

Algebra I Assessment and Student Performance in Principles of Economics

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Motivation

- Incoming freshmen do not have the Algebra I skills to be successful in economics. This slows the pace of the class and compromises rigor.

Fall 2012 Algebra I Assessment

- Administered to 1361 incoming freshmen in Principles of Economics
- Assessment counts towards 10% of course grade
- Students have four optional opportunities to pass the assessment
 - First opportunity during the first week of class
 - Each subsequent opportunity given every 2 weeks
- Format:
 - 20 questions covering Arithmetic, Algebra, Geometry, and Graphing
 - No multiple choice questions**
 - Calculators not allowed**
 - To show mastery, students must score an 80%

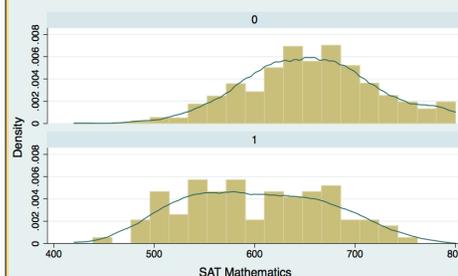
Fall 2012 Assessment Results

- 11.5% of 1361 students failed**
- On average, it took a student 1.59 times to pass.**
- On average, women took longer to pass (significant at 1%) with no significant difference in failure rates
- Students from private schools took longer to pass (significant at 5%) with no significant difference in failure rate
- Upper-classmen had a much higher failure rate although they needed fewer attempts to pass (both significant at 1%)

PERFORMANCE GROUP	TOTAL IN GROUP	SHARE
PG1 – passed on 1 st attempt	662	48.6%
PG2 – passed on 2 nd attempt	417	30.6%
PG3 – passed on 3 rd attempt	81	6.0%
PG4 – passed on 4 th attempt	45	3.3%
PG5 – failed all attempts	156	11.5%
TOTAL	1361	100%

Do SAT Math Scores Predict Performance on the Assessment?

- Distribution of SAT Math scores by pass (top) and fail (bottom)



- Regression 1:** Ordered Probit of SAT Math Score on Students' Performance Group

$$PerformerGroup_i = \alpha + \beta SAT_i^M + \theta SAT_i^{M^2} + \gamma Char_i + \varepsilon_i$$

- Regression 2:** Probit regression of SAT Math Score on whether student is in the 1st or 2nd Performance Group (Top Performer)

$$TopPerformer_i = \alpha + \beta SAT_i^M + \theta SAT_i^{M^2} + \gamma Char_i + \varepsilon_i$$

- Regression 3:** OLS regression of SAT Math Score on Performance on the 1st Algebra I Assessment Opportunity

$$Score_i = \alpha + \beta SAT_i^M + \theta SAT_i^{M^2} + \gamma Char_i + \varepsilon_i$$

- SAT Math scores are not a strong predictor of performance on the assessment overall but do predict performance on the first assessment opportunity**

Do SAT Math Scores and the Assessment Predict Performance on the Final Exam?

- OLS regression of Final Exam on Assessment Performance and SAT Math scores**

- Students in Performance Groups 1-3 score between 10 and 15 points higher on the Final Exam than students that fail, significant at 10%.**
- The 1st Algebra I Assessment opportunity and SAT Math have little predictive power in determining students' performance on the Final Exam.**
 - A 1% increase in the SAT is predicted to improve final exam score by .1%, significant at 1%.
 - A 1% point increase in the 1st Algebra I Assessment predicted to improve final exam score by .02%, significant at 10%.
- Innate test taking ability (using SAT Verbal scores as proxy) has a positive and significant impact on Final Exam scores**
- SAT Math is not adequately testing students on the basic math skills needed for Principles of Economics**

- Both the SAT Math and Algebra I Assessment cover the same material, so why the difference in predictive power?**

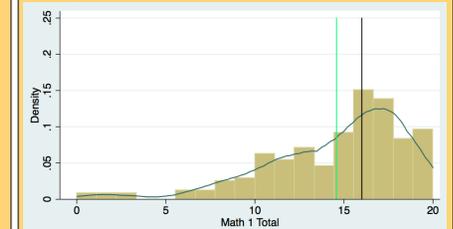
- Difference in test format.**
- Difference in allowance of calculators.**

Comparison to Past Research

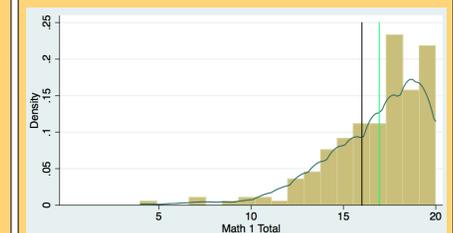
- Ballard and Johnson (2004) - effect of ACT Math scores, calculus, remedial math, and a math quiz on course performance.
 - All are significant
 - ACT Math and math quiz scores were similar
 - Quantitative skills are multifaceted
- Our results are different perhaps due to test format and disallowing use of calculators

Preliminary Results of the Effect of Calculator Use on Assessment Scores

- Comparison of Algebra I Assessment scores from Spring 2012 and Spring 2013**
 - Spring 2012- no calculator use allowed (green line-mean, black line-cut off to pass)



- Spring 2013- calculator use allowed (green line-mean, black line-cut off to pass)



- Calculator use does impact performance on the Algebra I Assessment.**

Conclusions

- SAT (or ACT) Math do not seem to pick up on the math skills needed for Principles of Economics**
- A basic test of math ability is important to test for readiness to study economics**
- Calculator use on the SAT Math test may be masking mathematical ability**
- The multiple choice format of the SAT Math test may be masking mathematical ability**