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FEATURES AND INFORMATION

Student Performance in Undergraduate Economics Courses

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Using undergraduate student records from six large public universities from 1990 to 2003, the authors analyze the characteristics and performance of students by major in two economics courses: Principles of Microeconomics and Intermediate Microeconomics. This article documents important differences across students by major in the principles course and compares these students to those who graduate with a major in economics. The data indicate that about two thirds of students who graduate with a major in economics declared their major sometime after completing the Principles of Microeconomics course. The article documents differences in characteristics and performance for economics graduates who started as engineering, math, or physics majors as compared to business or economics majors. The authors also examine whether starting in one of the more math-intensive majors of engineering, math, or physics improves student performance in intermediate microeconomics if performance in the principles course was good.

Keywords *economics major, undergraduate economics courses*

JEL codes *A22, I21*

Most students who graduate with a bachelor's degree in economics started in some other major. What kinds of students switch into the economics major? Using a large sample of students from several universities, we show that students who have already declared a major in economics at the time they take the course on principles of microeconomics are of ability (as measured by the SAT or ACT scores) similar to that of the other students in the course. However, the economics majors receive a better letter grade on average. Students who switch into economics from math-intensive majors like engineering, math, or physics tend to have performed poorly in their former major. The same is true of business or management majors. It seems that these students are being pushed out of their former majors, not pulled into the economics major because of strong performance in the course on principles of microeconomics.

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This evidence is consistent with the discouraged-business-major hypothesis of Salemi and Eubanks (1996). Using data from the University of North Carolina at Chapel Hill, they showed that a large fraction of economics graduates were students who had performed poorly in prebusiness courses and subsequently switched into the economics major. The discouraged business majors who switch into economics have lower measured ability and lower academic performance than other economics students and also accounted for a large amount of the variation in the total number of economics graduates. However, we show that the average student switching from business to economics is similar in measured ability and performance in the course on principles of microeconomics to those students who had initially chosen to major in economics.

In addition to business majors, we also analyze the performance of students who switch into economics from math-intensive majors. Students who enter college with math-intensive majors like engineering, math, or physics may be better prepared for economics courses than students who start out as business majors or in other majors that are less math-intensive. We find evidence that supports this hypothesis for those students who do not select into economics, but we find that students from math-intensive majors who graduate in economics do not perform better than do other students in the course on intermediate microeconomics if their grade in principles of microeconomics was good.

We also document the gender and racial composition of students who switch into economics from other majors. The evidence suggests that women are just as likely as men to select into economics from the math-intensive majors. However, economics is disproportionately attracting men from the business major—a finding that Dynan and Rouse (1997) are not able to address in their study on the selection of women into the economics major because their data come from Harvard University where there is no undergraduate business major.

Performing this analysis requires a large sample of students because although many university students take courses in economics, most take only a principles-level course, and few of them major in economics. Student academic records are confidential and protected by the Family Educational Rights and Privacy Act (FERPA). This law requires researchers to either obtain written consent from each individual student or have a school official strip the student academic records of identifying information before they are provided to the researcher. The confidentiality of student records and obstacles in working with school officials, particularly those from other institutions, make it difficult to obtain administrative data. Thus researchers have primarily relied on surveys like the Baccalaureate and Beyond data collected by the U.S. Department of Education or on administrative data from a single institution.

There are some exceptions, including Siegfried (2000, 2010), where the data come from surveys of economics departments across many different institutions. However, the data are aggregated at the department level and thus are not suitable for answering questions like the ones posed. Some studies, including those by Jensen and Owen (2000) and Allgood et al. (2004), have used surveys of students across multiple schools with some administrative data. However, the sample sizes have been small.

In this study, we use data from the Multiple-Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD), a collection of student academic records for all undergraduate students from several large public universities in the South and Midwest from 1990 to 2003. A disadvantage of using this data is that it is not nationally representative, but the advantage is that it contains entire academic transcripts for more than 200,000 students who completed an economics course at one of the participating universities.

The large number of students in the data allows us to answer questions that previous researchers have been unable to answer. We restrict the focus of this article to two courses: those on principles of microeconomics and those on intermediate microeconomics. All the institutions in our data offer these two courses (by similar names), and this restriction allows us to focus on the findings without the distractions that including many other courses would introduce.

DESCRIPTION OF THE MIDFIELD DATA

The National Science Foundation provided the funding for the creation of MIDFIELD. It was created in 1996 (as the SUCCEED Longitudinal Database) and has grown as fields, years of data, and institutions have been added. In this article, we use the undergraduate academic records from Clemson, Florida State, North Carolina State, Purdue, University of Florida, and the University of North Carolina at Charlotte. The student data include a record of every course completed with the grade received. The data also include college application information including the SAT and ACT score, the high school grade-point average (GPA), and GPA percentile (defined so that a lower number indicates better high school performance). The student academic records also indicate the declared major in each semester and at graduation.

We use data from 1990–2003 throughout the study and make some effort to adjust for right- or left-tail censoring issues. One problem is that for students enrolled in the intermediate course in the first year of our data, we are unlikely to observe performance in the earlier principles course. The censoring issue is especially important in measuring graduation because we are much less likely to observe that students in later years of the data graduate because they are still enrolled. We adjust our sample in some instances as an attempt to correct for censoring.

Each of the universities in our sample is a large public institution with an engineering college as well as a business school. In each of these universities, the economics major is small, only around 1 percent of all students. However, consistent with Bosshardt and Watts (2008) and Siegfried (2000), about half of all undergraduate students take at least one economics course. Each of the universities in this study has a two-semester principles sequence with courses on both microeconomics and macroeconomics principles offered. Each of these universities also has (or had) a combined one-semester economics principles course for nonmajors.

CHARACTERISTICS OF STUDENTS IN PRINCIPLES OF MICROECONOMICS

Summary statistics for students enrolled in the Principles of Microeconomics course are given in table 1. The course grade is reported on the standard 4.0 scale where A = 4, B = 3, C = 2, and D = 1 with "+" and "−" modifiers so that a "+" adds 0.33, and a "−" subtracts 0.33. The average grade for the full sample is 2.669, which is a B−. The table shows that about 40 percent of all students in the principles course are female, 8 percent are African American, 5 percent are Hispanic, and 5 percent are Asian.

As expected, most students take Principles of Microeconomics when they are first-year students or sophomores (defined by the number of credits completed, not the number of semesters at the university). The table shows that 77 percent of these students eventually graduate, with 1.8 percent graduating in economics.

TABLE 1
Students Enrolled in Principles of Microeconomics

Variable	All students	Economics majors	Business majors	Engineering, math, and physics majors	Other majors	Economics graduates
Number of students	129,322	1,914	46,033	39,351	42,024	2,035
Course grade (4.0 scale)	2.669	2.848	2.671	2.755	2.582	3.069
Female	.397	.298	.437	.256	.492	.267
African American	.079	.077	.088	.071	.078	.079
Hispanic	.050	.059	.053	.030	.066	.053
Asian	.051	.065	.042	.060	.051	.056
First-year student	.283	.354	.316	.226	.298	.271
Sophomore	.446	.477	.551	.417	.358	.503
Junior	.189	.141	.117	.233	.228	.193
Senior	.074	.029	.016	.122	.095	.033
High school percentile	26.2	27.7	26.3	27.0	24.1	25.7
SAT verbal score	527.3	548.5	521.5	517.0	542.5	546.1
SAT math score	584.1	599.9	573.0	600.8	579.7	596.2
ACT score	24.8	25.5	24.2	25.6	24.7	25.3
Graduated	.771	.772	.778	.792	.742	1
Graduated in economics	.018	.339	.013	.010	.016	1

Note: The major is defined at the time the student first takes the Principles of Microeconomics course. The *other major* category includes all majors other than economics, business, engineering, mathematics, and physics. Agricultural economics is included in the other majors group rather than the economics major group. The data includes all students enrolled in Principles of Microeconomics at Clemson, Florida State, North Carolina State, Purdue, University of North Carolina at Charlotte, and the University of Florida from 1990–2003. Because of right censoring, the two graduation measures are calculated only using students who started at the university in 1999 or earlier.

Columns 2–5 of table 1 report the summary statistics for students in the specified majors at the time they took the Principles of Microeconomics course. From these columns, it appears that economics majors perform better in the principles course than the average student. However, the economics majors are not necessarily of higher ability than the average student in the class. The average SAT and ACT scores are higher for economics majors, but their high school academic performance is worse on average as indicated by a larger high school percentile (defined as high school rank divided by the number of students in the graduating class).

Business majors make up more than one third of the principles course enrollment. They have lower performance in the course compared with the economics majors, perhaps because they have significantly lower math ability as indicated by the 26.9-point difference in the average SAT math score (t stat $= 12.54$). One notable difference is that 44 percent of the business majors are female, whereas only 30 percent of the economics majors are female.

Perhaps surprisingly, the average SAT math score is not statistically different (t stat $= 0.39$) for economics majors and those in the math-intensive major group of engineering, mathematics (including statistics and other math-related majors), and physics. Although they are of similar ability, students in the math-intensive majors perform worse than economics majors in the principles course. The fraction of female students in the math-intensive majors is even lower than that in economics.

As reported in table 1, about 34 percent of the economics majors in the principles course eventually graduate in economics. As expected, these economics graduates (last column of table 1) perform better in the principles course than the other groups considered. Note, however, that they do not have higher average SAT or ACT scores than those students who start out as economics majors. They were slightly better students in high school as indicated by the lower class rank percentile. Note also that economics graduates are even less likely to be female than economics majors in the principles course. Economics majors at the time they take principles make up less than one third (.339 $\times$ 1914/2035) of economics graduates. This means that a little more than two thirds of students who graduate with a major in economics declare their major sometime after completing the course on principles of microeconomics. The next section examines the characteristics of students who switch into the economics major.

ECONOMICS GRADUATES WHO STARTED IN ANOTHER MAJOR

About one quarter of the students who switch into the economics major after having completed the principles course come from a math-intensive major (engineering, math, or physics). We may expect that students joining economics from a math-intensive major would have an advantage over other economics students, but we show below that this is not the case.

Using an earlier version of this same data set, Ohland et al. (2004) claim that poor performance is not the primary reason students leave engineering. They do find strong evidence that those students who have a low GPA when they leave the engineering major are more likely to switch into a major in business or management. Economics is not separated out as a destination for engineering majors in this earlier work, so we will address that here.

In table 2, we compare economics graduates who started in another major to students who took the economics principles or intermediate courses but who do not switch into the economics major. This is done to describe the type of selection into the economics major. Are they the best students or the worst students from business or math-intensive majors who switch into economics?

The cumulative GPA reported in table 2 is the cumulative GPA at the time the student took Principles of Microeconomics. Note that for engineering, math, or physics majors, those students who graduate in economics are doing 0.313 grade points worse on average in their initial major than those students who graduate in a STEM field (science, technology, engineering, or math). Initial business majors who switch into economics also have a lower GPA on average than those who graduate in business. This is consistent with the discouraged-business-major hypothesis of Salemi and Eubanks (1996). It seems natural that students who are performing poorly in their chosen major would look for an alternative major.

There does not appear to be any gender selection into economics from engineering, math, or physics. However, a shockingly small percentage of business majors who select into economics is female. There is positive selection of African American and Hispanic students into economics from the math-intensive majors and business for African American and Hispanic students, although not for Asian students.

There is little difference in the ability measures for students who switch into economics. One exception is that students in engineering, math, or physics who graduate in economics have significantly lower math ability as measured by the 35.9-point difference (t stat $= 8.70$) in the mean SAT math score from those who graduate in a STEM field. Note that the students who

TABLE 2
Students' Characteristics by First Declared Major and Graduation Major

	First major (on top) and graduation major					
	Engineering, math, or physics major		Business major		Economics major	Other major
Variable	STEM graduate	Economics graduate	Business graduate	Economics graduate	Economics graduate	Economics graduate
Number of students	16,192	667	17,098	557	658	1,214
Micro principles grade	3.167	3.013	2.900	2.947	3.040	3.126
Cumulative GPA	2.991	2.678	2.943	2.750	2.945	2.830
Female	0.201	0.216	0.439	0.253	0.243	0.287
African American	0.049	0.096	0.069	0.088	0.061	0.063
Hispanic	0.024	0.037	0.040	0.065	0.032	0.060
Asian	0.065	0.063	0.040	0.036	0.053	0.049
High school percentile	25.1	26.0	26.6	26.2	27.1	25.4
SAT verbal score	518.1	527.5	512.0	534.6	541.7	546.9
SAT math score	628.3	592.4	573.3	586.3	591.5	592.8
ACT score	26.9	24.9	24.4	24.7	24.7	25.1
Graduation GPA	3.001	2.754	2.990	2.767	2.937	2.907

Note: The *other major* category includes all majors other than economics, business, engineering, mathematics, and physics. The data includes all graduates who were students in Principles of Microeconomics or Intermediate Microeconomics from Clemson, Florida State, North Carolina State, Purdue, University of North Carolina at Charlotte, and the University of Florida from 1990–2003. For transfer students, the first major is defined as the first declared major at the graduation university. STEM graduates are those students who graduate with a major in science, technology, engineering, or math.

switch into economics did not perform better on average in the principles course than those students who graduate in a STEM field. There seems to be more of a push of poor-performing students out of STEM fields into economics than a pull of students with strong performance in the principles course into economics. It also does not seem that the students in math-intensive majors who switch into economics are of higher ability than the students who started in economics. They do not have much higher SAT math scores, and they did not perform better in the principles course.

STUDENT PERFORMANCE IN INTERMEDIATE MICROECONOMICS

The level of mathematics required for the course on intermediate microeconomics is much higher than that required for the course on principles of microeconomics. The economics major typically only requires a passing grade in calculus, whereas students in engineering, math, or physics are required to take additional math and more math-intensive courses. Therefore, it is possible that students who start out in these math-intensive majors are better prepared for the intermediate-level economics courses than those students who start out in economics.

TABLE 3
Student Performance in Intermediate Microeconomics

Principles of Microeconomics course grade	Intermediate microeconomics grade						*N* students
	A	B	C	D	F	Mean	
Panel A: All students							
A	.469	.346	.133	.029	.023	3.23	2826
B	.175	.388	.308	.078	.051	2.58	3252
C	.089	.304	.391	.133	.084	2.20	2286
D	.101	.266	.327	.169	.137	2.03	278
Panel B: Economics graduates who were engineering, math, or physics majors							
A	.403	.409	.157	.019	.013	3.18	159
B	.156	.407	.357	.055	.025	2.63	199
C	.043	.371	.407	.107	.071	2.24	140
D	.083	.583	.083	.083	.167	2.36	12
Panel C: Economics graduates who were economics or business majors							
A	.464	.372	.122	.039	.003	3.27	336
B	.161	.388	.361	.061	.029	2.60	441
C	.099	.420	.365	.080	.035	2.46	312
D	.217	.391	.304	.000	.087	2.62	23
Panel D: Engineering, math, or physics graduates							
A	.588	.308	.081	.017	.006	3.44	665
B	.238	.399	.278	.071	.015	2.75	547
C	.131	.224	.440	.149	.056	2.21	268
D	.196	.261	.283	.217	.043	2.34	46

Note: The data includes all students enrolled in Intermediate Microeconomics who also took Principles of Economics at Clemson, Florida State, North Carolina State, Purdue University, University of North Carolina at Charlotte, and the University of Florida from 1990–2003. The average intermediate microeconomics grade is defined using "+" and "–" grade modifiers. Major is defined at the time the student took the Principles of Microeconomics course, not at the time of the Intermediate Microeconomics course.

In table 3, we show the fraction of students who receive each letter grade in the course on intermediate microeconomics as a function of the letter grade received in the course on principles of microeconomics. As expected, the data show that students who received a higher grade in principles of microeconomics perform better in the course on intermediate microeconomics. However, the math-intensive majors who switch into economics (panel B) do not perform any better than the average student (panel A) in the course or the business and economics students (panel C). In fact, among students who received an A in the course on principles of microeconomics, the engineering, math, and physics majors perform worse than the economics majors on average, although the difference is not statistically significant (t stat $= 1.255$).

This suggests that engineering, math, and physics majors who later switch to economics are not better prepared for the course on intermediate microeconomics than economics majors. Recall that these students have very similar SAT math scores as documented in table 2. However, students who graduate in engineering, math, or physics, and who take intermediate microeconomics (panel D) outperform both the economics and business majors and the students who switch into economics from a math-intensive major by a substantial margin.

CONCLUSION

In this article we document several interesting patterns in undergraduate economics coursework. The primary contributions of this article are the analysis of the differences in characteristics and performance in economics courses of students with different majors and the analysis of the selection into the economics major. One major finding is that economics majors are not, on average, of higher or lower ability than other students who take the course on principles of microeconomics. However, economics majors outperform these other students, perhaps indicating that they were able to identify their own comparative advantage.

Somewhat surprising to us was the finding that those students who switch from a math-intensive major (engineering, math, or physics) to the economics major do not perform better in the more math-intensive course on intermediate microeconomics, even after control for their performance in the course on principles of microeconomics.

The MIDFIELD data that we use in this article is a rich data set that can be used to answer a multitude of additional questions, including many relating to the characteristics and performance of undergraduate students in economics courses. There is sufficient data to analyze performance in popular upper-division field courses. In addition, the time period is long enough to look for trends in the characteristics of students in economics courses. We leave this to future work.

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