Does Macro/Micro Course Sequencing Affect Student Performance in Principles of Economics Courses?

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Abstract

Using a sample of 870 students in the College of Business at the University of Arkansas at Little Rock, we look at the question of whether and to what extent Macro-Micro course sequencing affects student performance in principles of economics. We find that the optimal sequencing involves having students take the two principles of economics classes concurrently. In addition, consistent with most prior research, we find that grade point average, major, and to some extent ethnicity and gender are significantly related to performance in one or both of the principles of economics classes.

Introduction

Most larger colleges and universities offer a two semester sequence in principles of economics. One course usually deals with microeconomics while the other normally concentrates on macroeconomics. One question that must be addressed by every institution offering these courses is how best to sequence them if, indeed, they are sequenced at all. Some institutions prefer that students take microeconomics before macroeconomics, while others prefer just the reverse. Others schools permit students to take the courses in any order.

The overriding concern in addressing this sequencing issue is how best to promote student learning in the area. If, for example, it were shown that overall learning in economics was enhanced by having students take microeconomics first, then that should be the proper sequencing. Unfortunately, this issue cannot be adequately addressed without a quantitative assessment of the question. There are several studies that have looked at this issue, and interestingly enough they all produced conflicting results. In an effort to add some further evidence to this debate, we rely on student data collected in the College of Business at the University of Arkansas at Little Rock to assess how the sequencing of micro and macro principles affects student learning in the area. Following this introduction, we look at some of the previous research dealing with this question. This is followed by a discussion of the data and the model to be estimated. Results are discussed and conclusions drawn in the last two sections of the paper.

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Previous Research

As noted above, the evidence concerning the optimal sequencing of micro and macro principles has been contradictory. For example, Brasfield et al. (1993), using student information relating to principles courses taken at Murray State University for the period 1987-90, found that students who had already taken one principles course did better (in terms of grade received) in the second one as opposed to those students who had no previous background in economics. They found the same statistically significant result for their macro and micro equations, and, thus, they concluded that course sequencing did not matter. However, they chose not to explore this issue further since this question was not the principle focus of their paper.

The study by Fizel and Johnson (1986) was the first one that focused primarily on the issue of the optimal sequencing of micro and macro principles courses. In this study, the authors used student information from the University of Wisconsin-Eau Claire for the 1983-84 academic year to determine the best sequencing of principles courses for student learning. Relying on results from the Revised Test of Understanding College Economics to assess student learning in economics, Fizel and Johnson found that, "the micro/macro sequence consistently generated higher levels of economic understanding than did the macro/micro sequence." On average, they found that micro/macro students did anywhere from 10 to 50 percent better than macro/micro students.

The most recent article dealing with this issue is by Lopus and Maxwell (1995). In their article, they first look at the course sequencing requirements in some of the top ranked economics departments, and find that most require either no specific ordering of courses or that microeconomics be taken first. They also do a brief literature search to determine how some economists view the sequencing issue. To quantitatively assess the importance of sequencing on student learning, Lopus and Maxwell use national data from the Third Edition of the Test of Understanding in College Economics collected during the 1989-90 academic year. The data were collected from 53 colleges and universities across the U.S., and consisted of test scores as well as other student/professor background data. Using ordinary least squares, with posttest and pretest scores in micro and macro principles as alternate dependent variables, Lopus and Maxwell found that a prior course in macroeconomics had a positive, statistically significant impact on both pretest and posttest scores in the micro principles course. However, a prior course in micro principles had no such effect on macro principles scores. As a result, the authors conclude that, "…student learning is enhanced by teaching macroeconomics before microeconomics."

As discussed above, each of the studies in this area has found differing results regarding the proper sequencing of micro/macro principles. In an effort to add additional evidence to the debate in this important area, we look at this question again in the context of data gathered for micro/macro principles courses in the College of Business at the University of Arkansas at Little Rock.

Model and Data

Data for this research were collected from a sample of 87 0 students who completed either or both principles of micro/macro economics at the University of Arkansas at Little Rock between 1996 and 2001. The University of Arkansas at Little Rock (UALR) is a metropolitan university with a significant number of non-traditional students. Many students work during the day and attend college at night. Approximately 20% of the students in the sample attended the principles of economics classes at night. The sample for UALR during this period is unique in that students were able to take the principles of economics classes in any order. This allows us to test whether the sequence in which students take microeconomics and macroeconomics matters.

The dependent variable (*Grade*) in our analysis represents the final grade received in the principles of micro/macro economics classes. Letter grades were converted to numerical values with A=4, B=3, C=2, D=1 and F=0.[3] The mean grade in the principles of macroeconomics class was 2.71, or a high "C." The mean grade in the principles of microeconomics class was 2.58, or a middle "C." It is recognized that final

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[3] Students receiving a grade of W (withdrawal) were excluded from the analysis. If W is interpreted as a failure in the course, then excluding these grades has the effect of biasing upward the average grade received.

grades, as a measure of economic knowledge, have certain inherent limitations. Therefore, final grades are just an index (or perhaps proxy would be a better word) of students' underlying knowledge of economics.

The independent variables in our sample capture various educational inputs, intellectual ability, and general student characteristics. The possibility of differential grading by professors is also taken into account. Prior research provides guidance as to which independent variables should be included. See for example Anderson, et. al. (1994), Borg, et. al. (1996), Robb, et. al.(1999) and Ziegert (2000). In particular, the independent variables include the student's grade-point average, the student's major field of study, the student's gender and ethnicity, whether the economics course was taken at night or during the day, whether the course was taken during the summer term or during the regular fall or spring semesters, and whether the course was taught by one of the full-time faculty members or by a part-time instructor.

In addition, we include variables to examine the impact of sequence on student performance. The model for microeconomics contains two variables that indicate whether the principles of macroeconomics course was taken previously, or whether the two courses were taken concurrently. Similarly, the model for macroeconomics contains two variables that indicate whether the principles of microeconomics course was taken previously, or whether the two courses were taken concurrently.

Summarizing, the models we estimate are: *Micro/Macro Grade = f(Night, Summer, FT1-FT3, (or FT1-FT4), Ptngt, GPA, Age, Ethnicity, Gender, Major, First, Concurrent)*. *Night* is a binary variable equal to 1 if the class was taken at night, and 0 if taken during the day. The expected sign of the night variable is ambiguous. Students who take the class at night may have work responsibilities during the day that interfere with school. On the other hand, the students who take the class at night may be more serious and more dedicated. The binary variable *Summer* takes on a value of 1 if the class was taken during the summer terms, and a value of 0 if the class was taken during the normal spring or fall semesters. The expected sign for summer is also ambiguous.

The binary variables *FT1-FT3* in the microeconomics model (and *FT1-FT4* in the macroeconomics model) are designed to capture the possibility of differential grading by the three full-time microeconomics professors, and the four full-time macroeconomics professors. They are measured in relation to whether the course was taught by a part-time instructor. In addition, the interaction term *Ptngt* is a binary variable that takes on a value of 1 if the class was taught by a part-time instructor at night. The expected signs for both are uncertain. While full-time professors would be expected to be better teachers, part-time instructors may be more likely to inflate grades. *GPA*, grade point average, is expected to have a positive coefficient. Grade point average is a summary statistic that captures many student attributes (e.g. persistence) that are important for performance in any class in general. *Age* measures the student's age. Prior studies have found both positive and negative effects of age. The expected sign is ambiguous. Older students may be more mature and focused, and have a better understanding of business in general. Alternatively, older students may have more time commitments with families and work that detract from the time they can spend on the economics course.

Ethnicity is examined by including two binary variables, *Afam* and *Other*. *Afam* takes on a value of 1 if the student is African-American, and 0 otherwise, while *Other* takes on a value of 1 if the student is Asian, Hispanic or American Indian, and 0 otherwise. The expected signs on the ethnicity variables are ambiguous. The *Gender* variable is a binary variable that takes on a value of 1 if the student is female, and 0 if the student is male. Much, though not all, of prior research indicates that males tend to perform better in economics classes than females. Consequently, the expected sign on *Gender* is negative. Major is examined by including the binary variable *Acecfi*, which takes on value of 1 if the student is an accounting or economics or finance major, and 0 otherwise.[4] The reference group consists of all other business majors and any non-business majors taking principles of economics. The expected sign on *Acecfi* is positive,

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[4] Economics majors were combined with accounting and finance because they comprised less than 2% of the total majors. These are collectively the quantitative majors in the business curriculum. The authors also estimated a model that included binary variables for management, marketing and MIS majors, but none of the estimated coefficients was significant. For parsimony these variables are excluded.

based on prior research. The more quantitative business majors are expected to perform better in the economics classes.

With respect to course sequencing, there are three possibilities. Students can take principles of microeconomics prior to taking principles of macroeconomics, they can take principles of macroeconomics prior to taking principles of microeconomics, or they can take the two courses concurrently in a semester. The binary variables *First* and *Concurrent* are used to examine the sequencing issue. The variable *First* is a binary variable that takes on a value of 1 if the student taking macro (micro) principles has taken micro (macro) principles previously. The expected sign is positive. Students who have previously completed either principles class have been exposed to the terminology of economics and the general framework for analysis and thus should perform better in the next class than those who have not had an economics class before. The variable *Concurrent* is a binary variable that is equal to 1 if the student took the two principles courses concurrently in a semester. Taking the two courses concurrently may lead to possible synergies between the two courses and perhaps impact performance in each. If this is the case, the expected sign on the coefficient is positive. On the other hand, taking the two courses currently may simply result in overlap of material with little resulting synergy. Table 1 summarizes the independent variables and indicates the expected coefficient sign of each.

TABLE 1. Model Specification and Expected Coefficient Signs

Independent Variable	Expected Sign
Night	?
Summer	?
FT#	?
Ptngt	?
GPA	+
Age	?
Afam	?
Other	?
Gender	-
Acecfi	+
First	+
Concurrent	+

Notes: Night = binary variable equal to 1 if the student attended the class at night, *Summer* = binary variable equal to 1 if the student took the class during the summer term, *FT#* = 1 if taught by full-time microeconomics professors 1 through 3 or full-time macroeconomics professors 1 through 4, *Ptngt* = binary variable equal to 1 if the class was taught at night by a part-time faculty member, *GPA* = student's grade point average, *Age* = student's age, *Afam* = binary variable taking on a value of 1 if the student is African-American, *Other* = binary variable equal to 1 if the student is Asian, Hispanic or American Indian, *Gender* = binary variable equal to 1 if the student is female, *Acecfi* = binary variable equal to 1 if the student is an accounting, economics or finance major, *First* = binary variable equal to 1 if the student completed principles of microeconomics prior to taking principles of macroeconomics, and *Concurrent* = binary variable equal to 1 if the student took principles of microeconomics and macroeconomics concurrently.

Table 2, which contains descriptive statistics of the variables, presents variables that are specific to the macroeconomics principles model and specific to the microeconomics principles model, as well as variables that are common to both. With the exception of *GPA* and *Age*, the explanatory variables are binary, and the mean represents the proportion of the sample having that characteristic. For example, 12% of the principles of macroeconomics classes were taught in the summer (*Summer*), while 10% of the principles of microeconomics classes were taught in the summer. Note that *Gender* takes on a value of 1 if the student is female; 56% of the students were female.

TABLE 2. Descriptive Statistics – Variables Specific to Each Course

Variable	Macroeconomic Principles		Microeconomic Principles	
	Mean	Stand. Dev.	Mean	Stand. Dev.
Grade	2.71	.99	2.58	1.03
Night	.21	.41	.24	.43
Summer	.12	.33	.10	.31
FT1	.13	.34	.26	.44
FT2	.13	.34	.50	.50

FT3	.40	.49	.11	.31
FT4	.10	.30		
Ptngt	.10	.34	.08	.27
First	.26	.44	.65	.48

TABLE 2, cont.. Descriptive Statistics – Variables Common to Both Courses

Variable	Mean	Stand. Dev.
GPA	2.84	.56
Age	26.10	6.01
Afam	.24	.43
Other	.09	.29
Gender	.56	.50
Acecfi	.28	.45
Concurrent	.08	.28

With respect to sequencing (*First*), approximately 65% of the students who took microeconomics had already taken principles of macroeconomics, while 26% of the students who took macroeconomics had already taken principles of microeconomics.[5] Approximately 8% of the students attended the two principles of economics classes in the same semester.

Results

Tables 3a and 3b contain the OLS regression results for the principles of macroeconomics and principles of microeconomics models, respectively. Performance in the principles of *macroeconomics* class was significantly *positively* related to whether the class was taken in the summer (*Summer*), to the student's grade point average (*GPA*), and to whether the student was an accounting, economics or finance major (*Acecfi*). The last two results are consistent with prior research, while the first result is new. There are a couple of possible explanations. One explanation is that professor expectations and standards are lower in the summer than during the regular fall and spring semesters. A second explanation is that because students are taking significantly fewer courses over a compressed time period they are more focused.[6]

TABLE 3a. OLS and Ordered Probit Estimation Results of *Macroeconomics* Principles

Variable	**OLS Coefficient** **(t-stat)**	**Ordered Probit**
Intercept	-0.67*** (-3.62)	-2.51***
Night	-0.08 (-0.84)	-0.11
Summer	0.23*** (2.67)	0.36***
FT1	-0.01 (-0.13)	-0.11
FT2	-0.14 (-1.24)	-0..05
FT3	-0.05 (-0.57)	-0.22
FT4	-0.01 (-0.89)	-0.08
Ptngt	-0.20	-0.32

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[5] One reason that so many more students take principles of macroeconomics first is that it has the lower course number. (Econ 2321 for Principles of Macroeconomics v. Econ 2322 for Principles of Microeconomics) Alternatively, it may be that students self-select macroeconomics first, possibly because they perceive that it is the less difficult of the two.

[6] Terry (2002) found this same result in an analysis of performance in the introductory finance course.

	(-1.39)	
GPA	1.14***	1.74***
	(23.67)	
Age	0.01	0.01*
	(1.58)	
Afam	0.03	0.05
	(0.50)	
Other	-0.00	0.01
	(-0.03)	
Gender	-0.16***	-0.24***
	(-2.98)	
Acecfi	0.20***	0.33***
	(3.47)	
First	0.10	0.16*
	(1.62)	
Concurrent	0.40***	0.68***
	(4.32)	

Notes: *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level. Adj. R^2 .45 (OLS model); Sample size: 870

Student performance in macroeconomics was also significantly *negatively* related to whether the student was female (*Gender*). The gender result is consistent with much prior research On the other hand, none of the professor-related variables (FT1-4) was important, and *Night* was equally unimportant. Over 60% of the night macroeconomic classes were taught by several part-time instructors. The gender result is consistent with much prior research. The estimated coefficients on ethnicity (*Afam* or *Other*) and *Age* were also insignificant.

The variable *First*, which indicates the student had taken principles of microeconomics prior to the macroeconomics course, surprisingly was not significant.[7] The estimated coefficient on *Concurrent*, which indicates the student took principles of macroeconomics and principles of microeconomics in the same semester, is significantly positive, and is the most significant explanatory variable other than *GPA*. This suggests that the optimal sequence for principles of macroeconomics is to take it concurrently with principles of microeconomics.

Table 3b contains the regression results for principles of *microeconomics*. In microeconomics student performance was significantly *positively* related to student grade point average (*GPA*), to whether the student was an accounting, economics or finance major (*Acecfi*), and to whether the student was Asian, American Indian or Hispanic (*Other*). The grade point average and student major results are consistent with prior research.

TABLE 3b. OLS and Ordered Probit Estimation Results of *Microeconomics* Principles

Variable	**Coefficient** **(t-stat)**	**Ordered Probit**
Intercept	-0.15	-1.27***
	(-0.07)	
NIGHT	0.13	0.19*
	(1.58)	
SUMMER	-0.13	-0.18
	(-1.19)	
FT1	-.64***	-0.85***
	(-4.02)	
FT2	-0.60***	-0.80***
	(-3.95)	

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[7] In an earlier version of the paper where the authors estimated the model without the CONCURRENT variable the t-stat on FIRST was half that reported in Table 3A.

FT3	-0.20	-0.25
	(-1.19)	
PTNGT	-0.37*	-0.47*
	(-1.87)	
GPA	1.04***	1.45***
	(20.16)	
AGE	0.00	0.01
	(0.79)	
AFAM	-0.18**	-0.24**
	(-2.67)	
OTHER	0.29***	0.44***
	(2.99)	
GENDER	.03	0.03
	(0.47)	
ACECFI	0.15***	0.23***
	(2.46)	
FIRST	-0.07	-0.09
	(-1.03)	
CONCURRENT	0.43***	0.66***
	(3.93)	

Notes: *** - significant at 1% level; ** - significant at 5% level; * - significant at 10% level. Adj. R^2 .40 (OLS model); Sample size: 870

Performance in the principles of microeconomics class was significantly negatively related to *FT1* and *FT2*, and to whether the student was African-American (*Afam*). The first result may be due to part-time instructors inflating grades and/or differential grading by professors.

In the microeconomics model *Gender*, whether the class was taken at night (*Night*) or in the summer (*Summer*), whether the class was taught by a part-time instructor at night (*Ptngt*) and *Age* were not significant.

The coefficient estimates for the variables related to sequencing are interesting. The variable *First*, indicating the student had taken principles of macroeconomics prior to the microeconomics class, had a negative, though statistically insignificant, estimated coefficient.[9] This is surprising in that the coefficient was expected to be significantly positive. Exposure to a previous economics course was expected to improve performance in the next economics course. One possible explanation is that there is a self-selection bias. That is, perhaps some students perceive that microeconomics is the more difficult of the two principles classes and delay taking microeconomics as long as they can. The mean grade is lower in microeconomics than in macroeconomics, and only 26% of the students attended the principles of microeconomics class first while 65% attended the principles of macroeconomics class first. However, inclusion of *GPA* should account for the difference in students if this was the explanation.[10]

The estimated coefficient for the variable *Concurrent*, indicating the student took principles of macroeconomics and microeconomics in the same semester, was significantly positive. Only *GPA* had a more significant impact on performance in the principles of microeconomics class.

Because the dependent variable used in the analysis is discrete, with A=4, B=3, C=2, D=1, and F=0, the variable may be viewed as being ordinal in nature, and if that is the case an 'ordered probit analysis'

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[9] In an earlier version of the paper where the authors estimated the principles of microeconomics model without the CONCURRENT variable, the estimated coefficient on FIRST was significantly negative, with a t-stat of –3.36.

[10] Someone has suggested that because the principles of macroeconomics course begins with a microeconomics review, perhaps the students in microeconomics who have previously had principles of macroeconomics are lulled into a false sense of security and fail to capture the more in-depth treatment of microeconomics in the principles of microeconomics class. On the other hand, those who previously had principles of microeconomics coast through the microeconomics review in principles of macroeconomics, but readily recognize the transition to new (macroeconomic) material.

may be more appropriate. Tables 3a and 3b also include results for an 'ordered probit' estimation of the models. As indicated in Tables 3a and 3b, the models are quite robust to the estimation technique employed. Both the signs and the statistical significance of the explanatory variables are virtually identical for both estimation techniques.

The estimation results of the two models have interesting and important implications for the sequencing of the two principles of economics classes. The optimal sequence appears to involve having students take the two economics classes in the same semester. The second best sequence would be to have students take principles of microeconomics prior to principles of macroeconomics, a sequence currently in place in most academic programs.

Conclusion

Using a sample of 870 students in the College of Business at the University of Arkansas at Little Rock, this study has examined the question of whether and to what extent Macro-Micro course sequencing affects student performance in principles of economics. We find that the optimal sequencing involves having students take the two principles of economics classes concurrently. This may be due to synergies, as the terminology and framework of analysis are nearly identical, and to increased focus. The second best sequence would be to have students take principles of microeconomics prior to principles of macroeconomics. In addition, consistent with most prior research, we find that grade point average, major, and to some extent ethnicity and gender are significantly related to performance in one or both of the principles of economics classes.

References

Anderson, Gordon, Dwayne Benjamin, and Melvyn A. Fuss. 1994. The Determinants of Success in University Introductory Economics Courses. *Journal of Economic Education* 25 (Spring): 99-119.

Borg, Mary O. and Stephen L. Shapiro. 1996. Personality Type and Student Performance in Principles of Economics. *Journal of Economic Education* 27 (Winter): 3-25.

Brasfield, David W., Dannie E. Harrison, and James P. McCoy. 1993. The Impact of High School Economics on the College Principles of Economics Course. *Journal of Economic Education* 24 (Spring): 99-111.

Fizel, John and Johnson, Jerry. 1986. The Effect of Macro/Micro Course Sequencing on Learning and Attitudes in Principles of Economics. *Journal of Economic Education* 12 (Spring): 87-98.

Lopus, Jane and Maxwell, Nan. 1995. Teaching Tools: Should We Teach Microeconomic Principles Before Macroeconomic Principles? *Economic Inquiry* 33 (April): 336-350.

Robb, Roberta Edgecombe and A. Leslie Robb. 1999. Gender and the Study of Economics: the Role of Gender of the Instructor. *Journal of Economic Education* 30 (Winter): 3-19.

Terry, Andy. 2002. Student Performance in the Introductory Corporate Finance Course. *Journal of Financial Education* 28 (Fall/Winter): 28-41.

Ziegart, Andrea L. 2000. The Role of Personality Temperament and Student Learning in Principles of Economics: Further Evidence. *Journal of Economic Education* 31 (Fall): 307-322.