Identifying Students-at-Risk Using a New Math Skills Assessment

By George Orlov, Douglas McKee, Irene R. Foster, Daria Bottan, and Stephanie R. Thomas

Online Appendix

A1: Brief review of the literature on the importance of quantitative skills in the study of economics

A vast body of research in economic education has shown that quantitative skills, attendance, race, class, attitudes and high school performance are all significant determinants of success in principles of economics (Durden and Ellis 1995; Benedict and Hoag 2002; Cohn et al 2004; Mallik and Lodewijks 2010; Owen 2012; Allgood et al 2015). Even where research is focused on the contribution of only certain determinants, one or more measures of quantitative skills are included as co-determinants. They are found to have a positive and significant correlation with course performance (Douglas and Sulock 1995; Durden and Ellis 1995; Benedict and Hoag 2002; Jensen and Owen 2003; Ballard and Johnson 2004; Schuhmann et al 2005; Gallo and Johnson 2008; Cohn et al 2004; Hoag and Benedict 2010; Mallik and Lodewijks 2010; Owen 2012; Allgood et al 2015).

A2: Construction of analysis samples

At the beginning of the Spring and Fall 2019 semesters, students in introductory and intermediate microeconomics courses at Cornell University took the MESA assessments. Of the 964 students enrolled in Introductory Microeconomics at the beginning of Fall 2019, 922 (or 96%) were given the Foundations assessment, and of those students, 822 (89%) went on to complete the course for a letter grade and 35 (4%) completed the course without receiving a letter grade. We believe many factors go into the decision to drop a course, take a course without receiving a letter grade, or complete a course for a letter grade. In our Cornell student data, the MESA score is not very predictive of this decision, and our analysis below focuses on the grades of those students who completed the course for a letter grade. We also removed from our sample 111 students for whom we do not have measures of gender or race. This leaves us with an analysis sample of 711 students.

The introductory microeconomics course was taught in two large sections, each by a different instructor. The sample used for analysis contains 350 students from one section and 361 from the other. The learning goals of the two courses overlapped substantially and the instructors used very similar mathematical methods when teaching the material. We pool the students in both sections in our analysis below, but in results available from the authors, we find that MESA predicts subsequent course performance very similarly in each section.

We also pool data from the Spring 2019 and Fall 2019 semesters of Intermediate Microeconomics. At the beginning of the term, 100 students were enrolled in the Spring course and 218 were enrolled in the Fall. In both courses the same instructor taught exactly the same learning goals using the same level of mathematical rigor. As we found with the introductory microeconomics course, MESA predicts subsequent performance almost identically in the two courses.

Of the 318 students enrolled at the beginning of the terms, 277 (87%) took MESA, and of those students, 229 (83%) went on to complete the course for a letter grade and 21 (8%) completed the course without receiving a letter grade. Our analysis below focuses on the grades of those students who completed the course for a letter grade. We also remove from our sample 22 students for whom we do not have measures of gender or race. This leaves us with an analysis sample of 207 students.

Table A1 presents descriptive statistics for our analysis samples for each class: those students who took MESA, completed the course for a letter grade, and whose demographic characteristics were observed. Distributions of scores are shown as histograms in Figure A1.

REFERENCES

Allgood, S., W. B. Walstad, and J. J. Siegfried. 2015. "Research on Teaching Economics to Undergraduates." Journal of Economic Literature, 35(1), 3-23.

Ballard, Charles L., and Marianne F. Johnson. 2004. "Basic Math Skills and Performance in an Introductory Economics Class." In The Journal of Economic Education, Vol. 35, No. 1 (Winter, 2004). 3-23.

Benedict, M. E. and J. Hoag. 2002. "Who's Afraid of Their Economics Classes? Why are Students Apprehensive About their Introductory Economics Courses? An Empirical Investigation." The American Economist, 46(2), 31-44.

Cohn, E., S. Cohn and D.C. Balch. 2004. "The Relation Between Student Attitudes Towards Graphs and Performance in Economics." The American Economist, 48(2), 41-52.

Douglas, S. and J. Sulock. 1995. "Estimating Educational Production Functions with Correction for Drops." The Journal of Economic Education, 26(2), 101-112.

Durden, G.C. and L.V. Ellis. 1995. "The Effects of Attendance on Student Learning in Principles of Economics." The American Economic Review, 85(2), 343-346.

Gallo, A.A. and C.K. Johnson. 2008. "Math Skills and Everyday Problem Solving." Journal of Economic and Finance Education, 7(1), 7-20.

Hoag, J. and M.E. Benedict. 2010. "What Influence Does Mathematics Preparation and Performance Have on Performance in First Economics Classes?" Journal of Economics and Economics Education Research, 11(1), 19-42.

Jensen, E.J. and A.L. Owen. 2003. "Appealing to Good Students in Introductory Economics." The Journal of Economic Education, 34(4), 299-325.

Mallik, G. and J. Lodewijks. 2010. "Student Performance in a Large First Year Economics Subject: Which Variables are Significant?" Economic Papers: A Journal of Applied Economics and Policy, 29(1), 80-86.

Owen, A.L. 2012. "Student Characteristics, Behavior, and Performance in Economics Classes." *International Handbook on Teaching and Learning Economics*. Edward Elgar Publishing, Inc.

Schuhmann, P., K. McGoldrick, and R. Burrus. 2005. "Student Quantitative Literacy: Importance, Measurement, and Correlation with Economic Literacy." The American Economist, 49(4), 49-65.
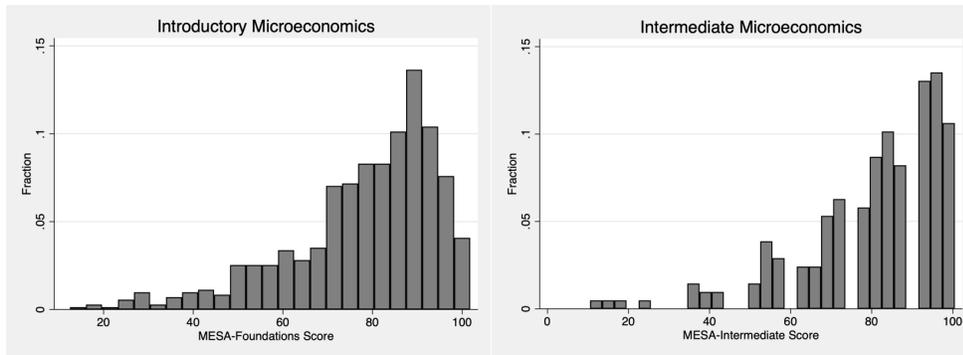
FIGURE A1. DISTRIBUTION OF MESA-FOUNDATIONS AND MESA-INTERMEDIATE SCORES

TABLE A1— SUMMARY STATISTICS FOR ANALYSIS SAMPLES

	Introductory	Intermediate
MESA score out of 100 (Mean, SD)	78, 17	80, 18
Time spent on MESA (minutes) (Mean, SD)	24, 9	27, 10
Low effort on MESA (%)	4%	3%
Female (%)	50%	34%
Under-represented minority (URM) (%)	26%	14%
College year		
Freshman (%)	58%	15%
Sophomore (%)	33%	55%
Junior (%)	7%	22%
Senior (%)	2%	8%
Other (%)	0.3%	0%
Economics major	N/A	68%
Low grade (B- or lower) (%)	29%	16%
Sample Size	711	207