The Gender Question in Economic Education: Is it the Teacher or is it the Test?

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Abstract

One of the most persistent, and controversial, empirical regularities in economic education research is the significant difference between the test scores of male and female students. Several possible explanations for this "Gender Gap" are well documented in the literature. Using a large sample of test scores from the Test of Economic Literacy (TEL), we seek to determine whether gender role-model effects influence these differentials or whether it is the result of biased testing materials. A model employing an educational production function exhibits no evidence of role-model effects for our two student cohorts, although some students perform better when taught by female teachers. We find no evidence to support the claim that the testing instrument is biased, and conclude that the gender gap observed in our data is not attributable to the teacher or the test.

INTRODUCTION

The purpose of economic education is to provide individuals with the knowledge and tools necessary to understand the world in which they live and make better choices as students, employees, entrepreneurs, civic leaders and voters (Bernheim, Garret and Maki, 2001). Economic literacy is also a key determinant of adult wealth accumulation, lower rates of loan delinquency and higher savings rates (Stern, 2002). Beyond matters of money and risk, Walstad (1998) demonstrates the importance of economic literacy in ensuring that people are competent to make personal economic choices. Likewise, economic literacy is an essential tool for enabling

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citizens to make well-informed decisions regarding educational, medical and military policy issues (Stigler, 1970).

Research suggests that the best, and possibly only, opportunity for students to be exposed to economics occurs before they leave the secondary school system (Walstad, 1998). Recognizing that economics is an essential component of a compressive educational experience, many states have chosen to include economic education mandates as part of their K-12 educational curriculum (CEE, 2009a). These mandates not only impact students who complete their education during high school, but also provide immediate returns to students who continue their education and enroll in economics courses at the post-secondary level (Becker, Greene, and Rosen, 1990; Myatt and Waddell, 1990; Lopus, 1997).

As a discipline, economics is accessible to students of all ages and across all ethnic and economic strata (Watts and Walstad, 2006). However, despite the universal need for students to master economic concepts, not all socio-economic and ethnic groups perform equally well on valid and reliable measures of economic knowledge (Walstad and Rebeck, 2001a; Butters and Asarta, 2011a). More disturbingly, female students tend to score significantly lower than male students, regardless of race or socio-economic status (Walstad and Rebeck, 2001b, Walstad, Watts and Rebeck, 2007). This "Gender Gap" is an empirical regularity that has been attributed to many possible factors including biased testing materials, cognitive and cultural differences.

We use a large sample of high school students from 22 states to determine whether the observed differentials in the Test of Economic Literacy (TEL) student scores can be attributed to teacher role-model effects or potentially biased testing materials. Expanding on previous research, we estimate a fixed effects model that includes all possible teacher-student gender pairings. In addition to formal modeling, a review of test items is performed to determine if they

contain language or examples that could be construed as favoring one gender over another. Our results provide no evidence to support the notion that the observed gap in student scores can be attributed to a gender bias in the testing materials. We further find that, although a teacher's gender may play a significant role in determining student performance, there are no consistent role-model effects that would account for the persistent gap in test scores between male and female students.

LITERATURE REVIEW

The role-model effect, and its impact on student scores, has received limited attention in the economic education literature. In the only study, to our knowledge, that addresses this issue, Evans (1992) estimated a knowledge-stock model examining gender and race role-model effects with data from students participating in the National Assessment of Economic Education (NAEE) Survey. The author focused on the female-female teacher-student relationship and found no evidence suggesting that female high school students perform significantly better, or worse, than their male counterparts when paired with female teachers. While the study used a number of variables to control for ability, socioeconomic background and peer effects, the author was unable to disaggregate the data for students who completed a dedicated course in economics and those who received economic education infused in the high school curriculum. Additionally, Evans' research did not examine other gender pairings which may generate positive learning effects on student performance in economics.

Gender is important in other areas of educational research. For example, the impact of teacher gender on selecting the economics major has received considerable attention in the literature. In a series of studies, Ferber (1990, 1995) argued that female students are less likely to study economics due to a lack of female role models in the classroom. Dynan and Rouse (1997),

however, estimated a probit model using 1,475 students from Harvard University and concluded that female students are not more likely to major in economics if they received instruction at the principles level from a female teacher. Additionally, Ashworth and Evans (2001) further examined gender role-model effects by using cross-sectional data on high school students. Their analysis focused on the willingness of students to study economics based on teacher gender. The authors found that female students are more likely to study economics with female teachers, but that the gender effect does not carry over to major selection in college. Conversely, Rask and Bailey (2002) examined over a decade of student data at Colgate University and found that role-model effects are present for women, indicating that female students are more likely to choose the economics major if the faculty member is also female.

The more general question of gender in economics has received considerable attention in economic education. Several studies identify a gender gap between male and female student test scores (e.g., Bolch and Fels, 1974; Siegfried, 1979; Williams, Waldauer and Duggal, 1992) and attribute it to social and cultural (Walstad and Robson, 1997), cognitive (Anderson and Benjamin, 1994; Hirschfeld et al. 1995), and instructional differences (Ferber 1990; Horvath, Beaudin, and Wright, 1992). Other research suggests that the format of the test may be responsible (Ferber et al., 1983; Lumsden, Scott and Becker, 1987). A number of more contemporaneous studies find that the gender gap in student performance no longer exists (e.g., Ziegert, 2000; Swope and Schmitt, 2006). However, the results from the 2006 National Assessment of Educational Progress (NAEP) in economics corroborate previous national findings by documenting higher proportions of male students performing at or above the proficient level than female students. Finally, Butters and Asarta (2011b) used a large national

sample of students in advanced high school economics courses and found the gender gap in economic understanding persists in every content category of the TEL.

Additional inputs in the formation of economic knowledge have also been identified in the literature. For example, Lopus and Maxwell (1993) examined the learning styles and preparation of college students enrolled in principles of economics courses and found that Caucasian students score higher than their non-Caucasian peers. This finding was corroborated by Laband and Piette (1995) in more advanced college level courses. However, Borg, Mason and Shapiro (1989) found that race and ethnicity do not serve as significant predictors of student performance at the principles level. Their findings were supported by other studies controlling for personality types (Borg and Shapiro, 1996; Ziegert, 2000; Borg and Stranahan, 2002). Finally, results collected during the 2006 NAEP in economics suggest that Caucasian and Asian/Pacific Island students perform, on average, significantly better than African American, Hispanic and American Indian students.

Research on the relationship between class size, an often used proxy for school size, and achievement in economics is inconclusive. While some studies find a positive and significant relationship between the two (Lopus and Maxwell, 1995), others find no relationship at all (Hancock, 1996; Kennedy and Siegfried, 1997), and some studies report a significant and negative classroom size effect (Becker and Powers, 2001; Arias and Walker, 2004). Although the direction of the effect seems to be inconclusive, Siegfried and Walstad (1998) reviewed a large body of literature and concluded that classroom size does not impact student performance once the student-teacher ratio reaches 20. Those in favor of smaller classrooms have based their arguments on the development of better critical thinking (Raimondo, Esposito and Gershenberg, 1990) or student accountability (Siegfried and Kennedy, 1995). On the other hand, Lopus and

Maxwell (1995) attributed the better performance of students in large classrooms to a selection mechanism that assigns better instructors to large classes. Clearly, the class size question in economic education deserves further analysis and exploration.

Teacher ability is one of the most relevant predictors of student learning in economics (Becker, Green and Rosen, 1994). Research controlling for factors such as post-graduate credit hours in economics, or years teaching economics, documents the importance of teacher knowledge and preparation in student achievement (Bosshardt and Watts, 1990; Allgood and Walstad, 1999; Butters and Fischer, 2008). However, Rivkin, Hanushek and Kain (2005) indicate that most student achievement gains are exhibited during the first few years of teaching. Additionally, Rockoff (2004) suggests that the effect could be driven by less effective teachers simply leaving the profession.

Finally, research has found that rural students significantly outperform similar students from urban settings (Walstad and Soper ,1982). The authors later discovered, however, no significant performance differentials between rural, suburban and urban students after controlling for their socioeconomic background (Walstad and Soper, 1989). Students from higher socioeconomic tiers consistently outperform their peers in tests of economic literacy and knowledge (Walstad and Soper, 1989; Rebeck, 2002; Butters and Fischer, 2008). More recently, a study conducted by the U.S. Department of Education (Provasnik et al., 2007) examined the results from the 2006 NAEP in economics and found that there were no significant differences between the proportion of twelfth grade students scoring at or above proficient level in rural areas and all other classifications (U.S. Department of Education, 2006). On the other hand, Butters and Fischer (2008) show that urban students score significantly higher than rural students on the TEL after controlling for the percent of students who participated in free or reduced-price

school lunch programs. Finally, Butters, Asarta and Thompson (2011) conducted a comprehensive analysis of economic education literacy in rural and urban settings and concluded that the production of economic knowledge in rural settings is fundamentally different than in urban settings.

DATA AND DESCRIPTIVE STATISTICS

The data for our sample consist of test results and demographic characteristics collected during the 2009 Online EconChallenge competition. Based on the same technology used to perform the national normings of the Test of Economic Knowledge (TEK) and the Basic Economics Test (BET), the online portal used in the competition is an effective method of administering testing materials and collecting student data (Walstad and Butters, 2011). Voluntary participation in the EconChallenge was solicited via e-mail and mailing campaigns conducted by state Councils on Economic Education, the Council for Economic Education, and local teacher e-mail lists. As part of the Challenge, students form teams in one of two divisions depending on the type of economics course in which they are enrolled. The Adam Smith division includes students in International Baccalaureate (IB), Advanced Placement (AP), Honors, two-semester, or any other advanced course in economics. Students enrolled in single (or less) semester courses in economics, general economics, or courses which include introductory economic concepts register in the David Ricardo division (CEE, 2009b). We define students in the Adam Smith division as "Advanced" and students in the David Ricardo division as "Regular." High scoring participants received cash, travel and other prizes in addition to local, state and national recognition. As a result, students had a competitive incentive to accurately demonstrate their level of economic understanding while taking the test.

Since participation in the national competition is voluntary, and teacher driven, the sample of students is not random but does represent a broad and diverse national sampling of high school students (Baglin, 1981). To the extent that academic competitions and highly qualified and engaged teachers contribute to student learning, we would expect that this sample represents a "best case" scenario for the students and teachers involved (Learning Point Associates, 2010).

Students in our sample completed an exam with questions randomly drawn and ordered from Forms A (Advanced) and B (Regular) of the TEL. The TEL is a nationally normed, standardized, reliable and valid measure of understanding of basic economics (Walstad and Rebeck, 2001b). Teacher characteristics were collected through an online survey. The survey asked teachers to report the number of years in teaching, the number of years teaching economics, and the number of hours of post-graduate education in economics. School characteristics were obtained from the National Center for Education Statistics (NCES). Overall, a total of 2102 students for whom we have complete student, teacher, and school data are represented in our sample.

Descriptive Statistics

Descriptive statistics for Advanced and Regular students can be found in Table 1. The variable *TEL Score* represents a vector of student test scores on the TEL. *Time* indicates the amount of time, in minutes, a student spent working on the test, while *Race* is a dummy variable taking the value of "1" if a student self-identified as Caucasian and a value of "0" otherwise. Additionally, there are 4 distinct variables to represent a student's high school grade (*Grade 9-12*). Overall, the majority of students in our Advanced sample were Caucasians in grade twelve, averaging an 80 percent TEL score and completing the exam in approximately 18 minutes. On

the other hand, Regular students were also predominantly Caucasian and in twelfth grade, but their average TEL score was 58 percent correct and they took approximately 17 minutes to complete the test.

Several school-specific variables for the overall sample of schools in our data are also available in Table 1. The number of students in the school at which participating students were enrolled is represented by the variable *Total Students* and is a proxy for school size. The *Student/Teacher Ratio*, a measure of the resources devoted by the school to each student, indicates the number of students per teacher. *Percent Lunch*, a proxy for income, is the percentage of students participating in free and reduced-price lunch programs. Finally, the variable *Percent Female* is the percentage of students at participating schools that are female, while *Rural* is an indicator variable that takes the value of "1" if the school is located in a rural area. Schools are designated as urban or rural based on a U.S. Department of Education classification of all U.S. schools as either urban, suburban, town, or rural. Towns and rural areas are by definition outside of urban areas. As such, our *Rural* variable includes students in schools located either in towns or in rural areas. Overall, Advanced students attend larger schools but participate in free and reduced-price lunch programs at lower rates than Regular students. Additionally, the proportion of female students in the two samples is remarkably similar. Finally, 46 percent of students in the Regular cohort attend rural schools as compared to 19 percent of students in the Advanced sample.

The variables *Postgrad*, *Teaching Experience* and *Econ Teaching Experience* are used as measures of teacher ability and training. The two teaching experience measures represent the total number of years teaching and the number of years teaching economics. These variables are intended to capture the accumulation of teaching skills through learning-by-doing. The *Postgrad*

variables measure the number of hours of post-graduate education that each teacher has completed in economics in increments of six credit hours. For example, *Postgrad 1* indicates teachers who have completed between 1 and 6 credit-hours of post-graduate education, and *Postgrad 4* includes teachers who have completed 19 or more hours. The descriptive values presented in Table 1 indicate that Advanced students are taught by teachers who have completed fewer post-graduate hours and have been teaching economics and other subjects 2 to 4 fewer years, on average, than the teachers of our Regular students.

Finally, we utilize several gender variables to identify student gender and role-model pairings. *Gender* is a zero/one variable representing a student's gender, with female being equal to one. The proportions of female students in our sample are roughly comparable at 41 and 48 percent of Advanced and Regular students, respectively. As described above, we create additional variables representing the four possible teacher-student gender pairings. In each case, the first gender in the pairing is that of the teacher and the second that of the student. For example, *Male-Female* takes the value of "1" if *Tel Score* represents the test score of a female student taught by a male teacher. Summary statistics in Table 1 indicate that the predominant teacher-student pairing is male-male, with approximately 41 percent of Advanced male students and 34 percent of Regular male students in this group.

ECONOMETRIC MODEL

We estimate two specifications of a standard educational production function that relates student performance on a test to student, teacher and school characteristics to identify potential gender role-model effects. Our model includes state-level fixed effects to control for differences in educational standards, testing and mandates. Its functional form is defined as

$$Q_{i,j,k} = F(S_{i,j,k}, X_{i,j,k}, E_k) \qquad (1)$$

where *i* represents the i^{th} student, *j* represents the j^{th} teacher, and *k* represents the k^{th} state. Cohn and Geske (1990) discuss two categories of educational inputs at the secondary level; those provided by the school (school inputs) and inputs that are innate to or provided by the student through home and social education (non-school inputs). In equation (1), *Q* is a vector of educational outputs (TEL test scores), *S* is a vector of student related inputs (e.g., student gender/race), *X* is a vector of school specific variables (e.g., urban/percent lunch, teacher characteristics, role-model interaction terms) and *E* represents the state level fixed effects.

The first specification (A) replicates previous research using a gender variable that takes the value of "1" if the i^{th} student is female. Using an identical student sample, we then estimate a second specification (B) which omits the gender dummy and employs the teacher-student gender variables: *Male-Male, Male-Female, Female-Male, Female-Female*. The *Male-Male* teacher-student paring is the omitted variable. We test for the appropriate specification of our model using a Box-Cox test and conclude that a double-log functional form is best suited for our analysis. As such, all continuous variables are expressed in logs.

REGRESSION RESULTS

Estimation of the models described above produces robust and stable relationships between test scores and student, teacher and school characteristics. These relationships, however, are distinctly different for each of our two student cohorts. Consequently, the findings for the Advanced and Regular student groups are reported in separate sections.

Advanced Students

Estimation results for Advanced students are reported in Tables 2 and 3. The coefficient on school size, as measured by *Total Students*, is positive but insignificant, and the coefficient on the *Student/Teacher Ratio* variable is large, positive and highly significant at the 1 percent level

in all eight specifications of the model. This finding is consistent with research conducted by Lopus and Maxwell (1995) and suggests that while school size may not play an important role in student outcomes, teacher density does. Next, we find that the coefficient on *Percent Lunch* is negative and significant at the 1 percent level in every specification of the model. Butters and Fischer (2008) and Butters, Asarta and Fischer (2011) found similar results with state level data. Our other school level demographic variables, specifically *Percent Female* and *Rural*, are statistically insignificant in every specification of the model.

As shown in previous research (Walstad and Soper, 1989; Butters, Asarta and Thompson, 2011) the students' high school grade, a proxy for age, enters positively and significantly in every specification. Curiously, the coefficients are not statistically different from one another at the 10 percent level. Although a student's race does not have an impact on test scores, the time students devote to completing the exam is both positive and significant, suggesting that increased effort on the exam is directly related to improved performance.

Model 1 does not control for teacher ability. In Models 2, 3, and 4, variables that control for teacher ability such as teaching experience, teaching economics experience and hours of post-graduate education completed are employed. The estimated coefficients on these variables are uniformly negative but statistically insignificant in every specification. The pattern of estimated coefficients observed up to this point suggests that student performance in advanced courses is largely driven by unobserved factors, such as innate student characteristics, and resource availability as measured by income and teacher density.

Finally, we turn our attention to the gender specific variables within our model. We first estimate a traditional human capital model using a simple dummy variable to capture potential differences in scores between male and female students (Specification A). This variable,

Gender, is found to be negative and statistically significant in every specification of the model for the Advanced student cohort. Having identified the well documented "Gender Gap" in economic education, we recast our model by including teacher-student gender pairing variables to identify potential role-model effects (Specification B). As with the other variables in our model, we find a remarkably consistent and stable relationship among the gender pairings. Specifically, male students score higher on the TEL than female students regardless of the gender of their teacher. Furthermore, male students perform equally well on the exam when paired with either male or female teachers. Likewise, and consistent with the baseline model, female students score significantly lower on the TEL than male students regardless of their teacher's gender, suggesting that the presence of a teacher role-model relationship for female students does not improve their learning or retention of economic knowledge at the secondary level. Although the point estimate on the *Female-Female* variable is 50 percent larger in absolute value than that of the *Male-Female* variable, the two coefficients are not statistically different from one another at the 10 percent level. Our findings suggest that we are unable to account for the "Gender Gap" in student scores among Advanced economics students using the available student, teacher, and school characteristics, and that no role-model effect exists between teachers and students of similar genders.

Regular Students

The models estimated for the Regular cohort, reported in Tables 4 and 5, also provide a remarkably stable and robust story about the relationship between our dependent and independent variables. Compared to the Advanced cohort, the estimated relationships are dramatically different for Regular students. The school size variable, *Total Students*, is negative and significant, and *Student/Teacher Ratio* is both positive and significant in every specification.

This finding suggests that Regular students struggle to master economic content in large schools but benefit from larger class sizes. Next, *Percent Lunch* and *Rural* are both negative and significant at the 1 percent level while *Percent Female* remains insignificant. As it was the case with Advanced students, time devoted to completing the exam is a positive predictor of student success, as is the student's high school grade. However, the coefficient on *Grade* is significant beginning in the eleventh grade instead of the tenth.

We further identify a consistent result in the economic education literature finding that *Race* is a statistically significant predictor of test scores for the Regular cohort. Additionally, when expanding our basic model to account for teacher quality, the coefficients on both *Teaching Experience* and *Econ Teaching Experience a*re negative and statistically significant in every specification. This result is troubling since it suggests that learning-by-doing may not be an effective method for improving or measuring teacher quality. On the other hand, however, it may simply reflect the recent adoption of economic standards in many states and the corresponding changes in teacher preparation programs to emphasize economics. As such, our findings may suggest that younger teachers have a more recent and contemporary exposure to economic pedagogy than more experienced educators. The variable *Postgrad* is positive and significant for teachers with 12 to 18 hours of post-graduate work in economics but becomes negative for those with more than 19 hours. This result may simply be a mirror of the effect documented by the variables measuring teaching experience.

We find that in our baseline models (Models 5A, 6A, 7A, and 8A) the variable *Gender* is both negative and significant at the 5 percent level in every specification, illustrating the "Gender Gap" identified previously. The size and sign of this gap is stable for all regressions regardless of the measure used to control for teacher ability. We expand Models 5B through 8B using the

teacher-student gender variables to estimate gender role-model effects. The resulting coefficient estimates are dramatically different than those of the Advanced students. In fact, teacher gender may be an important factor in contributing to the test scores of Regular students. There is, however, no evidence of a traditional role-model effects since both male and female students of female teachers perform significantly better than students of male teachers. The coefficients on the *Female-Female* and *Female-Male* variables are positive and statistically significant at the 1 percent level in every specification. Even more interesting, the point estimates for *Female-Male* are significantly larger than *Female-Female* in every specification at the 10 percent level. This finding indicates that male students of female teachers have a significant advantage over all other students regardless of gender pairings.

Discussion

The estimation results obtained from examining the performance of Advanced and Regular students illustrate two very different and compelling frameworks for understanding the relationship between student, teacher and school characteristics, and student and teacher genders. Being a part of the Advanced cohort is, in itself, a significant predictor of test scores and overshadows many traditional determinants of student performance such as race, school size, and whether or not the student is attending a school in a rural area. Furthermore, variables such as classroom tenure and the number of post-graduate education hours completed are poor measures of teaching ability for instructors who have been identified as qualified to teach an advanced course in economics. Finally, we find that there is no evidence of gender role-model effects for Advanced students and conclude that the observed gap in test scores must be the result of some other unobserved variable.

For Regular students, however, the story is more complex. First, demographic factors such as race, school size, and rural setting have measureable and significant impacts on student performance. Whether or not this is due to lower innate ability or some other factor is a matter of speculation. The fact that there appears to be a significant relationship between a teacher's gender (female) and her students' test scores is startling. Since this effect is positive for both male and female students, there is no clear gender role-model effect, a finding consistent with previous research (Evans,1992).

GENDER AND THE TEST

Having found no consistent evidence explaining the observed gap between the student scores on the TEL and their teachers' gender, we extend our analysis to the test instrument. Possible sources of the disparate scores between male and female students have been attributed to social and cultural differences (Walstad and Robson, 1997), cognitive differences (Anderson and Benjamin, 1994; Hirschfeld et al. 1995), and the format of the test (Ferber et al., 1983; Lumsden, Scott and Becker, 1987). Recognizing that this may be the case, we examine the TEL from three different perspectives. First, are there significant cultural or gender specific references in the test items that may favor one gender over another? Second, are there distinctive patterns of correct responses to the various content items that cluster by gender? Third, is one gender more or less likely to correctly respond to a question based on its cognitive level?

An analysis of TEL test questions does not suggest an inherent bias in the construction or content of the test favoring one gender over another. The test is written without gender specific content or examples. When persons are referred to in test questions, no gender assignment is made and words such as "people," "individuals," "workers," "businesses," and "entrepreneurs"

are used instead. Furthermore, gender neutral goods such as "pants," "sweatshirts," or "cars" are employed in examples instead of items which may be construed as gender specific.

Additionally, there is no systematic pattern associate with performance by gender and the content of the test questions. We report in Table 6 that male students score significantly higher than female students in the Advanced cohort on 33 of 40 test questions. The remaining 7 questions are distributed evenly among several content categories including "opportunity costs/trade-offs," "exchange, money, and interdependence," "competition and market structure," "market failures," "Gross Domestic Product," "fiscal policy" and "comparative advantage/barriers to trade." These questions cover the entire spectrum of concept and content categories, and suggest that there is no specific content represented on the test that would place female students at a disadvantage. If the converse were true, we would expect female students to be at a disadvantage in specific content areas. No such clustering is evident.

Questions on the TEL are categorized into one of three cognitive levels: Knowledge (I), Comprehension (II), and Application (III) (Davis, 1993, p. 242). To the extent that gender may contribute to differentials in cognitive ability, a test stressing one cognitive level over another would be inherently biased against one gender in favor of the other. Thus, we would expect to see a discernible pattern in how a specific gender responds to questions if the cognitive composition of an exam is gender biased. For Advanced students, we conclude that there is no consistent pattern among the questions when considering cognitive levels. Of the questions for which male students score significantly higher, the frequency of cognitive levels I, II and III are 15, 33, and 52 percent respectively, which is not materially different from their overall frequencies in the TEL of 15, 30 and 55 percent.

As shown in Table 7, Regular students exhibit patterns different than those of Advanced students. Male students score significantly better than female students on 10 items. On the other hand, female students score higher than male students on 7 questions, but the differences are not statistically significant. The questions for which there are significant differences span the range of concept areas and include "balance of payments & exchange rates," "economic institutions and incentives," "fiscal policy," "income distribution," "inflation & deflation," "monetary policy" and "supply & demand." Unlike the Advanced students, there are some differences in the distribution of questions by cognitive level relative to the exam. Of the questions for which male students in the Regular cohort score significantly higher, the frequency of cognitive levels I, II and III are 50, 10, and 40 percent respectively, which is different from their overall frequencies in the TEL of 15, 30 and 55 percent. To the extent that gender effects are shaping these results, we would conclude that the gap in student scores is driven by male students performing better on questions that test basic knowledge (Cognitive Level I). Whether or not this represents a pattern that is the result of gender or merely the small number of observations (10) is uncertain.

In summary, there is no evidence of a systematic bias in the cultural content, concept areas or cognitive difficulty of the test questions that would serve to explain the difference in test scores observed between female and male students in advanced economics courses. We are unable to make similarly strong claims for students in regular courses due to the small number of questions for which there are significant differences in performance between genders. The low number of questions for which there are significant differences between the performance of male and female students, however, suggests that no such bias may exist.

CONCLUSION

The gap between test scores for male and female students is a persistent and disturbing feature of economic education at the secondary level. Unlike other empirical regularities, the "Gender Gap" is not dependent on school size, teacher training, urbanization, or student income. As such, it represents a fundamental barrier to the educational and personal success of female students. In this paper we investigate whether there are structural differences in the educational experiences of male and female students that are introduced through role-model effects associate with teacher gender or through biases in testing instruments.

We use a large and diverse data set of Advanced and Regular students from 22 states to estimate a fixed effects model that utilizes teacher-student gender pairings to control for potential gender role-model effects. Although we identify recurring findings in the economic education literature regarding the impact of school size, student-teacher ratios, family income, etc., there is no evidence to suggest a gender role-model effect for Advanced students. We document that Regular students, regardless of their gender, perform significantly better when taught by a female instructor. This effect is especially true for male students: The point estimate on the *Female-Male* variable is more than 50 percent larger than that on *Female-Female,* and the difference is statistically significant at the 10 percent level. We conclude that there are no traditional gender role-model effects for Regular students and that some other mechanism causes the gap in student scores.

We examine the TEL for potential cultural, content or cognitive biases that would favor one gender over another. No evidence of test instrument bias is found for Advanced students. For Regular students, we find no evidence to support the claim that cultural or content biases influence student scores. We note, however, that the frequencies at which male students score

significantly better than female students in different cognitive levels do not match those of the cognitive levels in the overall test. This finding is likely the result of the small number of questions involved.

In summary, our findings show that the differences in test scores between the male and female students in our sample cannot be attributed to gender role-model effects. Additionally, we document that the gap cannot be readily explained by systematic biases in the cultural makeup, content, or cognitive levels of the various items on the exam. We conclude that the "Gender Gap" cannot be attributed to the teacher or the test and that further research is needed to address this issue.

REFERENCES

Allgood, S., and Walstad, W.B. 1999. The Longitudinal Effects of Economic Education. *Journal of Economic Education*, 30(2), 99-111.

Anderson, G., and Benjamin, D. 1994. The Determinants of Success in University Introductory Economics Courses. *Journal of Economic Education*, 25(2): 99-119.

Arias, J.J., and Walker, D.M. 2004. Additional Evidence on the Relationship between Class Size and Student Performance. Journal of Economic Education, 35(4): 311-29.

Ashworth, J., and Evans, J.L. 2001. Modeling Student Subject Choice at Secondary and Tertiary Level: A Cross Section Study. *Journal of Economic Education*, 32(4): 311-22.

Baglin, R.F. 1981. Does "Nationally" Normed Really Mean Nationally? *Journal of Educational Measurements*, 18(2): 97-107.

Becker, W., Greene, W., and Rosen, S. 1990. Research on High School Economic Education. *Journal of Economic Education*, 21(3): 231-245.

Becker, W., Greene, W., and Rosen, S. 1994. Research on High School Economics in the United States: Further Consideration. In Walstad, W.B., ed., *An International Perspective on Economic Education*, 93. Massachusetts: Klumer Academic Publishers.

Becker , W.E., and Powers, J.R. 2001. Student Performance, Attrition, and Class Size Given Missing Student Data. *Economic of Education Review*, 20(4): 377-88.

Bernheim, B.D., Garrett, D.M., and Maki, D.M. 2001. Education and Savings: The Long-Term Effects of High School Financial Curriculum Mandates. *Journal of Public Economics*, 80(3): 435-65.

Bolch, B.W., and Fels, R. 1974. A Note on Sex and Economic Education. *Journal of Economic Education,* 6(1): 64-67.

Borg, M.O., Mason, P.M., and Shapiro, S.L. 1989. The Case of Effort Variables in Student Performance. *Journal of Economic Education,* 20(3): 309-13.

Borg, M.O., and Shapiro, S.L. 1996. Personality Type and Student Performance in Principles of Economics. *Journal of Economic Education,* 27(1): 3-25.

Borg, M.O., and Stranahan, H.A. 2002. Personality Type and Student Performance in Upper-Level Economics Courses: The Importance of Race and Gender. *Journal of Economic Education,* 33(1): 3-14.

Bosshardt, W., and Watts, M. 1990. Instructor Effects and Their Determinants in Precollege Economic Education. *Journal of Economic Education,* 21(3), 265-76.

Butters, R.B., and Asarta, C.J. 2011a. A Survey of Economic Understanding in U.S. High Schools. *Journal of Economic Education,* 42(2): 200-205.

Butters, R.B., and Asarta, C.J. 2011b. Gender and Economic Understanding in U.S. High Schools. *Journal of Economics and Finance Education,* 10(1): 37-40.

Butters, R.B., Asarta, C.J., and Fischer, T.J. 2011. Human Capital in the Classroom: The Role of Teacher Knowledge in Economic Literacy. *American Economist,* 56(2): 1-11.

Butters, R.B., Asarta, C.J., and Thompson, E. 2011. Timing or Technology: Economic Education in Rural and Urban Settings. Manuscript.

Butters, R.B., and Fischer, T. 2008. Establishing State Specific Benchmarks in Economic Education. *Journal of Consumer Education,* 25: 61-72.

Cohn, E., and Geske, T. 1990. *The Economics of Education* (3rd edition). Oxford, England: Pergamon Press.

Council on Economic Education (CEE). 2009a. Survey of the States: A Report Card, http://www.councilforeconed.org/about/survey2009/, retrieved on 09/01/2011.

Council on Economic Education (CEE). 2009b. Check the Rules (2009 National Economics Challenge), http://economicschallenge.councilforeconed.org/rules.php, retrieved on 09/01/2011.

Davis, B.G. 1993. *Tools for teaching*. San Francisco, CA: Jossey-Bass.

Dynan, K. E., and C. E. Rouse. 1997. The Underrepresentation of Women in Economics: A Study of Undergraduate Economics Students. *Journal of Economic Education,* 28 (4): 350-68.

Evans, M.O. 1992. An Estimate of Race and Gender Role-Model Effects in Teaching High School. *Journal of Economics Education,* 23(3): 209-17.

Ferber, M. A., Birnbaum, B. G., Green, C. A. and Becker., W. E. 1983. Gender Differences in Economic Knowledge: A Reevaluation of the Evidence. *Journal of Economic Education,* 14(2): 24-37.

Ferber, M.A. 1990. Gender and the Study of Economics. In W.B. Walstad, and P. Saunders, eds., *The Principles of Economics Course*, 44-60. New York: McGraw-Hill.

Ferber, M. A. 1995. The Study of Economics: A Feminist Critique. *American Economic Review,* 85 (3): 357-62.

Hancock, T.M. 1996. Effects of Class Size on College Student Achievement. *College Student Journal*, 30(4): 479-81.

Hirschfeld, M., Moore, R.L., and Brown, E. 1995. Exploring the Gender Gap on the GRE Subject Test in Economics. *Journal of Economic Education,* 26(1): 41-48.

Horvath, J., Beaudin, B. and Wright, S. 1992. Persisting in the Introductory Economics Course: an Exploration of Gender Differences. *Journal of Economic Education,* 23 (2): 101-108.

Kennedy, P.E. and J.J. Siegfried. 1997. Class Size and Achievement in Introductory Economics: Evidence from the TUCE III data. *Economics of Education Review*, 16(4): 385-94.

Laband, D.N., and Piette, M.J. 1995. Does Who Teaches Principles of Economics Matter? *American Economic Review* (Papers and Proceedings), 85(20): 335-38.

Learning Point Associates. 2009. The Stock Market Game Study: Brief Report, Retrieved March 14, 2011: http://www.learningpt.org/smg/SMG_Study.pdf

Lumsden, K. G., Scott, A. and Becker, W .E. 1987. The Economics Student Reexamined: Male-Female Differences in Comprehension. *Journal of Economic Education,* 18(4): 365-75.

Lopus, J. 1997. Effects of The High School Economics Curriculum on Learning. *Journal of Economic Education*, 28(2): 143-54.

Lopus, J.S., and Maxwell, N.L. 1993. Ethnic Differences in Learning College Economics: An Empirical Analysis. Unpublished manuscript presented at the Allied Social Science Association.

Lopus, J.S., and Maxwell, N.L. 1995. Teaching Tools: Should We Teach Microeconomic Principles before Macroeconomic Principles? *Economic Inquiry,* 33(2): 336-50.

Myatt, A., and Waddell, C. 1990. An Approach to Testing the Effectiveness of the Teaching and Learning of Economics at High School. *Journal of Economics Education*, 21(3): 355-63.

Provasnik, S., KewalRamani, A., Coleman, M.M., Gilberton, L., Herring, W., and Xie, Q. 2007. *Status of Education in Rural America* (NCES 2007-040). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, D.C.

Raimondo, H.J., Esposito, L., and Gershenberg, I. 1990. Introductory Class Size and Student Performance in Intermediate Theory Courses. *Journal of Economic Education*, 21(4): 369-81.

Rask, K.N., and Bailey, E.M. 2002. Are Faculty Role Models? Evidence from Major Choice in an Undergraduate Institution. *Journal of Economic Education*, 33(2): 99-124.

Rebeck, K. 2002. Economic Literacy in U.S. High Schools. (Doctoral dissertation, University of Nebraska-Lincoln).

Rivkin, S.G., Hanushek, E.A., and Kain, J.F. 2005. Teachers, Schools, and Academic Achievement. *Econometrica*, 73(2): 417-58.

Rockoff, J.E. 2004. The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data. *American Economic Review*, 94(2): 247-52.

Siegfried, J.J. 1979. Male-Female Differences in Economic Education: A Survey. *Journal of Economic Education*, 10(2): 1-11.

Siegfried, J.J., and Kennedy, P.E. 1995. Does Pedagogy Vary with Class Size in Introductory Economics? *American Economic Review,* 82(2): 347-51.

Siegfried, J.J., and Walstad, W.B. 1998. Research on College Economics. In Walstad, W.B., and Saunders, P., eds., *Teaching Undergraduate Economics: A Handbook for Instruction*, 141-66. New York: Irwin/McGraw-Hill.

Stern, G. 2002. From Pocketbook to Policymaking, Economic Education Matters: Top of the Ninth. Federal Reserve Bank of Mineapolis. Available at http://www.minneapolisfed.org/publication_papers/pub_display.cfm?id=3406.

Stigler, G.J. 1970. The Case, if any, for Economic Literacy. *Journal of Economic Education*, 1(2): 77-84.

Swope, K. J. and Schmitt, P. M. 2006. The Performance of Economic Graduates over the Entire Curriculum: The Determinants of Success. *Journal of Economic Education,* 37(4): 387-394.

U.S. Department of Education. 2006. Institute of Education Sciences, National Center for Education Statistics, National Assessment of Education Progress (NAEP), 2006 Economic Assessment. Retrieved May 15, 2011. http://nces.ed.gov/nationsreportcard/naepdata/

Walstad, W.B. 1998. Why it's Important to Understand Economics. *The Region*, December:22-6.

Walstad, W.B., and Butters, R.B. 2011. Online vs. Paper and Pencil. *Journal of Economics Education*, 42(4): forthcoming.

Walstad, W. B. and Rebeck, K. 2001a. Assessing the Economic Understanding of U.S. High School Students. *American Economic Review*, Papers and Proceedings, 91(2): 452-57.

Walstad, W.B. and Rebeck, K. 2001b. *The Test of Economic Literacy* (3rd Ed.): Examiner's Manual. New York: National Council on Economic Education.

Walstad, W. B. and Robson, D. 1997. Differential Item Functioning and Male-Female Differences in Multiple Choice Tests in Economics. *Journal of Economic Education*, 28(2): 155-71.

Walstad, W.B., and Soper, J.C. 1982. A Model of Economic Learning in the High Schools. *Journal of Economic Education*, 13(1): 40-54.

Walstad, W.B., and Soper, J.C. 1989. What Is High School Economics? Factors Contributing to Student Achievement and Attitudes. *Journal of Economic Education*, 20(1): 39-57.

Walstad, W. B., M. Watts and K. Rebeck. 2007. *Test of Understanding of College Economics (Fourth Edition): Examiner's Manual*, New York: National Council on Economic Education.

Watts, M., and Walstad, W.B. 2006. Research on Economic Education in the Schools: A Review of Findings and a New Agenda, in Teaching Economics in Trouble Times: Theory and Practice for Secondary Social Studies, Mark Schug, William Wood, eds., Routledge.

Williams, M.L., Waldauer, C. and Duggal, V.C. 1992. Gender Differences in Economic Knowledge: an Extension of the Analysis. *Journal of Economic Education*, 23(3): 219-31.

Ziegert, A.L. 2000. The Role of Personality Temperament and Student Learning in Principles of Economics. *Journal of Economics Education*, 31(4): 307-22.

Table 1
Summary Statistics

	Advanced Students N = 1137				Regular Students N = 965			
Variable	**Mean**	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**
TEL Score	0.803	0.045	1	0.177	0.581	0.042	1	0.200
Time	18.061	1.033	36.717	5.772	17.089	1.267	35.367	6.191
Race	0.589	0	1	0.492	0.732	0	1	0.443
Grade 9	0.014	0	1	0.118	0.062	0	1	0.242
Grade 10	0.035	0	1	0.184	0.070	0	1	0.256
Grade 11	0.162	0	1	0.368	0.159	0	1	0.365
Grade 12	0.789	0	1	0.408	0.709	0	1	0.455
Total Students	1951.430	47	4666	1067.730	1246.628	47	4050	813.489
Student/Teacher Ratio	17.771	8.4	29.2	3.077	15.706	8	23.3	2.877
Percent Lunch	0.214	0.003	0.995	0.176	0.239	0.024	0.996	0.191
Percent Female	0.495	0.414	0.633	0.035	0.490	0.411	0.633	0.025
Rural	0.192	0	1	0.394	0.463	0	1	0.499
Postgrad 1 (1-6 hours)	0.481	0	1	0.500	0.506	0	1	0.500
Postgrad 2 (7-12 hours)	0.219	0	1	0.414	0.091	0	1	0.288
Postgrad 3 (13-18 hours)	0.064	0	1	0.245	0.048	0	1	0.213
Postgrad 4 (>18 hours)	0.236	0	1	0.425	0.355	0	1	0.479
Teaching Experience	14.699	3	40	7.851	18.323	1	39	10.608
Econ Teaching Experience	10.968	1	38	7.122	12.894	1	33	8.668
Gender (Female=1)	0.409	0	1	0.492	0.477	0	1	0.499
Male-Male	0.406	0	1	0.491	0.342	0	1	0.475
Male-Female	0.283	0	1	0.451	0.310	0	1	0.463
Female-Male	0.185	0	1	0.388	0.181	0	1	0.386
Female-Female	0.126	0	1	0.332	0.167	0	1	0.373

Note: Male-Male, Male-Female, Female-Male, and Female-Female are dummy variables representing teacher-student gender pairings. The first gender in the pairing is that of the teacher and the second that of the student.

Table 2
Regression Results – Advanced Students

	Model 1A	***Model 1B***	***Model 2A***	***Model 2B***
Total Students	0.016	0.013	0.017	0.013
	(0.028)	(0.029)	(0.028)	(0.029)
Student/Teacher Ratio	0.214***	0.205***	0.211***	0.201***
	(0.064)	(0.067)	(0.066)	(0.069)
Percent Lunch	-0.039***	-0.039***	-0.039***	-0.039***
	(0.008)	(0.008)	(0.008)	(0.008)
Time	0.154***	0.156***	0.154***	0.157***
	(0.033)	(0.034)	(0.034)	(0.034)
Percent Female	0.217	0.232	0.217	0.232
	(0.143)	(0.141)	(0.143)	(0.141)
Race (Caucasian=1)	0.018	0.018	0.018	0.018
	(0.016)	(0.016)	(0.016)	(0.016)
Rural (Rural=1)	-0.004	-0.010	-0.004	-0.009
	(0.025)	(0.025)	(0.024)	(0.025)
Grade 10	0.674***	0.663***	0.675***	0.665***
	(0.191)	(0.191)	(0.190)	(0.190)
Grade 11	0.764***	0.758***	0.765***	0.759***
	(0.187)	(0.188)	(0.187)	(0.187)
Grade 12	0.736***	0.728***	0.738***	0.729***
	(0.187)	(0.187)	(0.187)	(0.187)
Teaching Experience			-0.004	-0.005
			(0.020)	(0.020)
Gender (Female=1)	-0.085***		-0.085***	
	(0.015)		(0.015)	
Male-Female		-0.077***		-0.077***
		(0.018)		(0.018)
Female-Male		-0.020		-0.020
		(0.024)		(0.025)
Female-Female		-0.125***		-0.126***
		(0.029)		(0.029)
Constant	-2.159***	-2.079***	-2.141***	-2.055***
	(0.332)	(0.364)	(0.345)	(0.384)
R-squared	0.390	0.391	0.389	0.390
N	1137	1137	1137	1137
P	0.000	0.000	0.000	0.000

*Note: *p<0.10, **p<0.05, ***p<0.010, State fixed effects are omitted.*

Table 3
Regression Results – Advanced Students

	Model 3A	***Model 3B***	***Model 4A***	***Model 4B***
Total Students	0.017	0.012	0.023	0.019
	(0.028)	(0.029)	(0.030)	(0.030)
Student/Teacher Ratio	0.198***	0.186***	0.186***	0.178**
	(0.065)	(0.069)	(0.070)	(0.072)
Percent Lunch	-0.040***	-0.040***	-0.035***	-0.036***
	(0.008)	(0.008)	(0.011)	(0.011)
Time	0.155***	0.158***	0.154***	0.156***
	(0.033)	(0.033)	(0.033)	(0.033)
Percent Female	0.22	0.237*	0.215	0.231
	(0.144)	(0.142)	(0.144)	(0.142)
Race (Caucasian=1)	0.019	0.018	0.019	0.019
	(0.016)	(0.016)	(0.015)	(0.015)
Rural (Rural=1)	-0.001	-0.007	-0.001	-0.007
	(0.025)	(0.026)	(0.025)	(0.026)
Grade 10	0.676***	0.665***	0.677***	0.666***
	(0.191)	(0.191)	(0.191)	(0.192)
Grade 11	0.761***	0.754***	0.765***	0.759***
	(0.187)	(0.188)	(0.188)	(0.188)
Grade 12	0.734***	0.725***	0.739***	0.731***
	(0.187)	(0.187)	(0.188)	(0.188)
Econ Teaching Experience	-0.016	-0.018		
	(0.013)	(0.013)		
Postgrad 2			-0.009	-0.015
			(0.023)	(0.024)
Postgrad 3			-0.010	-0.018
			(0.039)	(0.038)
Postgrad 4			-0.032	-0.034
			(0.029)	(0.028)
Gender (Female=1)	-0.085***		-0.085***	
	(0.015)		(0.015)	
Male-Female		-0.078***		-0.077***
		(0.018)		(0.018)
Female-Male		-0.023		-0.02
		(0.025)		(0.024)
Female-Female		-0.127***		-0.127***
		(0.029)		(0.029)
Constant	-2.080***	-1.983***	-2.091***	-2.010***
	(0.335)	(0.372)	(0.365)	(0.396)
R-squared	0.390	0.391	0.389	0.390
N	1137	1137	1137	1137
p	0.000	0.000	0.000	0.000

*Note: *p<0.10, **p<0.05, ***p<0.010, State fixed effects are omitted.*

Table 4
Regression Results – Regular Students

	Model 5A	***Model 5B***	***Model 6A***	***Model 6B***
Total Students	-0.180***	-0.150***	-0.213***	-0.172***
	(0.054)	(0.050)	(0.051)	(0.049)
Student/Teacher Ratio	0.616***	0.702***	0.762***	0.774***
	(0.177)	(0.160)	(0.173)	(0.159)
Percent Lunch	-0.150***	-0.093***	-0.174***	-0.114***
	(0.036)	(0.034)	(0.035)	(0.034)
Time	0.238***	0.254***	0.247***	0.257***
	(0.040)	(0.038)	(0.039)	(0.038)
Percent Female	-0.092	-0.077	0.249	0.115
	(0.370)	(0.352)	(0.373)	(0.368)
Race (Caucasian=1)	0.061**	0.067**	0.069**	0.071***
	(0.028)	(0.027)	(0.027)	(0.027)
Rural (Rural=1)	-0.297***	-0.272***	-0.263***	-0.256***
	(0.049)	(0.047)	(0.050)	(0.048)
Grade 10	0.113	0.058	0.125	0.072
	(0.079)	(0.077)	(0.077)	(0.077)
Grade 11	0.228***	0.220***	0.165**	0.185**
	(0.081)	(0.080)	(0.081)	(0.080)
Grade 12	0.271***	0.250***	0.225***	0.226***
	(0.070)	(0.068)	(0.068)	(0.067)
Teaching Experience			-0.113***	-0.064**
			(0.027)	(0.028)
Gender (Female=1)	-0.050**		-0.051**	
	(0.023)		(0.023)	
Male-Female		-0.044		-0.046
		(0.030)		(0.030)
Female-Male		0.297***		0.259***
		(0.045)		(0.047)
Female-Female		0.235***		0.197***
		(0.046)		(0.048)
Constant	-2.457***	-3.090***	-2.206***	-2.867***
	(0.591)	(0.581)	(0.588)	(0.589)
R-squared	0.255	0.282	0.267	0.285
N	965	965	965	965
P	0.000	0.000	0.000	0.000

*Note: *p<0.10, **p<0.05, ***p<0.010, State fixed effects are omitted.*

Table 5
Regression Results – Regular Students

	Model 7A	***Model 7B***	***Model 8A***	***Model 8B***
Total Students	-0.220***	-0.180***	-0.144***	-0.135***
	(0.052)	(0.049)	(0.049)	(0.048)
Student/Teacher Ratio	0.604***	0.680***	0.580***	0.673***
	(0.171)	(0.159)	(0.162)	(0.158)
Percent Lunch	-0.200***	-0.134***	-0.120***	-0.083**
	(0.036)	(0.035)	(0.035)	(0.034)
Time	0.242***	0.254***	0.230***	0.244***
	(0.039)	(0.038)	(0.039)	(0.039)
Percent Female	0.091	0.033	-0.981**	-0.720*
	(0.358)	(0.356)	(0.402)	(0.391)
Race (Caucasian=1)	0.071***	0.072***	0.073***	0.073***
	(0.027)	(0.027)	(0.028)	(0.027)
Rural (Rural=1)	-0.312***	-0.286***	-0.318***	-0.292***
	(0.049)	(0.047)	(0.051)	(0.048)
Grade 10	0.085	0.05	0.121	0.071
	(0.073)	(0.074)	(0.082)	(0.080)
Grade 11	0.189**	0.197**	0.298***	0.278***
	(0.079)	(0.079)	(0.081)	(0.081)
Grade 12	0.251***	0.241***	0.283***	0.264***
	(0.066)	(0.066)	(0.071)	(0.069)
Econ Teaching Experience	-0.098***	-0.060***		
	(0.018)	(0.019)		
Postgrad 2			0.016	0.022
			(0.046)	(0.045)
Postgrad 3			0.488***	0.389***
			(0.077)	(0.085)
Postgrad 4			-0.159***	-0.094**
			(0.046)	(0.046)
Gender (Female=1)	-0.051**		-0.047**	
	(0.023)		(0.023)	
Male-Female		-0.044		-0.039
		(0.030)		(0.030)
Female-Male		0.248***		0.236***
		(0.047)		(0.048)
Female-Female		0.185***		0.174***
		(0.048)		(0.049)
Constant	-2.074***	-2.747***	-3.244***	-3.560***
	(0.576)	(0.580)	(0.614)	(0.598)
R-squared	0.271	0.287	0.278	0.292
N	965	965	965	965
p	0.000	0.000	0.000	0.000

*Note: *p<0.10, **p<0.05, ***p<0.010, State fixed effects are omitted.*

Table 6
Item Response Evaluation by Gender (Advanced Students)
Test of Economics Literacy Form A

Item	Male	Female	Difference	Cognitive Level	Category
1	91.51	87.01	-4.50**	II	Scarcity
2	92.20	84.30	-7.90***	II	Scarcity
3	93.55	86.62	-6.92***	II	Scarcity
4	87.62	83.28	-4.34	III	Opportunity costs/trade-offs
5	68.78	56.40	-12.38***	III	Opportunity costs/trade-offs
6	85.11	78.55	-6.56**	II	Productivity
7	78.94	69.54	-9.40***	III	Productivity
8	94.34	89.30	-5.05**	II	Economic systems
9	74.69	68.39	-6.30*	II	Economic systems
10	92.07	85.21	-6.87***	I	Economic institutions and incentives
11	64.60	54.55	-10.05***	I	Economic institutions and incentives
12	82.91	73.68	-9.23***	III	Economic institutions and incentives
13	74.49	63.81	-10.68***	III	Exchange, money, & interdependence
14	89.11	85.22	-3.89	II	Exchange, money, & interdependence
15	81.59	77.15	-4.43	III	Competition & market structure
16	90.31	82.11	-8.20***	III	Supply & demand
17	90.27	82.09	-8.17***	III	Supply & demand
18	85.10	76.49	-8.61***	III	Markets & prices
19	87.39	82.50	-4.89*	III	Supply & demand
20	82.87	74.52	-8.35***	III	Competition & market structure
21	73.27	57.19	-16.08***	II	Income distribution
22	83.70	78.97	-4.73	III	Market failures
23	74.83	65.67	-9.17***	II	Market failures
24	80.80	68.03	-12.77***	III	Role of government
25	88.71	84.54	-4.17	I	Gross Domestic Product
26	85.62	80.78	-4.83*	II	Aggregate supply & demand
27	93.56	89.11	-4.45**	III	Aggregate supply & demand
28	87.22	80.06	-7.16***	II	Unemployment
29	92.64	82.67	-9.97***	I	Inflation & deflation
30	88.97	78.71	-10.26***	III	Inflation & deflation
31	70.55	57.83	-12.72***	III	Monetary policy
32	61.38	49.51	-11.86***	III	Monetary policy
33	94.41	87.67	-6.74***	I	Fiscal policy
34	94.20	91.61	-2.59	III	Fiscal policy
35	86.61	76.95	-9.66***	III	Comparative advantage/barriers to trade
36	83.57	81.82	-1.75	III	Comparative advantage/barriers to trade
37	83.99	77.40	-6.59**	III	Comparative advantage/barriers to trade
38	88.16	80.33	-7.84***	I	Balance of payments & exchange rates
39	65.79	49.02	-16.77***	III	Balance of payments & exchange rates
40	84.08	75.93	-8.15***	II	International growth and stability

Note: *p<0.10, **p<0.05, ***p<0.010, Cognitive Levels: I – Knowledge, II – Comprehension, III – Application. Concept names and cognitive levels were obtained from William B. Walstad and Ken Rebeck, *Test of Economic Literacy: Examiner's Manual*, 3rd ed. (New York: NCEE, 2001).

Table 7
Item Response Evaluation by Gender (Regular Students)
Test of Economic Literacy Form B

Item	Male	Female	Difference	Cognitive Level	Category
1	66.36	69.36	3.00	II	Scarcity
2	71.12	70.45	-0.68	II	Scarcity
3	74.22	71.81	-2.41	II	Scarcity
4	52.98	52.63	-0.34	III	Opportunity costs/trade-offs
5	63.75	67.89	4.15	III	Opportunity costs/trade-offs
6	61.15	56.69	-4.46	II	Productivity
7	76.23	71.17	-5.06	III	Productivity
8	69.87	70.49	0.62	II	Economic systems
9	75.00	76.82	1.82	II	Economic systems
10	73.86	64.04	-9.82***	I	Economic institutions and incentives
11	60.49	53.77	-6.72*	I	Economic institutions and incentives
12	77.33	72.94	-4.39	III	Economic institutions and incentives
13	45.74	44.72	-1.02	III	Exchange, money, & interdependence
14	42.86	41.38	-1.48	II	Exchange, money, & interdependence
15	64.97	61.17	-3.8	III	Competition & market structure
16	79.88	71.10	-8.78**	III	Supply & demand
17	39.75	33.33	-6.42	III	Supply & demand
18	57.64	51.86	-5.78	III	Markets & prices
19	61.78	52.76	-9.02**	III	Supply & demand
20	61.47	59.80	-1.67	III	Competition & market structure
21	54.76	45.70	-9.07**	II	Income distribution
22	51.25	51.94	0.69	III	Market failures
23	56.63	61.87	5.25	II	Market failures
24	40.43	45.64	5.22	III	Role of government
25	63.58	61.21	-2.37	I	Gross Domestic Product
26	69.35	63.28	-6.07	II	Aggregate supply & demand
27	27.56	24.52	-3.04	III	Aggregate supply & demand
28	89.70	89.31	-0.39	II	Unemployment
29	66.14	57.97	-8.17**	I	Inflation & deflation
30	44.72	43.89	-0.83	III	Inflation & deflation
31	40.49	31.54	-8.95**	III	Monetary policy
32	28.57	21.23	-7.34**	III	Monetary policy
33	66.56	58.02	-8.54**	I	Fiscal policy
34	73.26	72.18	-1.07	III	Fiscal policy
35	65.96	64.14	-1.82	III	Comparative advantage/barriers to trade
36	40.84	37.81	-3.03	III	Comparative advantage/barriers to trade
37	63.55	57.70	-5.84	III	Comparative advantage/barriers to trade
38	55.39	46.28	-9.11**	I	Balance of payments & exchange rates
39	42.54	37.09	-5.45	III	Balance of payments & exchange rates
40	68.97	65.08	-3.88	II	International growth and stability

Note: *p<0.10, **p<0.05, ***p<0.010, Cognitive Levels: I – Knowledge, II – Comprehension, III – Application. Concept names and cognitive levels were obtained from William B. Walstad and Ken Rebeck, *Test of Economic Literacy: Examiner's Manual*, 3rd ed. (New York: NCEE, 2001).