THE INFLUENCE OF STUDENT PERSONALITY ON TEST PERFORMANCE IN ECONOMICS FOR AFRICAN-AMERICAN STUDENTS

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Abstract

The primary objective of this study was to estimate the influence of personality type on African American student performance in the first college course in macroeconomics at one of the Historically Black College and Universities (HBCUs). Data were collected on student test scores and individual characteristics from a survey in the 1995 Spring and Fall semesters and the Spring semester of 1996. The Myers-Briggs personality type indicators are used to estimate the impact of personality on student performance. The model that was developed and estimated is highly significant. The variables significant at the one percent level in the estimated model were: college grade point average, ACT score, hours enrolled for during the semester, understanding demand and supply and grade expectation. Students that were classified as thinkers scored 6.05 points higher than students that were classified as feelers and is significant at the five percent level. A student classified as a perceiver scored 5.56 above those that were judgers. Thus, performance is impacted on the basis of personality. This suggests the need for different teaching methods based on the way in which students with different personalities learn and process information. The overall level of African American student performance in economics points to the need for the economics profession to consider alternative methods in the teaching of undergraduate macroeconomic principles at HBCUs.

Introduction

In order to assess African-American student educational performance in economics, it is critical that more information and knowledge are acquired on the current achievement of this group at the principles level in this discipline. Research in the area of educational production functions provides an improved method for understanding the influence of specific inputs on student performance. However, research in the area of minority student performance, particularly on African Americans is limited. Our main concern in this study is to examine the influence of personality type on African-American student performance in the introductory macroeconomics class at one of the Historically Black Colleges and Universities (HBCUs). Research indicates the low participation rate among African Americans as business owners in the U.S.

economy and the importance of education in the development of successful entrepreneurs (Bates). A firm understanding of economic principles is an important element in the establishment of an entrepreneurial culture. In addition, a recent article in Black Issues in Higher Education (Ruffin) points to the lack of African Americans as professional economists. One reason suggested in this article for the low number of African-American doctorates in economics are the educational methods being used in teaching economics.

Research using the Myers-Briggs Personality Type Indicator (MBTI) suggests that individuals have different learning styles that can influence their performance based on the methods used in instruction. Thus, this study looks at the significance of the MBTI on African-American students at an HBCU in the macroeconomics principles course.

Data on test performance were obtained from classes in principles of macroeconomics and are analyzed using multiple regression analysis. Past research provides information on those variables that have proved important in assessing student performance in economics. This research is important in that it provides information that may be considered in the development of programs and policies for achieving greater African American participation in the study of economics. This study also contributes to an increased understanding of student performance by providing replication and support for the findings in previous studies.

Prior Research

A review of the literature on student performance studies provides a base from which to proceed in this analysis. Schmidt [1983] investigated the importance of time allocation on student performance in economics, variables significant to performance in this analysis included ability as measured by American College Test (ACT) scores and the amount of time allocated to lecture and discussion. Borg, Mason and Shapiro [1989] estimated a production function for principles of economics courses. Significant variables in this analysis included grade point average, ACT or SAT score and cumulative hours completed. Borg and Shapiro [1996] estimated the influence of personality type on student performance in introductory principles of macroeconomics classes. Variables specified in the model included SAT score, high school grade point average, total credit hours that the student has completed, dummy variables for sex and race, and the use of dummy variables to measure the influence of different learning styles with the Myers-Briggs Type Indicator (MBTI). Variables significant in their model included, high school grade point average, SAT score and the MBTI. Gender and race were not significant in this study, which the researchers suggest may be the result of including personality type. The present study adds to the knowledge base by applying statistical methods to a segment of the academic market that has not been studied in detail. We include the influence of personality type using the MBTI indicator as was tested in the Borg and Shapiro study. It is important to study student performance, for economic literacy is seen as being inextricably linked to

society's social fabric, in that economic reasoning helps individuals recognize and explain cause and effect relationships rather than making social decisions on the basis of emotion.

Theoretical Model

From a theoretical perspective, the model used in this study is formulated on the basis of production theory and previous research. Theoretically, the educational production function can be expressed as follows:

(1) $Q = f(X_1, X_2, X_3, X_4, X_5)$.

Where Q represents output in terms of an index of performance (test score, homework grade, etc.), X_1 represents student ability as measured by GPA and ACT, X_2 represents appreciation for the subject, such as majoring in business, X_3 represents time available to study the subject as measured by number of courses enrolled for during the semester, X_4 represents motivation as measured by grade expectations and study habits and X_5 represents personality type as measured by MBTI.

Multiple regression analysis is used in estimating the educational production function. Ordinary least squares (OLS) is the method selected in estimating the influence of a given variable on student performance. This method results in the best linear unbiased estimates when its assumptions are satisfied. For additional information on the properties and assumptions of the OLS estimator, refer to Gujarati. In general, we find that previous research has identified the major variables important in explaining course performance and we proceed by including these in our model. Rather than look at a single variable such as personality type, the production model must first be specified to include all independent variables influencing performance in a significant manner.

Once the model has been specified, multiple regression analysis allows for the testing of the influence of each variable on test performance. While previous research has provided the base model used in analyzing student performance, we extend this model by including additional variables and applying it to the African-American segment of the higher education market that has not been previously addressed from the perspective of HBCU institutions, where these students are enrolled in large numbers. Most studies that have included African-American students have a small number of these students in the survey, which may not be representative of this population. In the case of this study, the undergraduate student population at the surveyed institution is 98.5 percent African American.

The focus of this analysis is the influence of learning styles as measured by the Myers-Briggs Personality Type Indicator (MBTI). The MBTI model was developed by Isabel Briggs Myers and Katherine Briggs as an application of psychologist C. G. Jung's theory of personality. Jung classified all conscious mental activity into four processes. The MBTI classifies individuals along four

scales, (1) Extroversion - Introversion, (2) Sensing - Intuition, (3) Thinking - Feeling and (4) Judgement - Perception. These four designations are summarized in Table 1.

Table 1.
Definitions of MBTI Personality Types

Extroversion: (E) The person's interest flows mainly to the outer world of actions, objects, and persons.	Introversion: (I) The person's interest flows mainly to the inner world of concepts and ideas.
Sensing: (S) The person prefers to perceive the immediate, real, practical facts of experience and life.	Intuition: (N) The person prefers to perceive the possibilities, relationships, and meaning of experiences.
Thinking: (T) The person prefers to make judgements and decisions objectively, impersonally, considering causes of events and where decisions may lead.	Feeling: (F) The person prefers to make judgements or decisions subjectively and personally, weighing values of choices and how they matter to others.
Judgement: (J) The person prefers mostly to live in a decisive, planned, and orderly way, aiming to regulate and control events.	Perception: (P) The person prefers mostly to live in a spontaneous, flexible way, aiming to understand life and adapt to it.
Source: G. D. Lawrence. 1982. People Types and Tiger Stripes: A Practical Guide to Learning Styles. Second Edition. Gainesville, Fla.: Center for Application of Personality Types.	

Estimated Model

The dependent variable in the model is the student's final exam test score in macroeconomics. This is a comprehensive 200-point examination that is administered to all students taking introductory economics and is measured in absolute points that the student received. The exam is composed of 80 questions from the test bank of the commonly adopted textbook that is used by all instructors for the course. The exam is multiple choice and is developed by the course coordination committee. All instructors that teach the class are required to submit questions for inclusion on the final exam. Data on other variables in

the model were obtained from a student survey at an HBCU during the 1995 Spring and Fall semesters and the Spring semester of 1996. A total of 410 questionnaires from 15 classes were returned from the survey for the first macroeconomics course. Four dummy variables are used to account for the influence of the major Myers-Briggs Personality Type Indicators (MBTI). The following variables were included in the estimated model:

SCORE = F(C, ACT, HRSENROL, ACCTMAJO, HRSWORK, COLLGPA, DEMASUPY, AGE, LOWGRADE, NEWIE, NEWNS, NEWTF, NEWPJ)

where:

SCORE	= Absolute final exam test score in macroeconomics out of a maximum possible of 200
C	= Constant term
ACT	= Score on the American College Test
HRSENROL	= Total semester hours the student is currently enrolled for
ACCTMAJO	= Zero-one dummy variable, value of one if an accounting major, zero otherwise
HRSWORK	= Hours employed per week
COLLGPA	= College grade point average
DEMASUPY	= Zero-one dummy variable, value of one for full understanding of demand and supply, zero otherwise
AGE	= Student's age
LOWGRADE	= Lowest letter grade the respondent desires
NEWIE	= Zero-one dummy variable, value of one for introvert, zero if extrovert
NEWNS	= Zero-one dummy variable, value of one for intuition, zero if sensing
NEWTF	= Zero-one dummy variable value of one for thinking, zero if feeling
NEWPJ	= Zero-one dummy variable value of one for perception, zero if judgment

Based on previous research the variables included in this model are expected to contribute significantly in explaining student performance in economics. It is hypothesized that grade point average (COLLGPA) and score on the American College Test (ACT) which measures the student's past performance and ability respectively, will have highly significant and positive influences on student performance. This has been the general finding in previous research studies. Being an accounting major (ACCTMAJO); having a complete understanding of demand and supply (DEMASUPY); age (AGE) and lowest grade that is acceptable to the student (LOWGRADE) are all expected to positively influence student exam performance.

The economics program at the surveyed institution is in the business school,

which has a graduate program in accounting. The accounting program attracts students that are focused on succeeding in business careers. Accounting is the largest program in the college and receives the highest priority in resource allocation. Thus, the macroeconomics principles class is more of a service course for business and non-business majors at the freshman and sophomore levels. The number of economics majors at this level is less than five. A zero-one dummy variable is used to test the hypothesis that accounting students as a group, perform at a higher level than other students in macroeconomics principles.

The total number of semester hours that the student is currently enrolled in (HRSENROL), and the number of hours that the student is employed (HRSWORK), are each expected to have a negative influence on test performance. These variables reduce the amount of time that a student has available for studying in general and therefore are expected to adversely impact performance.

TABLE 2.
Descriptive Statistics on Dependent and Independent Variables First Economics Course (Survey Sample).

Variables	Mean	S.D.
SCORE	113.92	26.43
ACT	19.05	3.16
HRSENROL	15.48	2.64
ACCTMAJO	0.14	0.35
HRSWORK	13.22	14.71
COLLGPA	2.76	0.49
DEMASUPY	0.76	0.42
AGE	20.58	2.60
LOWGRADE	2.49	0.66
NEWIE	0.54	0.49
NEWNS	0.24	0.42
NEWTF	0.52	0.50
NEWPJ	0.28	0.45

The zero-one dummy variables for the student's personality are being tested in the model, the Borg and Shapiro study found that the introvert personality type performed significantly better than identical students with other personality types. Our hypothesis is that students with personality types designated as introversion, intuition, thinking and perception are more adapt at performing at higher levels in economics, all else being the same. We expect this result due to the nature of the subject matter in terms of the requirement to examine relationships through the use of abstraction in the thought process. Thus we

expect NEWIE, NEWNS, NEWTF and NEWPJ to be positive and significantly different from zero. Summary statistics for the variables are presented in Table 2.

Regression Results

In general, the regression results are indicative of a highly significant relationship between the dependent and independent variables and are presented in Table 3. The student survey resulted in 295 questionnaires out of 410 (72 percent) that were filled out correctly and completely for use in our analysis. The model's results are consistent with the findings in previous studies in general. The F-statistic, which tests the null hypothesis that all the estimated partial slope coefficients in the model are zero, is highly significant (below the one percent level) thus rejecting the null hypothesis. The adjusted coefficient of determination at 33.83 percent indicates that the linear model explains one third of the total variation in final exam scores.

Ten variables in the model were statistically significant at the 10 percent level or below. The variables significant at the one percent level in the model are as follows: the ACT test score (ACT), college grade point average (COLLGPA), hours currently enrolled for (HRSENROL), having a full understanding of demand and supply (DEMASUPY), and lowest grade that is satisfactory to the student (LOWGRADE). Variables significant at the five percent level were, being an accounting major (ACCTMAJO), hours worked per week (HRSWORK), and being a thinker (NEWTF) rather than a feeler on the MBTI personality type indicator. Two variables were significant at the 10 percent level in the model, years of age (AGE) and being perceptive (NEWPJ) rather than being judging on the MBTI personality type indicator. The introversion (NEWIE) and intuition (NEWNS) personality type indicators were not statistically significant in the estimated model.

The estimated coefficients varied considerably in terms of their impact on test performance. ACT score has a positive sign and the estimated coefficient indicates that for every one point increase in ACT score, final exam test results improved by 1.63 points. Hours carried per semester (HRSENROL) have the expected negative coefficient and indicates that, for every three hours of increased course work, test performance decreases by 3.78 points. Being an accounting major (ACCTMAJO) resulted in a 7.13 point increase in test performance. As expected, hours worked (HRSWORK) has a negative impact on performance, for each 10 hour increase in market work time, test results decreased by 1.80 points. College grade point average (COLLGPA) is highly significant in the model, for a one unit increase (one letter grade) in this variable, test scores increase by 12.48 points. Older Students in the class had higher scores, the age variable (AGE) is significant at the 10 percent level indicating that for each additional year of age, student performance on the final exam increased by 0.87 points. Student grade expectations as measured by the lowest grade that was satisfactory to them indicates that for each letter grade increase in grade expectations, test performance increased by 10.35 points.

Students indicating that they had a complete understanding of demand and supply had a 12.07 point increase in their final exam score compared to those that did not completely understand these concepts.

The results for the MBTI variables suggest that two of the four personality types are significant to test performance. Those students that were thinkers (NEWTF) and perceivers (NEWPJ) scored higher than those that were feelers and judgers.

TABLE 3.
Estimates of Parameters and their Significance for Economics First Course Dependent Variable is SCORE

Independent Variables	Estimated Coefficient	t-statistic
C	11.60	(0.73)
ACT	1.63***	(3.66)
HRSENROL	-1.26***	(-2.50)
ACCTMAJO	7.13**	(1.96)
HRSWORK	-0.18**	(-1.84)
COLLGPA	12.48***	(4.21)
DEMASUPY	12.07***	(3.94)
AGE	0.87*	(1.66)
LOWGRADE	10.35***	(4.92)
NEWIE	-0.67	(-0.26)
NEWNS	0.80	(0.25)
NEWTF	6.05**	(2.32)
NEWPJ	5.56*	(1.87)
F	13.52***	
Adj R^2	33.83%	
S.E.	21.50	
N	295.00	

t-values are in parenthesis. Significance level: *0.10, **0.05, ***0.01

These results are different from those reported by Borg and Sharipo. These researchers report that being an introvert increased performance. In our model, thinkers and perceivers scored significantly higher on the final examination in macroeconomics. Thus, two of the personality types are significant in our model.

In terms of statistical significance, it is the thinkers that are highly significant in our model (at the five percent level). Thus, as hypothesized, the ability to make decisions objectively and to impersonally consider case of events and where decisions may lead is important in the study of economics based on our results. Students that were thinkers (NEWTF) scored 6.05 points above

those that were feelers and those that were perceivers (NEWPJ) scored 5.56 points higher than those that were judging. Thus, if the individual is a thinker and perceiver, this will increase their score by 11.61 points. These results are significant and in line with our expectations. Our findings in general, come as no surprise, to perform well in economics requires ability and time allocated to the subject matter, as well as a personality type that is geared toward thinking in the way of making decisions by analyzing and considering the evidence in seeking to understand economics using abstract models.

Diagnostic tests on the model for multicollinearity and heteroskedasticity were negative. The Variance Inflation Factors for each coefficient were obtained in the analysis and ranged from a low of 1.04 for the accounting major variable to a high of 1.36 for college GPA. Thus, multicollinearity is not considering a major problem in the model. The Pearson correlation matrix shows that none of the correlations between the independent variables is above 0.40. A plot of the residuals suggests that no pattern exists, other than a purely random distribution (white noise).

Summary, Conclusions and Implications

This research provides an estimate of the educational production function for African American student performance in the first college macroeconomics course at one of the Historically Black Colleges and Universities (HBCUs). Results from the model (Table 3) are highly significant and informative in terms of the variables that influence course performance. Five variables in this study were statistically significant at the one percent level in the estimated model, they were: ACT score, college grade point average, hours that the student is enrolled for during the current semester, having a complete understanding of demand and supply and lowest grade that satisfies the student. These variables all exhibited the expected sign and had a major influence on performance. College grade point average is taken as a measure of ability and dedication in general and is highly significant as it has been in previous studies. An inverse relationship was estimated between final exam performance and the number of hours that the student is enrolled for during the semester. As expected, students indicating that they had a full understanding of demand and supply scored at a higher level on the final exam compared to those that did not completely understand these concepts.

This research has provided information on those variables important to student performance in economics and serves as a framework for an improved understanding of the educational process in economics instruction at an HBCU. In general, we would have to draw the conclusion that those variables that are important to majority student performance in economics based on previous studies are also important to minority student performance. If our objective is to increase the performance of African-American students, ways of generating a more effective use of time in the study of the subject should be considered. Students may also need more time in the course allocated to understanding basic demand and supply analysis. Thus, much work remains to be done to improve

African-American student performance. The use of computer-assisted tutorials that concentrate on basic economic principles such as demand and supply may be a productive means for increasing African-American student performance.

Economics departments can investigate the possibility of expanding the teaching methods and materials used in presenting economic concepts to undergraduate students. There is much that can be done to make the material presented more classroom-friendly. These steps may be even more critical when the purpose is to increase African American participation in the economics profession. Also, students should be advised of the trade-off between the number of hours that they work and enroll for in relation to how test performance is impacted. Instructors should emphasis the importance of time allocated to the study of economics to increase the understanding of demand and supply analysis.

Based on the estimated results using the Myers-Briggs personality type indicators, students that were thinkers scored 6.05 more points than those that were feelers and those that were perceivers scored 5.56 more points compared to those that were judging. These results are significant and in line with expectations. These findings come as no surprise, to perform well in economics requires ability and time allocated to the subject matter, as well as a personality type that is geared toward thinking in the way of making decisions by analyzing and considering the evidence and being perceptive in gathering information and seeking to understand.

While the surveyed institution is an open admissions university, efforts to increase the student's awareness of the impact of grade point average and ACT score on college performance in economics should be emphasized. An improvement in the performance levels of entering students on the ACT and raising their GPA once admitted would have a major impact on their performance in economics. However, given that the university has a responsibility to design programs to move low performing students to higher target levels once they have been admitted, the use of remedial programs and diversified teaching methods that take into consideration differences in personality and learning styles should be considered. Based on our MBIT estimates there are significant performance gains that are possible using these approaches.

Finally, in any organization, public or private, new technology is a means to improve output and productivity. It is time for an open debate on the use of improved technology at HBCUs to increase effective teaching for students that need to improve their performance. The mean score by students on the final exam in macroeconomics principles was approximately 57 percent. This result underscores the need to improve educational performance if African Americans are to fully participate in the global market economy as a result of an improved understanding of basic economic principles.

References

Bates, Timothy (1990). "Entrepreneur Human Capital Inputs and Small Business Longevity," TheReview of Economics and Statistics, Vol. LXXII, No. 4, November, pp. 551-559.

Bonello, F. J., W. I. Davisson and T.R. Swartz (1980). " Why Have We Ignored The Distribution of Benefits from College Instruction?" Journal of Economic Education, 11(2): pp. 28-36.

Borg, Mary O., Paul M. Mason and Stephen L. Shapiro (1989). "The Case of Effort Variables in Student Performance." Journal of Economic Education, (Summer), pp. 308-313.

Borg, Mary O. and Stephen L. Shapiro (1996). "Personality Type and Student Performance in Principles of Economics." Journal of Economic Education, (Winter), pp. 3-25.

Gujarati, Damodar. Basic Econometrics. Third Edition, McGraw-Hill, 1995. pp. 59-69.

Highsmith, Robert J. and William J. Baumol. (1991). "Education in Economics: Evidence on Determinants of Effectiveness." American Journal of Agricultural Economics, (December), pp.1378-1385.

Johnson, Marc A. (1991). "Toward Increased AAEA Involvement in Economics Education: Discussion." American Journal of Agricultural Economics, (December), pp.1386-1387.

Lawrence, G. D. (1982). People Types and Tiger Stripes: A Practical Guide to Learning Styles, Second Edition, Gainesville, FL: Center for Application of Personality Types.

Miller, Bill R. , H.M. Bahn, M. Drygas and C. H. Rust (1995). "Economics Education in a Workshop Setting: Agricultural Business Plan Training in an Emerging Democracy and Market Economy." American Journal of Agricultural Economics, (August), pp. 462-470.

Monahan, J. (1983). "An Educational Production Function for Principles of Economics." Journal of Economic Education, 14: (Spring), pp. 11-16.

Reda-Wilson, Kimberly. (1991). "Economic Literacy: A Marketable Product for Land Grant Universities. " American Journal of Agricultural Economics, (December), pp. 1370-1377.

Ruffins, Paul. (1996). Black Economist: An 'Elite Clan of Warrior Intellectuals,' Black Issues in Higher Education, November 14, pp. 18-24.

Schmidt, R. M. (1983). "Who Maximizes What? A Study in Student Time Allocation." American Economic Review, 73 (2): pp. 23-28.

Shulman, Steven. (1996). "The Political Economy of Labor Market Discrimination: A Classroom-Friendly Presentation of the Theory." The Review of Political Economy, (Spring-Vol. 24), (No. 4), pp 47-64.

Siegfried, J. J. and R. Fels. (1979). "Research on Teaching College Economics: A Survey." Journal of Economic Literature, (17) (September), pp. 923-969.