

A Pareto-Improving Way To Teach Principles of Economics: Evidence from the University of Toronto

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Of the forty percent of U.S. college students who annually take a principles course, only a small fraction become economics majors.¹ While most students never take another economics course, principles courses and textbooks are largely designed to provide majors with concepts and tools needed in upper level courses.

The “literacy targeted” (LT) approach to teaching principles argues that it is more valuable for students to be able to apply core economic concepts well, than to be exposed to a wide range of concepts they will soon forget. The LT approach focuses on a short list of core concepts that students can use for the rest of their lives, supplemented by active learning to help students achieve higher level mastery (Hansen, Salemi, and Siegfried 2002).

The obvious objection to redesigning principles courses to serve the interests of the non-major majority is whether students are disadvantaged in subsequent economics courses. Gilleskie and Salemi (2012, 112) address that question by comparing the performance in upper-level economics courses at University of North Carolina Chapel Hill of students who took a traditional, tools-oriented introductory course with students who took a literacy-targeted (LT) course. Over three years, they found that “students who complete a LT principles course earn grades as high in intermediate microeconomics and intermediate

macroeconomics as those of students who complete a traditional principles course.”

This paper takes up Gilleskie’s and Salemi’s (2012, 128) challenge for “other studies that check the robustness of our findings to other instructors and other LT syllabi.” Using an 11-year data set with over 13,000 students at the University of Toronto, we compare the performance in intermediate microeconomic and macroeconomic theory courses of students taking traditional two-semester principles courses with students taking a two-semester LT sequence. We also find no evidence of an LT penalty. Additionally, we investigate gender differences in the choice of principles courses and subsequent performance in intermediate economics courses. We find that women are disproportionately represented in the LT course and given that there are no appreciable gender differences in performance at the first-year level, offering an LT approach may improve the chances that female students progress in economics.

I. Introductory Economics at the University of Toronto

The University of Toronto is the largest university in North America and economics is one of the most popular undergraduate subjects. There are two streams of introductory economics. The primary introductory economics course, designed for majors, is ECO100, a full-year course covering micro and macroeconomics. The second alternative is a full-year introductory course that was created in the mid-1990s, ECO105, *Principles of Economics for Non-Specialists*. The course was originally just less mathematical and more topics-focused than ECO100, but in 2011-12, it

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¹Rates between 3 and 20 percent have been reported (Allgood, Walstad, and Siegfried (2015); Hansen, Salemi, and Siegfried (2002); Margo and Siegfried(1996)).

TABLE 1—DESCRIPTIVE STATISTICS

	ECO105		ECO100	
	Pre-2012	Post-2012	Pre-2012	Post-2012
Number of observations	2,016	2,328	3,823	5,274
Characteristics at admission (Percentage):				
Female	55.2	58.1	46.8	49.1
Canadian/Domestic	83.4	79.4	74.2	48.4
English Language Learner (ELL)	21.9	18.4	33.6	52.3
With Ontario High School	75.6	71.9	68.2	62.3
Of Ontario HS with G12 Calculus	52.6	33.9	75.2	65.3
Average Ontario HS Grade	86.0	87.9	86.1	88.9
Average Ontario G12 Calculus Grade	83.1	83.4	84.0	87.3
Academic outcomes (U of T):				
Average grade, introductory economics	71.7	68.4	64.2	66.4
Percentage eligible to take more ECO	45.3	28.4	55.2	60.0
Percentage of eligible that take:				
Intermediate Micro (ECO200)	11.0	11.6	33.6	32.6
Intermediate Macro (ECO202)	8.3	8.9	28.7	30.3
Data Analysis/Statistics (ECO220)	4.6	5.5	26.5	19.2
Average grade in ECO200Y	71.8	69.7	72.5	71.1
Average grade in ECO202Y	72.6	74.9	72.1	73.1
Average grade in ECO220Y	72.3	72.8	70.7	73.6

Note: 1) sample includes students who completed a Fall/Winter introductory course; 2) Average high school grades and Grade 12 (G12) Calculus grades are conditional on having been reported in the student's application; 3) Percentage eligible is calculated as the percentage of students that meet either 67% in ECO100, or 80% in ECO105.

was restructured as an LT course.² Entry into second-year economics courses is highly competitive, and depends on a combination of meeting minimum threshold grades in introductory economics, as well as a full-year calculus course. The threshold for ECO100 is a minimum grade of 67% (C+), which is essentially the course average, versus the higher threshold of 80% (A-) in ECO105.

II. Data and Descriptive Statistics

We obtained academic records for all students who completed a first-year economics course across the Faculty of Arts & Science at the University of Toronto between 2006 and 2017. Each student record includes personal attributes (age, gender and a measure of English proficiency) and the grade in introductory economics. These

data are linked to high school admissions records (for students from the Province of Ontario), as well as performance in subsequent economics courses (if applicable). We exclude three non-comparable groups from the sample—Commerce students, Engineers and summer sections—yielding a working sample of 13,441 observations.³

Table 1 summarizes the characteristics of students who took ECO105 and ECO100, pre and post-2012. The temporal partition is chosen to highlight the LT approach introduced in 2011-12. The same partition is applied to ECO100 to account for general pedagogical trends in introductory economics. *Ex ante*, we would not expect students to be identical in the two courses. Students in ECO105 likely choose the course because they do *not* plan to take more economics and are destined for other

²For course details, see Cohen and Williams (2019) for ECO105 and Anderson, Benjamin and Fuss (1994) for ECO100.

³ECO105 is not allowed for Commerce students who also channel into their own intermediate micro course.

social or life sciences.

Students taking ECO105 are more likely to be female by almost 10 percentage points. They are less likely to be international students, and much less likely to be “English Language Learners (ELL).”⁴ Fewer than one in five ECO105 students are identified as ELL (with little change over time). By contrast, the ELL portion in ECO100 rose from one-third to over half post-2012. The changing composition of students in ECO100 reflects a general increase in international and ELL students at the university. It is notable that ECO105 appears isolated from this trend. In terms of high school background, Ontario high school graduates in ECO100 have a slightly higher overall average than those in ECO105, and are both more likely to have taken, and earned a slightly higher grade, in Grade 12 calculus.

III. Estimated Outcomes

Formally, we wish to estimate the impact of a student taking ECO105 instead of ECO100 on their subsequent success in intermediate economics. This can be expressed in terms of the following regression, where our objective is to estimate the “treatment effect” of taking ECO105 on the final grade of student i in course j :

$$GRADE_{ij} = \alpha_j + \beta_j ECO105_i + \sum_{k=1}^K X_{ki} + \varepsilon_{ij}$$

where $GRADE_{ij}$ is student i 's grade in course j ; $ECO105_i$ is an indicator of whether student i took ECO105 (versus ECO100); the X_{ki} are K control variables (student “pre-treatment” characteristics); and ε_{ij} are unobservable determinants of student i 's performance in course j . The effect of taking ECO105 on course j is given by the coefficient, β_j .

The underlying thought experiment is of a student being randomly assigned to either ECO100 or ECO105, and tracing

⁴A student is coded “Canadian/Domestic” if they paid domestic tuition fees as citizens or permanent residents. A student is coded ELL if required to take an English proficiency test to secure admission.

their academic path, first to completion of principles, and then to their subsequent economics courses. Because we are using observational data on realized student choices and outcomes, our research design falls short of an ideal experiment. There are at least two forms of selection to consider. First, students are not randomly assigned to ECO105. As noted, students who self-select into the less mathematical version of introductory economics presumably have little intention of taking more economics. We cannot directly address this form of selection, beyond including the rich set of high-school and demographic data that control for some of the observable determinants of academic success.

The second form of selection is from ECO105 to subsequent economics courses: The population of second-year students includes students from both ECO100 and ECO105 who differ in ways beyond their choice of introductory course. Some differences can be accounted for by including pre-treatment characteristics as controls. Others, like motivation, remain unobservable. This is a less problematic form of selection, as it is part of the “treatment effect” of taking ECO105. The estimated effect of taking this course includes not just learning economic concepts that carry forward to second year, but also the interaction with whatever motivates those ECO105 students to continue in economics. Because first-year calculus is required for intermediate economics, the unobserved differences between the ECO100 and ECO105 students are somewhat mitigated.

The descriptive statistics in the bottom panel of Table 1 foreshadow the regression results. First, the class average in ECO105 is higher than in ECO100, though the grade “premium” declined after 2012. The percentage of students eligible to continue in economics is lower in ECO105, reflecting the higher cutoff. This percentage also declined after 2012, and is now at 28.4% versus 60.0% in ECO100. Conditional on eligibility, just over 10% of ECO105 students take intermediate microeconomics (ECO200), as compared to approximately one-third of eligible ECO100

students. Again, this reflects student differences in planned programs, math backgrounds, and students' own perceived abilities in economics. The fraction taking intermediate macroeconomics (ECO202) is slightly smaller for both sets of students.⁵

As a “placebo” comparison, we also report progression to (and performance in) ECO220, a full-year course in data analysis and statistics (“Statistics”). This course is of interest because the curriculum of ECO100 versus ECO105 should be irrelevant and differences in performance may principally reflect selection and other factors. Post-2012, just over 5% of ECO105, and approximately 20% of eligible ECO100 students take Statistics.

The most striking result at the bottom of Table 1 is the absence of differences in second-year performance. There is no more than one percentage point difference in performance between students from ECO100 or ECO105, and this holds for all three second-year courses. The raw differences in Table 1, however, do not take into account differences in student backgrounds—notably that the bar is higher for ECO105 students, who may therefore be stronger students in other dimensions.

In Table 2, we present the regression-adjusted differences in outcomes associated with taking ECO105. We refine our question beyond the overall effect of ECO105 to specifically identify the impact of the LT curriculum introduced in 2012. To do this, we estimate a “difference-in-differences” specification that allows us to see whether the LT curriculum changes made any difference in the impact of taking ECO105 on subsequent performance. This entails including a control for post-2012 to capture overall trends in the performance and composition of first-year students in economics at the University of Toronto, as well as an interaction term for ECO105 and post-2012, to see whether the estimated effect of taking ECO105 changed after the LT cur-

riculum was introduced. We also explore whether females are differentially affected by taking ECO105: As we saw in Table 1, women are more likely to take ECO105, and it is also well known that females may not do as well in ECO100 (e.g., Anderson, Benjamin, and Fuss 1994). To control for differences in “pre-treatment” characteristics of ECO100 and ECO105 students, the controls include all of the admissions-based (high school) variables in Table 1.

In the first two columns, we explore the effect of ECO105 on first-year performance, and the probability of establishing eligibility to take more economics. In column (1), the outcome is the grade in first-year economics. Students with a given high school background who take ECO105 can expect a 7.79% higher grade than comparable students in ECO100, though this expected premium declined significantly after 2012. Females do a full-percentage point worse in ECO100, but are at no disadvantage in ECO105 – indeed, they earn higher grades on average. In column (2), we see that the results from column (1) are reflected in lower rates of eligibility for ECO105 students, even though their expected grades are higher, grades are not high enough to offset the 80% ECO105 cutoff. Women, while at a disadvantage relative to men in ECO100, are at no disadvantage for continuing if they took ECO105 instead.

In next three columns we report the bottom-line results for the effect of taking ECO105 on second-year performance. In column (3), we report a statistically insignificant coefficient for ECO105: Controlling for high school background, there is no detectable difference in performance between students who took ECO100 and ECO105. Furthermore, we find no change in the effect once the LT curriculum was introduced. Concerning the effect of gender, there are also no detectable differences in performance between males and females in intermediate microeconomics, whether they took ECO105 or ECO100. These results are echoed in columns (4) and (5): For both intermediate macroeconomics and stats, there is no disadvantage to have taken ECO105, including with the LT curriculum.

⁵We offer other intermediate theory courses, but restrict our analysis to the only intermediate courses that can be taken by both ECO100 and ECO105 students (ECO200 and ECO202).

TABLE 2—ESTIMATED EFFECT OF ECO105 ON PERFORMANCE IN FIRST AND SECOND-YEAR ECONOMICS

	Intro	Eligible	Intermediate Grades		
			Micro	Macro	Statistics
	(1)	(2)	(3)	(4)	(5)
Took ECO105	7.79 (0.54)	-0.08 (0.02)	-1.61 (1.57)	1.60 (2.12)	0.97 (2.33)
Post 2012	-1.13 (0.36)	-0.04 (0.01)	-2.45 (0.64)	-0.12 (0.76)	1.38 (0.74)
Took ECO105 × Post 2012	-3.89 (0.60)	-0.17 (0.02)	-0.16 (2.08)	1.42 (2.68)	-2.09 (2.95)
Female	-0.99 (0.34)	-0.03 (0.01)	0.28 (0.62)	0.97 (0.75)	2.11 (0.73)
Female × Took ECO105	1.71 (0.60)	0.03 (0.02)	0.18 (2.00)	-2.50 (2.57)	-0.59 (2.87)
Observations	13,441	13,441	1,651	1,457	1,090
R-squared	0.19	0.19	0.11	0.07	0.18

Note: The outcomes are (1) Grade in introductory economics (ECO100 or ECO105); (2) Whether the student's introductory economics grade is high enough to be eligible to take intermediate economics courses; and (3), (4), and (5), grades in intermediate micro, macro, and statistics (ECO200, ECO202, and ECO220). Standard errors are in parentheses. All regressions (OLS) include controls for Canadian, English Language Learner, Ontario High School Average (indicator and level), and Ontario Grade 12 Calculus (indicator and level).

The one notable gender effect is the significantly *better* performance of women in statistics. This highlights the importance of ensuring that females are not excluded from continuing in economics based on first-year performance. While we do not report them, the coefficients on the control variables highlight the strong and persistent predictive power of a student's high school record even through second-year.

IV. Principle(s) Implications

Our results demonstrate that with appropriately chosen grade cutoffs, departments can offer LT principles courses while preserving subsequent disciplinary rigor. Students can take such courses, without placing themselves at a significant disadvantage should they change their minds and decide to pursue further studies in economics. The vast majority of “one and done” principles students will be better off from LT courses better suited to their interests and abilities. Economics departments can also benefit from attracting more of the 60% of college students who currently never take any economics courses.

As a further benefit, literacy-targeted principles courses designed to interest a broader spectrum of students also have the potential to address the underrepresentation of women and other minorities in our discipline. Bayer and Rouse (2016, 226) highlight the perceived lack of interest in economics among undergraduate women, while Bayer and Wilcox (2019) implicitly argue for a literacy-targeted approach with active learning.⁶

If a LT approach to principles is more accessible to women and presumably makes the 80-plus percent of students who never take another economics course better off, while the minority who pursue economics degrees are no worse off, is it not Pareto improving for students to offer a literacy-targeted alternative to mainstream principles?

⁶ “We also suggest that authors and instructors construct curricula around teaching core competencies in economics...emphasizing skills over laundry lists of concepts and content is integral to learning economics and allows more nuanced investigation of substantive economic issues. Taking these steps could improve and sustain broader appeal” (Bayer and Wilcox, 311).

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