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by

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March 1999
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ABSTRACT

As teachers of economic principles, we often rely on casual empiricism to identify characteristics of students or of the classroom environment that we believe affect student performance. When we do so, we run the risk of stereotyping students in various groups as being more or less likely to do well in our principles of economics classes. In this paper, we report the results of a study designed to determine the factors affecting success of students in large economic principles classes, and the factors affecting satisfaction of students with the teacher and with the course. The results of the study indicate that while demographic and educational variables are important determinants of student success and satisfaction in economic principles, factors related to the physical environment are also important.
I. The Model

Models of the determinants of student success, satisfaction with the course, and satisfaction with the teacher were developed and tested. The same nine independent variables were used in each model:

Model 1: \( \text{AVE} = f(\text{ABS, ROW, LR, CRED, GPA, LOAD, SEX, FOR, TECH}) \),

Model 2: \( \text{CSAT} = f(\text{ABS, ROW, LR, CRED, GPA, LOAD, SEX, FOR, TECH}) \),

Model 3: \( \text{TSAT} = f(\text{ABS, ROW, LR, CRED, GPA, LOAD, SEX, FOR, TECH}) \),

where AVE = course grade, calculated as percentage of total possible points earned; CSAT = student satisfaction with the course, measured on a 1-5 scale, with 5 indicating the highest degree of satisfaction; TSAT = student satisfaction with the teacher, measured on a 1-10 scale, with 10 indicating the highest degree of satisfaction; ABS = total number of days absent during the quarter; ROW = seat row number, with rows numbered from 1 to 11, row 1 being closest to the front of the classroom; LR = dummy variable for seats in the left or right sections (1) rather than in the center section (0); CRED = number of credits completed by the student before the current quarter; GPA = grade point average before the current quarter, on a standard 4.0 scale; LOAD = course load, measured by the number of classes in which the student is currently enrolled; SEX = dummy variable for female students (1) relative to male students (0); FOR = dummy variable for foreign

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1L. Dwight Israelsen is Professor of Economics, and Karl E. Israelsen is a senior majoring in Economics at Utah State University, Logan, UT 84322-3530.
students (1) relative to domestic students (0); TECH = dummy variable for student major in a technical college (1) relative to a major in a nontechnical college (0).

We hypothesized that larger values of CRED, GPA, and TECH will lead to larger values of the dependent variables, while larger values of ABS, ROW, LR, and FOR will lead to smaller values of the dependent variables, ceteris paribus. We believed that students with more college experience, higher GPAs, and better technical skills are more likely to perform well in economic principles courses, while those who miss classes, sit toward the back or the sides of the room, and/or come from foreign countries are less likely to be successful and satisfied. Because economic analysis relies on using a general framework of problem-solving to identify and resolve economic issues, it is quite different from the memorization and rule-application techniques characteristic of most high school and introductory college courses. Hence, students with more experience at the college level should be more successful in understanding and using the economic approach to problem solving. GPA is a proxy for factors such as intellectual ability, drive, dedication, and study habits that are difficult or impossible to measure directly. Students with high GPAs generally have more of these qualities than do students with low GPAs, hence, they should do well in economics courses relative to students with low GPAs. Students with technical majors have two advantages in learning economics. First, it is more likely that these students have the quantitative and logical skills necessary to understand and use the tools of economic analysis. Second, in many technical majors—engineering, for example—students have already learned a general problem-solving technique, hence, the economic approach to problem solving is not strange and different to them.

We believed that students who miss class more often are likely to achieve a lower level of success and satisfaction in economic principles, ceteris paribus, because they also miss insights,
explanations, and examples presented during lectures. The seating assignment should be a determinant of student success and satisfaction in large economic principles classes because of the difficulty in seeing, hearing, and concentrating on the lectures for students seated near the back of a large auditorium. We hypothesized that the further away from the front, center of the auditorium a student is seated, the lower will be the student’s performance and satisfaction with the class, other things equal. We also believed that students whose first language is not English will achieve lower satisfaction and success than will native English speakers, because the nonnative speakers will generally have more difficulty in understanding lectures, textbooks, and even in reading and understanding test material. Although we were not able to ascertain the native language of the foreign students in the class, it is true that the large majority of foreign students at Utah State University are native to countries in which English is not the primary language. In addition, we believed that students from countries with economic and political institutions that differ substantially from those of the United States, and students from developing and transition economies are at a disadvantage in understanding the American economy.

The impacts on student performance and satisfaction of course loads and sex were more difficult to hypothesize and, in fact, we did not put an expected sign on the LOAD and SEX coefficients. A higher course load could mean that the student is unlikely to be able to spend a significant time studying for a given class, or it might be an indicator that the student is particularly well-organized and has the intellectual ability, discipline, and drive necessary to be successful in learning economics. We did not believe that female students are either more or less likely to be successful in learning economics than are male students, *ceteris paribus.*
II. Data

Data for the study were collected from a macroeconomic principles course taught by the most experienced economic principles teacher in the Department of Economics at Utah State University, a professor who has on several occasions received university-wide recognition for his teaching abilities. The course was taught in an auditorium with 275 seats, and 250 students—essentially the entire class—were included in the study. Seats were assigned the first day of class, and an attendance record was kept for the entire quarter. A course evaluation was conducted at the end of the quarter, and permission was obtained to code the responses according to seat number. Grades were based on the number of points earned by the students as a percentage of total points possible. Other data were obtained from university records and were also coded by seat number. The classification of colleges as technical and nontechnical is Utah State University’s own classification. Technical colleges include Engineering, Natural Resources, and Science. Nontechnical colleges include Agriculture, Business, Education, Family Life, and Humanities, Arts & Social Sciences. Undeclared students were placed in the nontechnical category. Two observations were omitted from the database because there was no information available on major or college.

III. Results

A multiple regression analysis was applied to each of the three models. The first regression, with student success, AVE, as the dependent variable, utilized all 248 available observations. The CSAT and TSAT regressions were limited to 175 observations, the number of evaluations that were completed by students at the end of the quarter. Results of these regressions follow.
**Student Success**

The regression results for the determinants of student success (AVE) are shown in Table 1. Notice that all of the coefficients except LR have the expected signs. Although LR is not statistically significant at the .05 level, it is interesting to note that in the curved seating arrangement of an auditorium, the students seated in the outside sections performed slightly better (1.6%) in the class than did those seated in the center section. The three variables we anticipated would contribute positively to student performance, CRED, GPA, and TECH, were all statistically significant at the .05 level or less. The number of credits completed before the current quarter, CRED, was statistically significant at the .05 level. The estimated coefficient, 0.0238, suggests that for each additional year of experience (about 45 credits), a student’s course average will increase by only 1%.

![Table 1. Regression Results for the Determinants of Student Success](image)

<table>
<thead>
<tr>
<th>Independent Variable = AVE</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>33.60</td>
<td>3.93</td>
<td>8.55***</td>
</tr>
<tr>
<td>ABS(-)</td>
<td>-0.179</td>
<td>0.122</td>
<td>-1.46</td>
</tr>
<tr>
<td>ROW(-)</td>
<td>-0.469</td>
<td>0.222</td>
<td>-2.11*</td>
</tr>
<tr>
<td>LR(-)</td>
<td>1.60</td>
<td>1.31</td>
<td>1.22</td>
</tr>
<tr>
<td>CRED(+)</td>
<td>0.0238</td>
<td>0.0129</td>
<td>1.84*</td>
</tr>
<tr>
<td>GPA(+)</td>
<td>13.65</td>
<td>0.919</td>
<td>14.85***</td>
</tr>
<tr>
<td>LOAD</td>
<td>0.0706</td>
<td>0.159</td>
<td>0.445</td>
</tr>
<tr>
<td>SEX</td>
<td>-4.40</td>
<td>1.21</td>
<td>-3.63***</td>
</tr>
<tr>
<td>FOR(-)</td>
<td>-0.191</td>
<td>2.43</td>
<td>-0.079</td>
</tr>
<tr>
<td>TECH(+)</td>
<td>3.33</td>
<td>1.22</td>
<td>2.73***</td>
</tr>
</tbody>
</table>

n = 248.
d.o.f. = 238.
Adjusted $R^2 = .616.$
F-statistic = 45.05***.

*Significant at .05 level.
**Significant at .01 level.
***Significant at .005 level.
The TECH coefficient is statistically significant at the .005 level, and the size of the coefficient indicates that a technical major is likely to enable a student to earn an additional 3.33% of the possible points in economic principles, enough to raise a grade from a B+ to an A-, for example. The variable with the most important positive effect on student performance is clearly the grade point average before the current quarter. GPA is statistically significant at the .005 level, and its estimated coefficient of 13.65 predicts that a 3.0 GPA relative to a 2.0 GPA will result in an improvement in student performance in economic principles of more than one full grade, ceteris paribus; for example, a B+ rather than a C. Students who do well in school in general are likely to do even better in economic principles, relative to other students.

Among the variables we anticipated would have a negative effect on student performance, only ROW, the number of rows from the front of the classroom, was statistically significant at the .05 level. Its estimated coefficient of -0.469 suggests that a student seated at the back of the auditorium—11 rows from the front—is likely to suffer a one-half grade reduction in performance, other things equal. The interpretation of this result must be viewed with some caution, however, since there was no effort to assure that seating was assigned randomly. Rather, students were assigned the seats in which they were sitting the first day of class. To the extent that poorer students self-selected seats toward the back of the classroom, distance from the front of the classroom would have a smaller independent effect on success. However, even if poor students wished to self-select to the back of the classroom, their opportunity to do so was reduced as the classroom filled up. Although ABS, number of absences during the quarter, is not statistically significant at the .05 level, it is significant at the .10 level. Its estimated coefficient of -0.179 is so small, however, that it would take 6 absences to reduce a student’s performance by 2% of the total points. Perhaps there is a
threshold effect for absences on class success, or maybe the timing of absences matters, with consecutive absences more costly than scattered absences. Perhaps students miss class strategically—just after exams, for example. The FOR coefficient is not significant statistically nor is it significant in an absolute sense. There is no important difference in the classroom performance of foreign and domestic students, *ceteris paribus*. This is an unanticipated result, and can perhaps be attributed to more rigorous admissions screening of foreign students, student self-selection, different study habits, and an effective intensive English program for nonnative speakers.

The two variables we did not sign, LOAD and SEX, were among the most interesting. Apparently, the number of courses carried by a student has no effect on the student’s performance in economic principles, other things equal. The sex of the student, however, does have an important effect. The estimated coefficient for the female student dummy, SEX, is negative, large, and statistically significant in a two-sided test at the .005 level. In our model, female students performed at a one-half grade lower level than did male students, *ceteris paribus*. There are several possible explanations for this result, none of them completely satisfactory. Perhaps female students were systematically steered away from analytical subjects as high school students. Perhaps women and men truly do think differently, with men’s thinking tending more than women’s toward the linear processes used in economic analysis. Perhaps females perform better than males on essay tests and worse than males on the objective tests used in this class. Perhaps the female students were put off in some way by the male teacher.

The adjusted R-squared for the model is .616, high for a cross-sectional regression, and the F-statistic is statistically significant at the .005 level, indicating that the overall model does help explain variations in student course performance.
Student Satisfaction

The regression results for the determinants of student satisfaction with the course (CSAT) and with the teacher (TSAT) are shown in Tables 2 and 3, respectively. The only significant coefficient estimates in the CSAT regression are for the seating variable, ROW, and for the dummy variable for female students, SEX. The ROW variable is statistically significant at the .005 level and has the expected negative sign. The estimated coefficient of -0.0855 indicates that students at the back of the class will evaluate the quality of the course about one point lower on a five-point scale than will students in the front of the class, other things equal. The SEX variable is statistically significant at the .05 level, with female students ranking the quality of the course 0.2 points lower than the ranking by men, ceteris paribus. The adjusted R-squared is only .095, indicating that a relatively small percentage of the variation in CSAT can be explained by the model. However, the F-statistic is significant at the .005 level, so the model does, indeed, provide a statistically significant, albeit partial, explanation of the determinants of student satisfaction with the economic principles course.

The regression for student satisfaction with the teacher (TSAT) reveals a modest adjusted R-squared of .161. The F-statistic is significant at the .005 level, and there are three statistically significant independent variables. ROW is significant at the .005 level, and the estimated coefficient implies that a student sitting on the back row will rank satisfaction with the teacher lower by almost 3 points on a 10-point scale relative to the ranking of a student on the front row, other things equal. The estimated SEX coefficient is statistically significant at the .05 level, with female students...
Table 2. Regression Results for the Determinants of Student Satisfaction with the Course

<table>
<thead>
<tr>
<th>Independent Variable = CSAT</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td></td>
<td>4.13</td>
<td>0.374</td>
<td>11.06***</td>
</tr>
<tr>
<td>ABS(-)</td>
<td>-0.0185</td>
<td>0.0179</td>
<td>-1.03</td>
<td></td>
</tr>
<tr>
<td>ROW(-)</td>
<td>-0.0855</td>
<td>0.0197</td>
<td>-4.34***</td>
<td></td>
</tr>
<tr>
<td>LR(-)</td>
<td>-0.0192</td>
<td>0.119</td>
<td>-0.162</td>
<td></td>
</tr>
<tr>
<td>CRED(+)</td>
<td>-0.0004</td>
<td>0.0001</td>
<td>-0.352</td>
<td></td>
</tr>
<tr>
<td>GPA(+)</td>
<td>-0.0396</td>
<td>0.0842</td>
<td>-0.471</td>
<td></td>
</tr>
<tr>
<td>LOAD</td>
<td>0.0014</td>
<td>0.0152</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>SEX</td>
<td>-0.202</td>
<td>0.108</td>
<td>-1.86*</td>
<td></td>
</tr>
<tr>
<td>FOR(-)</td>
<td>0.165</td>
<td>0.219</td>
<td>0.753</td>
<td></td>
</tr>
<tr>
<td>TECH(+)</td>
<td>-0.0143</td>
<td>0.115</td>
<td>-0.124</td>
<td></td>
</tr>
</tbody>
</table>

n = 175.  
d.o.f. = 165.  
Adjusted R² = .095.  
F-statistic = 3.02***.  
*Significant at .05 level.  
**Significant at .01 level.  
***Significant at .005 level.

Table 3. Regression Results for the Determinants of Student Satisfaction with the Teacher

<table>
<thead>
<tr>
<th>Dependent Variable = TSAT</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>10.10</td>
<td>0.967</td>
<td>10.45***</td>
<td></td>
</tr>
<tr>
<td>ABS(-)</td>
<td>0.0080</td>
<td>0.0463</td>
<td>0.172</td>
<td></td>
</tr>
<tr>
<td>ROW(-)</td>
<td>-0.275</td>
<td>0.0510</td>
<td>-5.40***</td>
<td></td>
</tr>
<tr>
<td>LR(-)</td>
<td>-0.0625</td>
<td>0.307</td>
<td>-0.204</td>
<td></td>
</tr>
<tr>
<td>CRED(+)</td>
<td>-0.0040</td>
<td>0.0030</td>
<td>-1.15</td>
<td></td>
</tr>
<tr>
<td>GPA(+)</td>
<td>-0.0949</td>
<td>0.218</td>
<td>-0.436</td>
<td></td>
</tr>
<tr>
<td>LOAD</td>
<td>0.0130</td>
<td>0.0393</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>SEX</td>
<td>-0.594</td>
<td>0.280</td>
<td>-2.12*</td>
<td></td>
</tr>
<tr>
<td>FOR(-)</td>
<td>-1.82</td>
<td>0.565</td>
<td>-3.23***</td>
<td></td>
</tr>
<tr>
<td>TECH(+)</td>
<td>0.0983</td>
<td>0.298</td>
<td>0.330</td>
<td></td>
</tr>
</tbody>
</table>

n = 175.  
d.o.f. = 165.  
Adjusted R² = .161.  
F-statistic = 4.70***.  
*Significant at the .05 level.  
**Significant at the .01 level.  
***Significant at the .005 level.
ranking satisfaction with the teacher lower by more than half a point relative to the ranking by male students. The estimated coefficient for the foreign dummy variable is significant at the .005 level, with foreign students ranking satisfaction with the teacher lower by almost 2 on a scale of 10, compared to the rankings assigned by domestic students, ceteris paribus.

IV. Conclusions

Our study leads to several interesting conclusions. One obvious important conclusion is that student success and satisfaction with the course and the teacher in large economic principles classes is negatively impacted by physical distance from the teacher. A student on the back row (row 11 in our study) will lose a half-grade, will evaluate the course 1 point lower on a 5-point scale, and will evaluate the teacher 3 points lower on a 10-point scale than will a student on the front row, ceteris paribus. This suggests that more attention should be paid to improving lighting, acoustics, and multimedia capabilities in large classroom settings in order to minimize the negative effects of distance on student success and satisfaction. Female students score lower than do male students by about half a grade, and they evaluate their satisfaction with the course 0.2 points lower and their satisfaction with the teacher half a point lower than do male students, other things equal. These results are somewhat puzzling, because it is not clear what causes the problems in female performance and satisfaction in large economic principles classes. The authors have conducted some additional analyses from survey data in large economics principles classes, and have found results similar to those reported here. Because in all the classes tested thus far, the teacher has been male, we intend to extend the analysis by including classes taught by our female colleagues. While foreign students perform as well as do domestic students in economic principles courses, and while they tend
to rank their satisfaction with the course slightly higher than do domestic students, they are considerably less satisfied with the teacher than are domestic students, ranking satisfaction with the teacher almost 2 points lower on a 10-point scale than do domestic students. A final interesting result of the model is the key importance played by GPA in the prediction of student success in large economic principles courses. This suggests that a primary target for recruiting economics majors should be students with relatively high GPAs, particularly those from technical areas.