
ONE-SEMESTER PRINCIPLES AND STUDENT PERFORMANCE IN INTERMEDIATE THEORY COURSES

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ABSTRACT

The Economics Department at California State University Northridge had the unique experience of replacing its two-semester principles course with a one-semester principles course. This was done on a large scale as the principles course, along with intermediate micro and macroeconomics, was required of all business and economics majors. The timing of course offerings made it impossible for students to select the one-semester principles course over the two-semester course. This environment allows us to investigate whether completion of a one-semester, rather than the standard two-semester, introductory course lowers student performance in intermediate micro or macroeconomic theory courses. Regression analysis indicates that students who complete the one-semester course earn slightly lower grades in both intermediate micro and macroeconomics. While we anticipated the direction of the results, the size is surprisingly small.

INTRODUCTION

In 2001, the University mandated that all undergraduate degree programs cut their course requirements, within the major, to 45 units or less. All CSUN undergraduate degrees have a total of 120 units—48 units of general education, 45 units from the major, and 27 units of open electives. The Business College faced some tough decisions as its common core contained 54 units. College faculty argued that other CSU business schools rarely required any economics courses in their upper-division core. Both intermediate economic theory courses were subsequently removed from the core. At the same time, university administrators

were concerned about transfer problems and articulation agreements arising from the one-semester principles course. For example, it was difficult for a CSUN student to transfer to a University of California campus which would not accept one-semester as a substitute for two-semesters of principles. The Economics Department was thereby forced to remove the one-semester course and reinstate the two introductory (micro and macro) courses.

Most economics faculty welcomed this change as they believed the one-semester principles course did not allow enough time to cover many important topics and concepts. Faculty typically resorted to a one-semester course that was two-thirds micro and one-third macro. Naturally, there were concerns about how well the one-semester principles course prepared students for work in the subsequent micro and macro theory courses.

In this study, we investigate whether a one-semester principles course lowers student performance in economic theory courses by examining 2,555 students who completed intermediate micro or macro theory between spring 1996 and fall 1998. This timeframe allows us to focus on the period when the principles course changed (i.e., fall 1996) and when intermediate micro and macro were still required of all business students.

LITERATURE REVIEW

To date, only one study has examined the effectiveness of a one-semester principles course. Klos and Trenton (1969) compared comprehensive test scores of 170 students who completed a one-semester course against 223 students who completed the standard two-semester course. Their analysis of variance indicated no significant differences in mean test scores across the two groups.

Unfortunately, our department did not develop common tests for students enrolled in principles, so grades in intermediate theory courses are used as a proxy for student learning/preparedness. However, this study provides additional insights into the potential costs and benefits associated with condensing the two-semester principles course into a one-semester course.

This study also adds to the existing literature which analyzes the effects of quantitative prerequisites on course performance. Analysis of student performance in introductory economics dominates the literature. For example, Anderson, Benjamin, and Fuss (1994) found that a high school calculus course was significant in predicting performance in basic economics. Cohn et al. (1998) also found math skills were important but questioned math as a prerequisite, arguing that evidence

from other courses or SAT performance could suffice. Alternatively, Brasfield, McCoy, and Milkman (1992) concluded that math should be a prerequisite for introductory economics.

Some studies also examine how previous mathematical training impacts student performance in intermediate courses. For example, Von Allmen (1996) found that performance in intermediate microeconomics was significantly improved by higher grades in college calculus. Alternatively, Moore (1978) reported that prior hours completed in mathematics had no impact on student performance in intermediate micro. Ely and Hittle (1990) found that performance in managerial economics was improved by mathematical background and positive attitudes towards math.

Most of the remaining studies investigate how course or individual characteristics impact student success. For example, Durden and Ellis (1995) considered the importance of class attendance and found that excessive absenteeism is strongly associated with poor performance in introductory economics. Raimondo, Esposito, and Gershenberg (1990) examined the influence of class size and found that students who took a large lecture introductory macroeconomics course earned lower grades in intermediate macroeconomics. Horvath, Beaudin, and Wright (1992) investigated gender differences in course persistence and found that female students were less likely to persist in the introductory economics course sequence. Robb and Robb (1999) also explored gender differences and found that gender of the instructor did not impact performance in introductory microeconomics nor the likelihood that students would continue in economics.

ANALYSIS SAMPLES

This project analyzed course outcomes for students enrolled in intermediate microeconomic or macroeconomic theory between spring 1996 and fall 1998. Both theory courses are 3-unit semester courses that were required of all business and economics majors. Approximately 4,117 students enrolled into intermediate micro and 3,397 students enrolled into intermediate macro over this time period. However, approximately 60 percent of these students are excluded from our “micro” and “macro” analysis samples because they did not complete their introductory economics courses at CSUN. Another six percent are excluded because they withdrew from the intermediate theory course or had missing values for some of the explanatory variables. Thus, there are 1,428 students in the micro analysis sample and 1,127 students in the macro analysis sample.

Table 1 provides descriptive statistics for the analysis samples. Roughly 36 (50) percent of students in the micro (macro) sample completed the one-semester principles course between fall 1996 and summer 1998. The remaining 64 (50) percent completed the micro (macro) portion of the standard two-semester principles course between spring 1994 and summer 1996. It is important to emphasize that the one-semester principles course entirely replaced the two-semester course in fall 1996 for all business and economics students. This should ease any concerns about selection bias as a business student who disliked economics could not choose the one-semester principles course to avoid taking two-semesters of principles.

Table 1: Variable Definitions and Descriptive Statistics			
Variable	Definition	Sample 1: Micro	Sample 2: Macro
ECON 310	Grade in intermediate microeconomics	1.94 (1.1)	-----
ECON 311	Grade in intermediate macroeconomics	-----	1.90 (1.1)
Age	Age when enrolled in ECON 310 (311)	23.8 (4.0)	23.7 (4.1)
Female	Student is a female	45.3%	47.4%
EOP	Participant in Equal Opportunity Program	15.3%	14.4%
GPA	College GPA prior to ECON 310 (311)	2.54 (0.5)	2.51 (0.6)
Total Units	Credit hours prior to ECON 310 (311)	103.0 (26.5)	100.0 (25.7)
Econmaj	Student is an economics major	4.3%	4.1%
ECON 200	Satisfied a combined principles course	36.3%	49.8%
Sample size		1,428	1,127
Note: standard deviation is in parentheses next to the mean. Otherwise, the statistics are percentages.			

METHODOLOGY

An ordered probit model is estimated separately for the micro and macro samples to determine whether students who complete one-semester of principles obtain lower grades in intermediate theory than students who complete two-semesters of principles.

The specification for the model is as follows:

$$\begin{aligned} \text{ECON310}^* &= \beta'x + \varepsilon, \\ \varepsilon &\sim N[0,1] \end{aligned}$$

where ECON310^* is the unobserved continuous grade scale that underlies the students' course grades in intermediate microeconomics and x is the vector of explanatory variables. The same model is estimated separately for the intermediate macroeconomics course (i.e., ECON 311). The letter grades are coded so that F = 0, D = 1, C = 2, B = 3, and A = 4. These observed grades are related to the unobserved grading scale in the following manner:

$$\begin{aligned} \text{ECON310} &= 0 && \text{if } \text{ECON310}^* \leq 0, \\ \text{ECON310} &= 1 && \text{if } 0 < \text{ECON310}^* \leq \mu_1, \\ \text{ECON310} &= 2 && \text{if } \mu_1 < \text{ECON310}^* \leq \mu_2, \\ \text{ECON310} &= 3 && \text{if } \mu_2 < \text{ECON310}^* \leq \mu_3, \\ \text{ECON310} &= 4 && \text{if } \mu_3 \leq \text{ECON310}^*. \end{aligned}$$

The μ 's are threshold parameters that provide the ranking in the model and are estimated with the beta coefficients. The estimation results (μ and β) allow a calculation of the conditional probability that a student receives a particular letter grade given her characteristics (x).

We assume that student performance in an intermediate theory course is influenced by personal characteristics, past achievement in college courses, choice of major, and completion of the one-semester principles course. Information regarding the student's age, gender, and participation in the University's Equal Opportunity Program is included in the regression. College grade point average and total units completed comprise past achievement in college courses. We distinguished economics majors from business majors.

REGRESSION RESULTS

The regression results are reported in Table 2. The estimated coefficients of the explanatory variables in an ordered probit regression are not the marginal effects normally interpreted in a linear regression model. If we let P_j represent the

probability of receiving a j grade (e.g., $j = 0$ is an F) then calculation of the marginal effects is as follows:

$$\partial P_j / \partial \mathbf{x}_i = [f(\mu_{j-1} - \beta' \mathbf{x}_i) - f(\mu_j - \beta' \mathbf{x}_i)] \times \beta$$

where f is the standard normal density. It is clear that the marginal effects will vary with the values of $\mathbf{x}$. Table 2 contains the marginal effects calculated at the means of the regressors ($\mathbf{x}$). It is worth noting that the marginal effects are multiples of the coefficient vector. Thus, the magnitudes of the marginal effects are likely to be very different from the beta coefficients. See Greene (1993: 672-676) for a discussion of this regression technique.

The findings indicate that completion of the one-semester principles course (ECON 200) slightly lowers student performance in intermediate micro and macroeconomic theory courses. The coefficient of ECON 200 is small, negative, and statistically significant in both regressions. The marginal effects suggest that students who complete the one-semester principles course are 4.9 (3.9) percent less likely to earn a grade of A or B in intermediate micro (macro) than otherwise comparable students. The negative impact of ECON 200 is not surprising. Obviously, students who complete one-semester of principles are exposed to half as many hours of classroom instruction. However, the small impact of ECON 200, especially on intermediate macro grades, was unexpected.

Table 2: Ordered Probit Analysis of ECON 310 and 311 Grades				
Variable	Sample 1: Micro		Sample 2: Macro	
Dependent	ECON 310 Grade		ECON 311 Grade	
	Coefficient	Mrg. Effect ^a	Coefficient	Mrg. Effect ^a
Constant	-3.375 (0.253)		-3.703 (0.278)	
Age	0.009 (0.008)	0.003	0.017 (0.008)**	0.005
Female	-0.043 (0.059)	-0.013	-0.124 (0.066)*	-0.037
EOP	-0.302 (0.081)***	-0.085	-0.297 (0.093)***	-0.081
GPA	1.750 (0.061)***	0.536	1.800 (0.068)***	0.535
Total Units	0.003 (0.001)***	0.001	0.004 (0.001)***	0.001
Econmaj	0.337 (0.141)**	0.114	0.324 (0.164)**	0.107
ECON 200	-0.161 (0.062)***	-0.049	-0.130 (0.067)**	-0.039

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Variable	Sample 1: Micro		Sample 2: Macro	
Dependent	ECON 310 Grade		ECON 311 Grade	
	Coefficient	Mrg. Effect ^a	Coefficient	Mrg. Effect ^a
Mu(1)	0.892 (0.037)		0.847 (0.041)	
Mu(2)	2.233 (0.042)		2.196 (0.048)	
Mu(3)	3.363 (0.062)		3.368 (0.071)	
Sample size	1,428		1,127	
Log Likelihood	-1,737.4		-1,352.1	
Restricted Ln	-2,148.7		-1,699.5	
Chi-squared	822.4		694.9	
Notes: ^a marginal effects of the regressors on the probability that ECON 310 (311) grade is an A or a B. Standard error is in parentheses next to the coefficient. *, **, and *** indicate basic significance in a two-tailed test at the 10, 5, and 1 percent significance level.				

There are a couple of factors that might explain why one-semester of principles has such a small impact on student performance in subsequent theory courses. First, faculty teaching one-semester principles are forced to reduce the number of models and concepts covered. Naturally, faculty would eliminate material of lesser importance (e.g., monopolistic competition and exchange rates). This may give students greater focus and thereby a deeper understanding of the most important principles. Second, as mentioned previously, two-thirds of our students are transfers and complete their introductory economics courses at local community colleges. It is important to reiterate that our analysis samples only contain students who completed all introductory economics courses (i.e., one-semester or two-semester principles) at CSUN. This is done to eliminate the potential bias (positive or negative) from transfer courses that may offer students a different level of preparation. Given the wide diversity in student preparation, faculty cannot rely on a common level of knowledge among students taking intermediate theory courses. Consequently, faculty may teach intermediate theory from first principles which would reduce the anticipated negative impact of the one-semester principles course.

As mentioned previously, most of our faculty delivered a one-semester principles course which was two-thirds micro and one-third macro. Thus, we

expected ECON 200 to have a greater negative impact on student performance in intermediate macro than on micro. We offer two possible explanations for this result. First, our coverage of macroeconomic theory is typically based on microeconomic foundations. Second, students are more interested in and thereby more motivated to study the concepts and topics covered in intermediate macro. Topics in macro (e.g., unemployment, interest rates, exchange rates, monetary policy, etc.) are more likely to be covered by media outlets making them seem more immediate and important. Students might also find the material to be less abstract and analytically demanding than intermediate micro. If so, this might mitigate the negative impact of having substantially less exposure to macroeconomics in the one-semester principles course.

The focus of this study is the impact of one-semester principles on student performance in intermediate theory courses. However, there are some other noteworthy results. First, older and more experienced college students are expected to obtain higher grades in both intermediate theory courses. Age had no influence on student success in intermediate micro and it has only a slight positive impact on student success in macro. The number of completed units has a very small positive influence on student success in intermediate micro and macro.

Gender is included in the regression because some studies have found that male gender is a significant predictor of student success in introductory economics (see, for example, Anderson, Benjamin, and Fuss 1994). Our results suggest that males and females earn similar grades in intermediate micro. However, females earn slightly lower grades in macro. On average, females are 3.7 percent less likely to earn an A or B in intermediate macro.

CSUN has a large minority enrollment. Many of these students are first-generation college students and frequently come from homes where English is seldom spoken. Our best measure to capture this population was participation in the University's Equal Opportunity Program (EOP). Approximately 15 percent of our analysis samples are participants in EOP which provides disadvantaged students with specialized access to advisement resources, financial aid, and mentoring programs. Our findings indicate that EOP participants earned somewhat lower grades in both theory courses. EOP participants were roughly 8 percent less likely to earn an A or a B in intermediate micro and macro.

Students with higher college grade point averages (GPA) earn better grades in intermediate micro and macro. The coefficient on GPA is large, positive, and statistically significant. Moreover, the marginal effects indicate that holding a higher GPA substantially increases the probability of receiving an A or B in both

theory courses. This finding is consistent with previous pedagogical research in economics (Von Allmen 1996 and Brasfield, Harrison, and McCoy 1993) and confirms that previous success is a good indicator of future success in college courses.

College GPA was our best measure of student ability. The regressions did not include Scholastic Aptitude Test (SAT) scores because 40 percent of the students in our two analysis samples were missing this information. The University does not require submission of SAT scores for students who place in the top 10 percent of their high school graduating class; or transfer from local community colleges. However, in separate regression results (not reported), the inclusion of SAT scores did not alter the findings in a substantive manner. In particular, the marginal effect of ECON 200 (i.e., completing one-semester of principles) on intermediate course grades was still small, negative, and statistically significant.

Adding one variable –combined SAT scores– to each regression specified in Table 2 suggests that students who completed one-semester of principles were 7.1 (4.0) percent less likely to earn an A or B in intermediate micro (macro). Thus, the inclusion of SAT scores slightly changes the marginal effect of ECON 200 on intermediate micro (from -4.9 to -7.1); while the marginal effect of ECON 200 on intermediate macro remains virtually unchanged (from -3.9 to -4.0). Note: there are only 910 (676) students with SAT scores in the micro (macro) sample.

Finally, we expected economics majors to obtain higher grades than business majors in both intermediate courses. Students who have chosen economics as a major should have a greater aptitude and interest in studying economic theory. Our results indicate that economics majors were 11.4 (10.7) percent more likely to earn an A or B in intermediate micro (macro) than otherwise comparable business majors.

CONCLUSION

Our Economics Department, which is housed within the Business College at CSUN, had the unique experience of replacing its two-semester principles course with a one-semester principles course. This was done on a large scale as the principles course, along with intermediate micro and macro, was required of all business and economics majors. The timing of course offerings made it impossible for students to select the one-semester principles course over the two-semester course. This environment allows us to examine whether one-semester of principles lowers student performance in intermediate micro and macroeconomic theory

courses. In practice, most faculty resorted to teaching a one-semester principles course which was two-thirds micro and one-third macro. Thus, we expected to find that one-semester of principles would lower grades in both intermediate theory courses, especially in macro.

Our regression results indicate that students who completed one-semester of principles earned slightly lower grades in both intermediate courses when compared with students who completed two semesters of principles. More specifically, completion of the one-semester principles course reduces the probability of earning an A or B in intermediate micro (macro) by roughly 5 (4) percent. We do not find it surprising that replacing two semesters of principles with one semester of principles lowers student performance in intermediate theory courses. What is surprising is the small impact of this change. Perhaps making the one-semester principles course a four-unit (rather than a three-unit) course would eliminate any loss in intermediate theory performance.

Our results suggest that the cost of combining the two principles courses is a small reduction in intermediate theory performance. However, students may benefit from the one-semester principles configuration because it allows them to take an additional course. Assuming a business program maintains the same number of hours to graduate, students could take an upper-division economics course in place of the second principles course. Arguably, the knowledge acquired from an additional three-unit, upper-division economics course would outweigh the slight reduction in knowledge of intermediate theory. If your program goal is a higher level of economic understanding, then an upper-division economics course uses a higher level of cognitive skills.

Alternatively, our findings suggest that a one-semester principles course is a reasonable option for a business or economics program that is seeking to reduce course requirements. However, there are two important caveats. First, if most local universities require two-semester of principles, interested programs may encounter difficulties with student transfers and articulation agreements. Second, our institutional setting may have reduced the negative impact of the one-semester principles course. Two-thirds of our students are transfers and complete their introductory economics courses at local community colleges. Given the wide diversity in student preparation, faculty may teach intermediate theory from first principles. Thus, one-semester principles may be inappropriate for schools that conduct intermediate theory courses which are more reliant on an accomplished level of knowledge from introductory material.

REFERENCES

- Anderson, G., D. Benjamin, and M. Fuss. 1994. The determinants of success in university introductory economics courses. *Journal of Economic Education* 25 (Spring): 99-119.
- Brasfield, D., D. Harrison, and J. McCoy. 1993. The impact of high school economics on the college principles of economics course. *Journal of Economic Education* 24 (Spring): 99-111.
- Brasfield, D., J. McCoy, and M. Milkman. 1992. The effect of university math on student performance in principles of economics. *Journal of Research and Development in Education* 25 (4): 240-247.
- Cohn, E., S. Cohn, R. Hult Jr., D. Balch, and J. Bradley Jr. 1998. The effects of mathematics background on student learning in principles of economics. *Journal of Education for Business* 74 (1): 18-22.
- Durden, G., and L. Ellis. 1995. The effects of attendance on student learning in principles of economics. *American Economic Review* 85 (2): 343-346.
- Ely, D., and L. Hittle. 1990. The impact of math background on performance in managerial economics and basic finance courses. *Journal of Financial Education* 19 (2): 59-61.
- Greene, W. 1993. *Econometric Analysis*, 2nd ed. New York: Macmillan Publishing Company.
- Horvath, J., B. Beaudin, and S. Wright. 1992. Persisting in the introductory economics course: an exploration of gender differences. *Journal of Economic Education* 23 (Spring): 101-108.
- Klos, J., and R. Trenton. 1969. One semester or two. *Journal of Economic Education* 1 (Fall): 51-55.
- Moore, G. 1978. A note on factors affecting student performance in intermediate microeconomic theory. *Journal of Economic Education* 10 (Fall): 51-53.
- Raimondo, H., L. Esposito, and I. Gershenberg. 1990. Introductory class size and student performance in intermediate theory courses. *Journal of Economic Education* 21 (Fall): 369-381.

- Robb, R., and A. Robb. 1999. Gender and the study of economics: the role of gender of the instructor. *Journal of Economic Education* 30 (Winter): 3-19.
- Von Allmen, P. 1996. The effect of quantitative prerequisites on performance in intermediate microeconomics. *Journal of Education for Business* 72 (1): 18-22.

ECONOMICS ARTICLES

