA) as the admission criteria. Two of them impose additional academic performance criteria for admission to required upper-division business courses and all three have post university admission standards for transfer students. These performance requirements were often similar to the formal admission criteria imposed by the other schools.

The criteria for admitting students already attending the university into the undergraduate business program or major are the primary focus of this study. The schools we reviewed use a combination of three types of performance measures to determine which applicants are admitted to their program. These measures are:

1. Overall university GPA
2. The GPA in a set of prescribed "core" classes
3. Minimum grade requirements in specific courses.

Half the schools use overall university GPA as one of their criteria for professional program admissions. Four of the schools have a requirement of a minimum GPA across a prescribed set of courses (english, math, statistics, accounting, and economics were the fields most commonly covered in these courses). Almost all of the schools require a C or better in a set of preliminary classes and three of them required a minimum grade of B (B minus in one case) in two or three specific courses.

DATA AND ANALYSIS

This paper uses data about students accepted into a professional business program at a mid-sized public university in the Southwest, hereafter referred to as NAU. NAU students wishing to major in business must formally apply for major status. Normally, students apply during the last semester of the sophomore year and become business majors entering the junior year. To achieve major status a student must have achieved a grade of C or better in each of a set of required lower division core courses (LD Core). In addition, the student's (GPA) across this LD Core is a key criterion for acceptance as a major. Students achieving a 2.75 GPA in the LD Core are automatically admitted and students with an LD Core GPA of 2.25 or above but below 2.75 may be admitted on a space available basis. Thus, NAU's admission criteria are centered on the second of the three alternative screening methods described above.

Each student, regardless of their business discipline, must complete a set of upper division core courses (UD Core) once accepted to major status. In addition, each student completes a set of major courses in his/her selected discipline. A wide variety of courses is involved in the various majors in the business college, and it proved to be extremely difficult to create a clean set of data reflecting the GPA in all business classes taken after business major status has been achieved. For these reasons, we decided to focus on performance in a set of four upper division core business courses normally taken during the junior year or the first semester of the senior year. It can be argued that this focus on core courses gives too narrow a view of performance within the business program. On the other hand, the college may want to define acceptable performance based on just the core and allow individual departments to define standards relating to their major coursework.

Data used in this study was extracted from a data warehouse. Records were initially retrieved for all students who were undergraduate business majors for at least one semester between Fall, 2000 and Spring, 2002. The warehouse used for this study did not provide grade data for courses transferred from other institutions. Thus, our analysis must be restricted to courses completed at NAU.

In evaluating potential admissions standards, we wish to look at each of the three types of performance measures described above and see how well they predict performance in the set of upper-division core courses. Thus, the dependent variable in our analysis is always the student's GPA in the upper division core. Specifically, these classes include the introductory courses in Finance, Management, Marketing, and Production and Operations Research. The independent variable performance measures used include: 1) the student's overall GPA for courses taken at NAU at the time he/she was admitted to major status, 2) the student's GPA in a set of lower division business core classes (as further described below), and 3) sets of dummy variables indicating the student's performance in a number of specific lower-division core courses.

For the second type of measure "performance in a set of core classes" we wish to create a GPA estimate for the set of courses actually used as the admission criterion at NAU. This set of courses includes: College Algebra, English, Introduction to Computer Information Systems, Financial Accounting, Managerial Accounting, Business Statistics, Business Law, Microeconomics, and Macroeconomics. Unfortunately, the algebra and English requirements are fairly frequently met by taking alternative classes or through advanced placement credit. Inclusion of these classes in our GPA estimates would have cut the sample size in half and possibly introduced bias in our estimates since better qualified students are more likely to be able to bypass these classes. For these reasons we included only the seven, business-related, lower-division core classes in our GPA measure. We will refer to this measure hereafter as the LDBC.

The demographic factors of age, sex and race are often included in studies of this type in order to identify potential areas of concern with respect to the impact of standards on diversity. In our case the number of minority students is quite small, less than 15 percent of the total and widely spread across diverse Native American, Hispanic, Asian and African American groups. In preliminary analysis, coefficients for race variables were found to be both non-significant and highly variant. For this reason, race is not included as an explanatory variable in the results below

Because of data limitations, we only look at students completing all of the LDBC and the UD Core at NAU. Thus, we lose students who transfer in business-related courses from other institutions and we also lose those students who drop out of the program due to academic difficulty either before or after achieving major status. We are, in reality, differentiating between those students who "just-get-by" in the program and those who thrive.

Course grades combined into a GPA can only be approximately normally distributed, since the range of values for a GPA is truncated. We examined the distributions of all of the GPA variables used in this study and performed statistical tests for skewness. Visually, there was a slight bulge in the distribution of each of the GPA variables at the top end of the grade scale, but statistically significant skewness was not present. About 6 percent of students had overall GPAs and LDBC GPAs of 4.0, while about 9 percent had UD Core GPAs at the 4.0 maximum. Regressions using a standard correction for truncated variables known as Tobit analysis (Green, 1997) were performed. Their results were very similar to the results of ordinary least squares (OLS) regression. Based upon this, we have treated the GPAs across sets of courses as cardinal numeric data in this study and present the OLS results below.

The student's overall GPA at NAU when admitted to major status is highly correlated (.88) with the LD Business Core GPA. Because of this high correlation, and because we want to compare the two measures as alternative admission criteria, we do not include both of these GPAs in the same model. Instead we compare the results of otherwise identical regressions using these alternative performance measures.

Table 1 presents the results of these two alternative models. The model using the LDBC GPA did a slightly better job of explaining UD Core performance – 49 percent adjusted R-Square versus 47.6 percent. Both models explain nearly half of the variation in UD Core performance which suggests that either might be a good starting point in defining admission criteria. In Table 1, standard errors are presented to the right of the coefficient values. Coefficients that are statistically significant – for which the null hypothesis that the coefficient is 0 can be rejected at the .05 level of probability - are indicated by an asterisk. Both the LDBC GPA and the Overall GPA easily meet the significance criteria in their respective equations.

Age and gender have much less impact. Age is not statistically significant in either equation. With respect to gender there is no significant impact in the equation using the Overall GPA measure. However, in the model using LDBC GPA, Female students in general perform about one-tenth of a point better in the UD Core GPA than male students with the same LDBC GPAs, and this difference is statistically significant.

Table 1

Lower Division GPA Criteria and Performance in the Upper Division Core

	Core Course GPA Criterion			Overall GPA Criterion		
Degrees of Freedom						
Model	3			3		
Error	464			462		
Adjusted R-Square	0.490			0.476		
	Coefficient Value		Standard Error	Coefficient Value		Standard Error
Parameters						
Intercept	0.9957	*	0.1935	0.4309		0.2220
Age	-0.0118		0.0074	0.0022		0.0077
Gender	0.1059	*	0.0375	-0.0095		0.0387
Lower Div. Bus. GPA	0.7472	*	0.0360			
Overall GPA				0.8287	*	0.0412

* Coefficient is statistically significant at .05 level.

The distinction between the two GPA measures presented above is about breadth versus focus. Is prospective performance in the professional business program better predicted by a broad measure of overall performance or is it better predicted by performance in a targeted set of precursor courses? An alternative way to address this question would be to divide the student's academic performance into two separate sets of classes 1) classes in the LDBC and 2) all other classes. This provides two independent GPA measures whose impact on upper division performance can be assessed.

Table 2 presents the results of this type of analysis. The explanatory power of the model is somewhat improved – the adjusted R-Square improves to just over 51 percent from 49 percent. Both the LDBC GPA and the GPA in Non-Core classes have statistically significant impacts on performance in the UD Core. However, the magnitude of the LDBC coefficient is nearly 3 times as large as that of the Non-Core GPA. This suggests that Non-Core class performance is less important than performance in the LDBC, but still adds something to the assessment of how well a student is likely to perform. A weighted average of these 2 GPAs with weights based on their coefficients might be used as an admission criteria, but such a formula would be cumbersome.

Table 2

Impact of LDBC GPA and GPA in Other Courses on UD Core GPA

		Coefficient Value		Standard Error
Degrees of Freedom				
Model		4		
Error		463		
Adjusted R-Square		0.513		
Parameters				
Intercept		0.6080	*	0.2090
Age		-0.0054		0.0074
Gender		0.0549		0.0382
Lower Div. Bus. GPA		0.6008	*	0.0465
Non-Core GPA		0.2275	*	0.0474

* Coefficient is statistically significant at .05 level.

The simplest way to incorporate both breadth and focus elements in a single performance measure would be through simply averaging the LDBC GPA and the Overall GPA. Table 3 presents regression results for a model using this GPA measure. The adjusted R-Square for this model is slightly higher than that for any of the previous models. This suggests that a combination of broad and focused performance measures may provide a better admission standard than either factor alone. Also, it is worth noting that the gender coefficient is much smaller in this model than in the one using LDBC GPA alone and that the gender coefficient is no longer statistically significant.

Table 3
**Impact of a Composite Lower Division GPA Measure
on UD Core GPA**

Degrees of Freedom

Model	3		
Error	462		

Adjusted R-Square	0.515		

Parameters	Coefficient Value		Standard Error
Intercept	0.5293	*	0.2064
Age	-0.0038		0.0074
Gender	0.0446		0.0368
GPA Index **	0.8418	*	0.0386

*   Coefficient is statistically significant at the .05 level
**   (Lower Division Business GPA + Overall GPA) / 2

Our results only provide guidance about the types of performance indicators that might be useful criteria for admissions. Our data does not directly support a determination of the level of performance that should be required, nor does it allow us to determine whether a single criteria based on a combination of factors is preferable to a set of distinct standards which students must meet – such as, a GPA of 2.75 in the LDBS courses *and* an overall GPA 2.75.

The results presented thus far have provided direct analysis of the first two types of admission criteria that were described in the previous section. We have not yet provided an analysis of the third type of admission standard, however, ones based on performance in specific individual courses. Recall that this type of standard required achieving a specific level of grade (usually a "B") in each of a small number of targeted courses. Direct analysis of this type of performance measure is difficult since the courses used will vary across institutions. However, we can present a model that looks at individual grades in all of the courses of the LDBC as defined above. It is likely that specific target courses would come primarily from this set. In addition, looking at individual course performance may be useful from an intervention perspective.

Since individual grades are clearly not normally distributed, individual class grades are converted to a pair of dummy variables in the model presented below. The first dummy variable is set to a value of 1 if the student earned an "A" in the course and is 0 otherwise. The other dummy is set to a 1 if the student earns less than a "B" in the course and is 0 otherwise. As noted above, a student must earn at least a "C" in each of these courses at NAU before achieving major status. Thus, the pair of dummy variables has the effect of establishing a "B" as the base case and assessing the impact of performance above or below that level. Also, note that this technique makes no assumption that the difference between an "A" and a "B" is the same as the difference between a "B" and a "C."

The results of this model are shown in Table 4. The adjusted R-square is comparable to prior models. As with the model using LDBC GPA, this model shows a small but significant, about one-tenth of a point, stronger performance for female students in the UD Core than for males with comparable grades in the various LDBC courses. The coefficients for each of the individual courses are of particular interest.

Table 4
**Lower Division Business Course Performance and
Performance in The Upper Division Core**

Degrees of Freedom

Model		16
Error		451

Adjusted R-Square   0.508

Parameters		Coefficient		Standard Error
Intercept		3.191	*	(.1628)
Age		-0.0989		(.0075)
Gender		0.1086	*	(.0371)
Grades in:				
Financial Accounting	A	-0.024		(.0568)
	C	-0.1025	*	(.0447)
Managerial Accounting	A	0.2603	*	(.0578)
	C	-0.0921	*	-0.0439
Business Law	A	0.0215		(.0461)
	C	-0.1214	*	(.0499)
Intro to Info. Systems	A	0.0567		(.0432)
	C	0.0034		(.0553)
Macroeconomics	A	0.1023	*	(.0445)
	C	-0.0576		(.0494)
Microeconomics	A	0.1251	*	(.0505)
	C	-0.1285	*	(.0451)
Statistics	A	0.2364	*	(.0473)
	C	-0.1667	*	(.0451)

*   Coefficeint is statistically significant at .05 level.

As one would expect, there are moderately high levels of multicollinearity between the various course grades. For example, the correlation between the grades in the two accounting courses was above .6, while those for other pairs of courses were generally in the range of .3 to .45. Several of the coefficients for the "A" and "C" course variables are non-significant, however, only two have unexpected signs (the "A" coefficient for the Financial accounting course and the "C" coefficient for the information systems course) and neither of those coefficients approaches statistical significance.

The two most powerful predictors in this model are earning "A" grades in Managerial Accounting and Business Statistics. The indicators of students who will be high performers are somewhat more clear-cut than those that indicate students who will struggle. However, "C" grades in Statistics, Business Law, and Microeconomics are rather strong indicators of lower performance in the upper division classes.

These results do not clearly identify two or three target courses where "B" or better performance could be used as an admission standard. However, they do suggest some areas for intervention – among students receiving a "C" in any of the above courses - to improve the chances of those students meeting the admission standard and successfully completing the major.

CONCLUSIONS

This study has examined factors influencing academic performance in UD Core courses with an eye to identifying performance criteria that might be appropriate for use as admission standards. While lack of data has limited our analysis, we were able to establish that performance in a set of lower-division business classes is a strong factor in determining performance in higher-level core courses. Overall GPA over the first two years of study was also found to be a strong predictor of upper division performance although slightly less accurate than the more focused business core related measure. Finally, use of the average of the GPA in lower division business core classes and the overall GPA provides an improvement of either measure taken alone perhaps suggesting that admission standards should incorporate both program-focused and broad performance measures. .

We also analyzed the effects of performance in specific program-focused courses on upper-division core performance. Our results do not suggest that upper-division performance can be effectively predicted by performance in two or three key lower division courses. However, they do suggest that not all of the lower-division core courses are equal in their impact on later performance which might provide some insights that are useful in counseling students who are preparing for admission to the professional business program.

The analysis presented here has been limited by gaps in the available data. A similarly designed study which also included transfer grades and solid measures of student ability at entry could substantially extend the current effort. In addition there seems to be little available data about the nature of admission standards used by business schools in their undergraduate programs. A study looking at the types of criteria used and their prevalence would be of great use to schools considering adoption of or modifications to admission standards.

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