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## The Impact of Analyzing Economic Events on the Learning of Undergraduate Economic Theory

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## **The Impact of Analyzing Economic Events on the Learning of Undergraduate Economic Theory<sup>\*</sup>**

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### **Abstract**

In this paper, we look at the effect of having students read and respond to articles regarding economic events on the learning of economic theory in both Intermediate Microeconomics and Intermediate Macroeconomics. We find that having students apply theoretical material to real world situations has spillover effects into the learning of theoretical material itself. By assigning articles and measuring performance on midterm exams in four Intermediate Theory courses during the 2007-08 academic year, we find that each additional article a student completed resulted in an improvement of approximately one percentage point on a given midterm exam. This effect grew to three percentage points per article completed on the middle of three midterms where we could ensure that both “finish everything early” students and “procrastinate as long as possible” students were represented.

JEL Classification: A22

Keywords: Academia, Economic Education, Intermediate Theory, Undergraduate Teaching

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## 1. Introduction

Much of the economics education literature has focused on improving performance and general economic literacy in principles courses. Intermediate theory courses however are the basis for the field courses and have largely been ignored in these studies. Additionally, while many different studies have been done on various teaching methods, little has been examined in how we relate the material to current or historical events. We examine the effects of having students read and respond to articles regarding economic events. Having students relate real world economic events to the economic theory in Intermediate Microeconomics and Intermediate Macroeconomics courses has spillover effects into the learning of theoretical models.

Our study took place in two Microeconomic Theory and two Macroeconomic Theory courses over the Fall '07 and Spring '08 semesters at the University of Colorado, Boulder. Weekly articles from various news sources such as Slate.com, the New York Times, and CNN.com were assigned. They related to such topics as sunk costs or aggregate demand. Students read and completed a written summary of the article and a response to directed questions relating the articles to the course material. Student performance was then measured on three non-cumulative exams. To obtain individual variation across exams, each student chose eight of the twelve articles to complete. The exams covered only theoretical material and did not test on the current and historical events from the articles. After controlling for demographic and academic ability indicators, we find that each additional article a student completed resulted in an improvement of approximately one percent on a given exam across the full sample. In order to ensure that both “finish everything early” students and “procrastinate as long as possible” students were represented for a given exam we then restricted our sample to the middle of the three exams. In doing so, we observe an increased grade of approximately three percentage points per article completed on the test. A student who completed all four articles during that section of the course would have averaged a twelve percentage point improvement over a student

who did not complete any of the article analyses. We conclude that having students relate current and historical events to economic theory not only allows them to have better economic literacy in general, but significantly improves their ability to solve mathematical models.

Our research follows those who have examined student performance in Intermediate Theory courses and those that study economic literacy and teaching methods. Katzner (1991) examines the balance between teaching economic theory and teaching mathematical tools in Microeconomic Theory concluding that the two are best taught when done so in a complementary way. The student article analysis in our study serves this purpose. Hansen, Salemi, & Siegfried (2002) look at the level of economic literacy for students who have taken a Principles of Economics course and conclude that this course is generally ineffective at creating retained economic knowledge for students. While we do not examine the level of basic economic knowledge retention, our study does show that adding analysis of world events to a theory course does result in better performance on theoretical material.

This paper continues by describing the course design and methodology for isolating the effect of the article analysis in Section 2. Next, Section 3 describes the data with summary statistics. Results are presented and discussed in Section 4 and Section 5 concludes with a summary of results and our recommendations for Intermediate course design.

## **2. Course Design and Methodology**

Our study of the effectiveness of real world economic analysis on student performance in Intermediate Economic Theory courses was conducted in four courses at the University of Colorado, Boulder during the 2007-2008 academic year. J. Dean Craig taught one section of Intermediate Microeconomic Theory during both the fall and spring semesters that year. Samuel Raisanen taught one section of Intermediate Macroeconomic Theory during each of those semesters. These three credit hour courses both focus on mathematical tools for economic modeling and require mathematics through the multivariate calculus level. Here are the class descriptions from the University of Colorado, Boulder course catalogue:

### **ECON 3070 (3): Intermediate Microeconomic Theory**

Explores theory and application of models of consumer choice, firm and market organization, and general equilibrium. Extensions include intertemporal decisions, decisions under uncertainty, externalities, and strategic interaction.

### **ECON 3080 (3): Intermediate Macroeconomic Theory**

Introduces theories of aggregate economic activity including the determination of income, employment, and prices; economic growth; and fluctuations. Macroeconomic policies are explored in both closed and open economy models.

The Intermediate Microeconomics course was taught using the second edition of “Microeconomics” by Besanko and Braeutiam. The Intermediate Macroeconomics course was taught from the fourth edition of “Macroeconomics” by Olivier Blanchard.

In class, two to three page articles, often by noted economists, were assigned for reading and written response. These articles related to the economic modeling that was being completed in class. Students were asked to write a one page summary and response to directed questions. For example, after discussing long run Aggregate Supply-Aggregate Demand equilibrium, the article “Stimulus Minimus: Why all stimulus bills–Democrat or Republican–are bunk”<sup>1</sup> which discusses timing issues of the 2001 stimulus package, was assigned. After summarizing the article, students responded to questions such as “Why doesn’t the author like fiscal stimulus packages? Using the AS-AD analysis and graphs, explain the timing issues described in the 6th and 9th paragraphs.” These article assignments were graded on a credit-no credit basis. The assignment details from our syllabi were as follows:

**Article Analysis Instructions:** Over the course of the class we will be analyzing a number of articles related to the material covered. There will be approximately an article per chapter, 12 in all. As an incentive to read the articles 10% of the grade will be

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<sup>1</sup> “Stimulus Minimus” by Steve Chapman posted on Slate.com Jan. 4, 2002: <http://www.slate.com/id/2060375>.

determined by preparing a short summary and answering a few articles for a number of articles. You must do 8 of the 12 articles. I will give a number of questions to consider for each article. Students will be required write a summary of the articles and answer the presented questions in paragraph form, including a second page of relevant graphs if necessary. The article analysis must be one page typed, double spaced, 12 point Times New Roman font, with 1 inch margins to receive credit. The summaries will be credit/no credit and are due in class on the day we discuss the article. I will not accept e-mailed articles as being present for the discussion is part of the assignment. I reserve the right to randomly call on those people who turned in articles to help answer questions to generate discussion.

Isolating the effect of the article analysis on the exams was a primary concern in the design of our courses. In order to identify the effect of the student analysis we first needed to obtain variation in the number of articles students completed. This was done by breaking the courses into three non-overlapping five week sections. An article was assigned each of the first four weeks of a section. The fifth week was used for a midterm exam over the course material. Each student was only required to complete eight of the twelve article analysis assignments. This resulted in students completing anywhere from no articles for a given section to completing all four. This gave us variation across students for a given exam. Additionally, because credit was only given for eight articles, the number each student completed across the three periods varied. This results in variation per student across exams. Next, to ensure that the completion of the articles did not have a direct effect on the exam grades, the exams did not include any questions on the current or historical events in the articles. We only tested on the mathematical economic theory and modeling. Finally, demographic and academic information about the students was collected at the beginning of the semester and used as controls. Final exam and problem set grades were not used for this study.

### **3. Data and Empirical Analysis**

### **3.1 Data**

Data are cross sectional observations of student performance. We have 174 students in the sample representing two courses and two semesters for a total of four individual classes. Students took all three exams during the period, and we have complete data on all students, giving us a grand total of 522 observations<sup>2</sup>. These Observations come from courses taught by the authors in the fall of 2007 and the spring of 2008 at the University of Colorado at Boulder. The data was supplemented by surveys completed by the students and available student data. Our unit of observation is the student exam score measured in percentage points (i.e. 85 is an 85%), and we measure outside learning in the form of number of article assignments completed. The maximum completed during an exam observation is 4 and the minimum is 0. Our data includes information on both sexes and six ethnicity types. Additionally, we have SAT math and verbal maximum scores achieved by students<sup>3</sup>. Information on student major was available and was categorized into 4 broad categories; Economics majors, Hard Science majors (engineering Physics etc), Business majors, and finally everything else. We have students' college GPA before taking the class in question<sup>4</sup>, and the highest academic degree obtained by each parent using the typical census categories. Finally, we have information on whether each student was a resident of the state of Colorado, and the approximate number of hours that the student expected to spend either working a job for pay or engaged in school related activities not included in coursework. A full description of all relevant variables can be found listed in Table 1.

### **3.2 Summary Statistics and Anecdotal Evidence**

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<sup>2</sup> Approximately 5 students were dropped from the sample set due to missing one of the 3 exams. Additionally there were 8 students for which SAT or ACT equivalent scores were unattainable.

<sup>3</sup> For any student that did not take the SAT but rather took the ACT, a conversion was made using conventional conversion tables. In addition if a student took both standardized tests the maximum based on ACT conversion was used. For more information if desired please contact the authors.

<sup>4</sup> There were about 5 students who took one of our classes, and then took a second one of our classes in the sample, either due to failing 1 course or passing and then taking the next class. However eliminating these students does not change our results, and therefore we conclude the effect on GPA to be minimal.

Summary Statistics are presented in Table 2. Highlighting some of our summary statistics, we see that the average exam score is approximately 70, ranging from a maximum of 101<sup>5</sup> to a minimum of 10. Students completed 2.5 articles per exam period on average, doing as many as 4 and as few as 0 with all possible numbers in between represented. The average student has a 2.6 GPA, scored a combined 1200 on the SAT, and spends 15 hours per week working a job or other activity not related to coursework. In addition we can see that the majority of our students were white males, however other ethnicities were represented<sup>6</sup>. In addition, while most of our students were male, this is common in economics departments throughout the world and reflects typical enrollment for upper division economics courses at the University of Colorado, Boulder. Our sample consists of about 50% econ majors which is within the range we would expect given both courses are a requirement for the major. Another quarter of our sample are major's in either the hard sciences or business, with the last quarter having some other major. It should also be noted that in terms of parents' education, we have no observations for which the student's father had achieved an associate's degree as their highest degree. Additionally, the majority of student's parents attended some college. Our sample includes approximately twice as many residents as non-residents, which is common of a state sponsored university. Lastly, approximately 56% of our observations took the Intermediate Macroeconomics course with Samuel Raisanen, 44% taking the Intermediate Microeconomics course with J. Dean Craig. This is a function of the enrollment sizes for these courses at the university. Intermediate Microeconomics is typically capped at 47 students while Intermediate Macroeconomics is enrollment is capped at 60.

In order to give a preliminary look at our findings we have standardized exam scores<sup>7</sup> broken down by the exam and number of articles completed for that exam period. These results are reported in Table 3. We see very strong support of the alternative hypothesis that additional

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<sup>5</sup> Extra credit was available on one of the Micro exams resulting in a score over 100.

<sup>6</sup> It can be noted that 4% elected not to respond and 7% did not know their own ethnicity with enough surety to answer, but these are still extremely small amounts.

<sup>7</sup> For each class exam the mean score was subtracted from the students score and this was then divided by the standard deviation of that class exam.



articles increase exam scores for the first two exams. As we can see looking at the first two exams, each additional article is associated with a higher standardized average. The strongest trend seems to be for the second exam. We believe this is the most controlled exam period since by this time students have made decisions about how much time to spend on the course, have settled into a routine, and they are still avoiding the end of semester rush. Additionally, any student whose procrastinates would have been forced to complete articles during this exam period. The third exam seems to have contradictory evidence. Specifically the highest standardized average is for students only completing one article assignment. This we believe is due to the fact that the best students will typically frontload their work at the beginning of the semester, whereas students who have generally decided not to work hard in the course will wait until the end to complete assignments. Ideally we would prefer to have a random sample of students of all ability across all exam periods, but this is generally impossible in a classroom setting<sup>8</sup>.

### 3.3 Empirical Analysis

We employ a reduced form to estimate the effect of completing additional article assignments on exam scores. We regress exam score of student  $i$  on exam  $j$  in class  $t$  in percentage points on the number of articles completed. We will control for student ability, and time available by including student specific variables including SAT maximum scores, current GPA, educational attainment by parents, ethnicity, residency status, and declared major using the following specification:

$$\text{Exam}_{ijt} = \alpha_i + \alpha_j + \alpha_t + \beta_0 + \beta_1 \text{Articles}_{ijt} + \beta_2' \mathbf{X}_{ijt} + \varepsilon_{ijt} \quad (1)$$

Notice that in specification (1) we include the possibility of including random or fixed effects for student  $i$ , fixed effects for exam  $j$ , and fixed effects for class  $t$ .  $\beta_2$  is a coefficient of vectors on student specific variables that were discussed above, and  $\varepsilon_{ijt}$  are the randomly distributed normal errors. We will use standard ordinary least squares regression to estimate equation (1).

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<sup>8</sup> We anticipate attempting this experiment again in the future by fully randomizing the article assignments.

#### 4. Results

Our results of estimating equation (1) are listed below in Table 4. Several things are of note here. First and foremost in the interest of space coefficients on ethnicity, mother's education and father's education are not included<sup>9</sup>. Our coefficient of interest is not statistically significant, but is of a magnitude that would be expected of around one additional percentage point per additional article completed; we explore a different specification that we think is more appropriate later. The difference between those completing no articles and those completing all four articles is significant at the 1% level. In addition we can see that current college GPA is statistically significant at all conventional levels across all specifications, and a magnitude that seems consistent of 2-4 percentage points' increase per additional GPA point. We can also see the women tend to score better than men by about 4 percentage points which is consistent to observational experience in these courses. Higher SAT scores increase exam scores but only statistically significantly for SAT math scores. This is consistent with the mathematical nature of these courses. Work outside of class tends to reduce scores but not statistically significantly. Hard sciences tend to score better than the excluded economics majors, by about 7 percentage points. Finally, business majors tend to do better in our courses than econ majors, and other majors tend to do worse but not statistically significantly in either case. Highlighting some of the results from the excluded coefficients we found that generally higher levels of educational attainment by mothers increased exam scores. The coefficients on father's educational attainment were very diverse. This however is consistent with the general finding in related literature stating that mother's educational attainment is a stronger predictor of children's success. Additionally, because mother's and father's education are highly correlated, multicollinearity issues increase the standard error for father's education.

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<sup>9</sup> Full tables can be seen in table 6.

As noted above our coefficient of interest is not statistically significant for a single additional article. It may be that additional article analyses are not helpful in increasing students' exam scores. However when looking at the r-squared values of the above equation we believe another story may be to blame. It can be noted that our r-squared never exceeds 0.32 for non random effects models. We believe this means that we are not controlling adequately for student work ethic, so in our experiment we are facing an endogeneity problem. Students with strong work ethics, the "finish everything early" students, will tend to complete earlier article assignments, and score higher in class work, whereas students with poor work ethics, the "procrastinate as long as possible" students, will tend to complete the latest article analyses. One method to control for this is to use an instrumental variables approach. Another is to look more closely at individual exams. We believe that this strong work ethic will lead to coefficients on the number of articles completed being biased upward for earlier periods and biased downwards for later periods. This means our best chance of eliminating this problem is to look closely at the second exam<sup>10</sup>. In order to do this we present Table 5 below which is a re-estimation of equation (1) for exam 2 only. As can be seen the same broad patterns as were found in Table 4, with the exception that the coefficient of interest is now larger and statistically significant. In fact we see that in specifications (vii)-(ix) the coefficient on additional articles is statistically significant at the 5% level. In addition an additional article assignment is associated with an increase in exam score of approximately 3 percentage points. Lastly r-squared values have increased across all specification indicating the fact that we have less of a problem of omitted variable bias from work ethic in this sub sample. We see this as strong evidence that additional article analysis that incorporate ideas outside of the classroom increase student understanding.

## 5. Conclusion

We find evidence article analysis assignments that incorporate material outside of the traditionally theoretical course material for Intermediate Economics courses increase exam

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<sup>10</sup> Additional regressions on the first and third exams are presented in tables 7 and 9.

scores. While the results on all three exams indicate small effects per article these are significant enough to show statistically and economically significant differences between students completing all articles and those completing none. When we limit the sample to the second exam observations only we find strong effects on the order of three percentage point higher grades per article on this exam. This is the sub-sample least likely to be influenced by outside work ethic and thus the most conclusive.

Students do better in completing mathematical problems when they are better able to relate the results to a concrete real world example. It is the opinion of the authors that having students complete assignments requiring that they relate economic models to current and historical events improves their ability to do mathematics required to solve the theoretical models. These assignments should be presented to direct students into applying the model to the relevant events. Additional course discussion of the assignments will likely strengthen the effects.

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**Table 1**

## Variable Description

Exam Score	Student's exam score out of 100.
Number of articles	Number of articles completed for the section.
College GPA	College GPA at time of course.
Max SAT math	Maximum SAT score in math. If student took ACT only scores were converted. If student took both the maximum was used.
Max SAT English	Maximum SAT score in English. If student took ACT only scores were converted. If student took both the maximum was used.
Hours working outside coursework	Combined hours working for pay or extra-curricular activities.
Gender variables	Dummy variables for gender.
Ethnicity variables	Dummy variables for ethnicity.
Econ major	Dummy variable equal to one if student was an econ major at start of course.
Hard sciences major	Dummy variable equal to one if student was a hard sciences major at start of course (for instance engineering, physics, math etc).
Business major	Dummy variable equal to one if student was a business major at start of course ( including finance etc.).
Other major	Dummy variable equal to one if student was an econ major at start of course.
Mother's education	Mother's highest level of education attained.
Father's education	Father's highest level of education attained.
Resident	Dummy variable equal to one if the student is a Colorado state resident.
Non-resident	Dummy variable equal to one if the student is not a Colorado state resident.

**Table 2**  
Selected Summary statistics

Variable	Mean	Max	Min	Standard Deviation
Exam score	69.851	101.0	10	16.907
Number of articles	2.563	4.0	0	1.050
College GPA	2.605	3.9	0	1.046
Max SAT Math	559.655	770.0	260	86.374
Max SAT English	637.040	780.0	470	72.974
Hours working outside coursework	15.422	50.0	0	12.160
Female	0.207	1.0	0	0.405
Male	0.793	1.0	0	0.405
Asian	0.057	1.0	0	0.233
Black	0.006	1.0	0	0.076
Hispanic	0.052	1.0	0	0.222
Unknown ethnicity	0.069	1.0	0	0.254
White	0.776	1.0	0	0.417
Elected not to respond	0.040	1.0	0	0.197
Econ major	0.500	1.0	0	0.500
Hard sciences major	0.103	1.0	0	0.305
Business major	0.126	1.0	0	0.333
Other major	0.270	1.0	0	0.444
No degree mother education	0.034	1.0	0	0.183
High school mother education	0.057	1.0	0	0.233
Some college mother education	0.161	1.0	0	0.368
Associates mother education	0.006	1.0	0	0.076
Bachelors mother education	0.362	1.0	0	0.481
Graduate mother education	0.224	1.0	0	0.417
Post graduate mother education	0.075	1.0	0	0.263
Blank mother education	0.080	1.0	0	0.272
No degree father education	0.052	1.0	0	0.222
High school father education	0.057	1.0	0	0.233
Some college father education	0.138	1.0	0	0.345
Bachelors father education	0.322	1.0	0	0.468
Graduate father education	0.224	1.0	0	0.417
Post graduate father education	0.121	1.0	0	0.326
Blank father education	0.086	1.0	0	0.281
Macro fall 2007	0.305	1.0	0	0.461
Macro spring 2008	0.264	1.0	0	0.441
Micro fall 2007	0.224	1.0	0	0.417
Micro spring 2008	0.207	1.0	0	0.405
Resident	0.632	1.0	0	0.483
Non-resident	0.368	1.0	0	0.483

**Table 3**

Standardized average scores by exam and # of articles completed

Number of article exams completed	Exam 1 standardized average	Exam 2 standardized average	Exam 3 standardized average
4	0.121	0.192	-0.058
3	0.065	0.054	0.004
2	-0.021	-0.036	-0.092
1	-0.255	-0.330	0.274
0	-0.370	-1.359	-0.017



Table 4

Dependent variable is exam score					
	i	ii	iii	iv	v
Number of Articles	0.74	1.03	0.88	0.55	0.19
	[0.76]	[0.73]	[0.74]	[0.68]	[0.55]
College GPA			2.30***	4.10***	3.93***
			[0.80]	[1.36]	[1.40]
Max SAT English			0.01	0.02*	0.02
			[0.01]	[0.01]	[0.01]
Max SAT Math			0.05***	0.03*	0.03*
			[0.01]	[0.02]	[0.02]
Hours Working Outside Coursework				-0.05	-0.04
				[0.08]	[0.08]
Female				3.75**	4.09*
				[1.83]	[2.19]
Hard Sciences Major				6.79***	6.85**
				[2.40]	[3.19]
Business Major				1.95	2.28
				[2.50]	[2.92]
Other Major				-3.31	-3.35
				[2.16]	[2.20]
Non-resident				-2.66	-2.86
				[1.75]	[1.94]
Semester fixed effects	No	Yes	Yes	Yes	Yes
Exam fixed effects	No	Yes	Yes	Yes	Yes
Mother's educational fixed effects	No	No	No	Yes	Yes
Father's educational fixed effects	No	No	No	Yes	Yes
Student random effects	No	No	No	No	Yes
Constant	67.97***	64.33***	18.42**	23.71**	26.45***
	[2.37]	[3.11]	[8.56]	[9.38]	[9.84]
Observations	522	522	522	522	522
R-squared	0	0.1	0.2	0.32	
Number of SID					170
Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% Excluded dummies are Micro Spring 2008, Third Exam, Male, Econ Majors, and Colorado residents					

**Table 5**  
Exam 2 only

Dependent variable is exam score					
	vi	vii	viii	ix	x
Number of Articles	1.74	3.11**	2.86**	2.73**	1.74
	[1.47]	[1.23]	[1.22]	[1.33]	[1.36]
College GPA			3.03***	3.07*	
			[1.07]	[1.79]	
Max SAT English			0.03*	0.04**	
			[0.01]	[0.02]	
Max SAT Math			0.04**	0.02	
			[0.02]	[0.02]	
Hours Working Outside Coursework				-0.06	
				[0.09]	
Female				2.69	
				[2.39]	
Hard Sciences Major				7.78**	
				[3.26]	
Business Major				3.62	
				[3.23]	
Other Major				-2.89	
				[2.96]	
Non-resident				-3.36	
				[2.40]	
Semester fixed effects	No	Yes	Yes	Yes	Yes
Exam fixed effects	No	Yes	Yes	Yes	Yes
Mother's educational fixed effects	No	No	No	Yes	Yes
Father's educational fixed effects	No	No	No	Yes	Yes
Student random effects	No	No	No	No	Yes
Constant	60.54***	55.96***	4.89	15.48	60.54***
	[4.24]	[4.32]	[10.05]	[11.69]	[3.89]
Observations	174	174	174	174	174
R-squared	0.01	0.24	0.38	0.51	
Number of SID					170

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.  
Excluded dummies are Micro Spring 2008, Third Exam, Male, Econ Majors, and Colorado residents

**Table 6**  
Exams 1-3 complete results, all variables included

Dependent variable is exam score					
	I	ii	Iii	iv	v
Number of Articles	0.74	1.03	0.88	0.55	0.19
	[0.76]	[0.73]	[0.74]	[0.68]	[0.55]
Macro Fall 2007		10.36***	13.71***	12.81***	11.77***
		[2.93]	[2.74]	[2.67]	[2.56]
Macro Spring 2008		4.44	4.66*	2.76	2.1
		[2.88]	[2.60]	[2.69]	[2.41]
Micro Fall 2007		8.86***	8.86***	6.38**	5.72**
		[2.96]	[2.57]	[2.75]	[2.72]
First Exam		-1.34	-1.3	-1.21	-1.1
		[1.27]	[1.27]	[1.30]	[1.34]
Second Exam		-7.80***	-7.74***	-7.63***	-7.50***
		[1.54]	[1.55]	[1.58]	[1.35]
College GPA			2.30***	4.10***	3.93***
			[0.80]	[1.36]	[1.40]
Max SAT English			0.01	0.02*	0.02
			[0.01]	[0.01]	[0.01]
Max SAT Math			0.05***	0.03*	0.03*
			[0.01]	[0.02]	[0.02]
Hours Working Outside Coursework				-0.05	-0.04
				[0.08]	[0.08]
Female				3.75**	4.09*
				[1.83]	[2.19]
Asian				-2.29	-3.38
				[4.91]	[3.98]
Black				-17.56***	-18.03
				[3.88]	[11.39]
Hispanic				-5.96*	-6.15
				[3.09]	[4.18]
Unknown Ethnicity				-4.22	-3.45
				[4.23]	[3.67]
Elected Not to Respond				10.22***	10.37*
				[3.87]	[5.45]
Hard Sciences Major				6.79***	6.85**
				[2.40]	[3.19]
Business Major				1.95	2.28
				[2.50]	[2.92]
Other Major				-3.31	-3.35
				[2.16]	[2.20]
Non-resident				-2.66	-2.86
				[1.75]	[1.94]
Associates Mother Education				-0.64	-0.85
				[3.58]	[11.09]
Blank Mother Education				33.24***	33.98***
				[7.16]	[13.19]

Graduate Mother Education				0.51	0.32
				[2.42]	[2.40]
H.S. Mother Education				2.61	2.46
				[3.91]	[4.09]
No Degree Mother Education				-16.04**	-16.49*
				[7.88]	[8.83]
Post Graduate Mother Education				5.95*	5.86
				[3.22]	[3.66]
Some College Mother Education				-1.41	-1.77
				[2.94]	[2.71]
Blank Father Education				-20.51***	-21.41*
				[4.82]	[12.22]
Graduate Father Education				0	0.03
				[2.16]	[2.42]
H.S. Father Education				0.23	0.02
				[4.30]	[4.22]
No Degree Father Education				11.50***	11.67*
				[3.54]	[7.05]
Post Graduate Father Education				3.04	3.3
				[2.67]	[3.01]
Some College Father Education				4.68	5.38*
				[3.34]	[3.15]
Student random effects	No	No	No	No	Yes
Constant	67.97** *	64.33***	18.42**	23.71**	26.45***
	[2.37]	[3.11]	[8.56]	[9.38]	[9.84]
Observations	522	522	522	522	522
R-squared	0	0.1	0.2	0.32	
Number of SID					170
Robust standard errors in brackets* significant at 10%; ** significant at 5%; *** significant at 1%. Excluded dummies are Micro Spring 2008, Third Exam, Male, White, Bachelors Mother, Bachelors Father Econ Majors, and Colorado residents					

**Table 7**

Exam 1 complete results, all variables

Dependent variable is exam score					
	xi	xii	xiii	xiv	xv
Number of Articles	2.48**	2.14*	1.73	1.17	2.28**
	[1.18]	[1.15]	[1.06]	[1.22]	[1.06]
Macro Fall 2007		10.49***	13.77***	14.65***	
		[3.43]	[3.28]	[3.28]	
Macro Spring 2008		9.18***	9.17***	8.90***	
		[3.23]	[3.01]	[3.38]	
Micro Fall 2007		9.40***	9.55***	9.07**	
		[3.40]	[3.09]	[3.67]	
College GPA			1.82*	3.41**	
			[1.08]	[1.51]	
Max SAT English			6.19	5.59	
			[10.57]	[13.61]	
Max SAT Math			0.01	0.03	
			[0.02]	[0.02]	
Hours Working Outside Coursework			0.07***	0.05**	
			[0.02]	[0.02]	
Female				-0.18*	
				[0.10]	
Asian				0.61	
				[2.43]	
Black				-4.16	
				[4.64]	
Hispanic				-0.65	
				[5.57]	
Unknown Ethnicity				-1.62	
				[4.52]	
Elected Not to Respond				-3.8	
				[4.42]	
Hard Sciences Major				14.55**	
				[6.23]	
Business Major				5.80*	
				[3.25]	
Other Major				2.43	
				[3.28]	
Non-resident				-4.38	
				[3.02]	
Associates Mother Education				-1.38	
				[2.36]	
Blank Mother Education				6.65	
				[4.72]	
Graduate Mother Education				12.52	
				[9.85]	
H.S. Mother Education				2.46	
				[3.12]	
No Degree Mother Education				2.08	

				[5.65]	
Post Graduate Mother Education				-18.68**	
				[8.97]	
Some College Mother Education				6.48	
				[4.80]	
Blank Father Education				2.46	
				[3.56]	
Graduate Father Education				-2.73	
				[8.13]	
H.S. Father Education				0.84	
				[2.80]	
No Degree Father Education				5.33	
				[5.60]	
Post Graduate Father Education				17.05***	
				[5.48]	
Some College Father Education				1.69	
				[3.85]	
Observations	174	174	174	174	174
R-squared	0.03	0.1	0.26	0.4	
Number of SID					170

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Excluded dummies are Micro Spring 2008, Third Exam, Male, White, Bachelors Mother, Bachelors Father Econ Majors, and Colorado residents

**Table 8**

Exam 2 complete results, all variables

Dependent variable is exam score					
	vi	vii	viii	ix	x
Number of Articles	1.74	3.11**	2.86**	2.73**	1.74
	[1.47]	[1.23]	[1.22]	[1.33]	[1.36]
Macro Fall 2007		3.46	7.66**	4.32	
		[3.40]	[3.34]	[3.40]	
Macro Spring 2008		-9.21***	-8.76***	-11.04***	
		[3.46]	[3.13]	[3.25]	
Micro Fall 2007		13.31***	13.31***	10.23***	
		[3.39]	[3.06]	[3.35]	
College GPA			3.03***	3.07*	
			[1.07]	[1.79]	
Max SAT English			0.03*	0.04**	
			[0.01]	[0.02]	
Max SAT Math			0.04**	0.02	
			[0.02]	[0.02]	
Hours Working Outside Coursework				-0.06	
				[0.09]	
Female				2.69	
				[2.39]	
Asian				-2.57	
				[6.91]	
Black				-7.43	
				[4.98]	
Hispanic				-3.85	
				[3.93]	
Unknown Ethnicity				-4.59	
				[4.94]	
Elected Not to Respond				6.7	
				[4.32]	
Hard Sciences Major				7.78**	
				[3.26]	
Business Major				3.62	
				[3.23]	
Other Major				-2.89	
				[2.96]	
Non-resident				-3.36	
				[2.40]	
Associates Mother Education				-11.49**	
				[5.08]	
Blank Mother Education				41.45***	
				[9.24]	
Graduate Mother Education				-2.68	
				[3.22]	
H.S. Mother Education				3.51	
				[4.75]	
No Degree Mother Education				-14.09	

				[9.49]	
Post Graduate Mother Education				8.09**	
				[3.45]	
Some College Mother Education				1.71	
				[3.27]	
Blank Father Education				-37.90***	
				[6.03]	
Graduate Father Education				-0.48	
				[2.96]	
H.S. Father Education				-5.81	
				[4.21]	
No Degree Father Education				10.66***	
				[4.05]	
Post Graduate Father Education				-4.47	
				[4.06]	
Some College Father Education				5.69	
				[3.89]	
Student random effects	No	No	No	No	Yes
Constant	60.54***	55.96***	4.89	15.48	60.54***
	[4.24]	[4.32]	[10.05]	[11.69]	[3.89]
Observations	174	174	174	174	174
R-squared	0.01	0.24	0.38	0.51	
Number of SID					170
<p>Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Excluded dummies are Micro Spring 2008, Third Exam, Male, White, Bachelors Mother, Bachelors Father Econ Majors, and Colorado residents</p>					



**Table 9**  
Exam 3 complete results

Dependent variable is exam score					
	xvi	xvii	xviii	xix	xx
	OLS	FE course and exam	FE ability variables	FE all relevant	RE
Number of Articles	-0.73	-0.78	-0.58	0.36	-0.54
	[1.26]	[1.23]	[1.19]	[1.14]	[1.21]
Macro Fall 2007		17.03***	19.37***	19.33***	
		[3.52]	[3.50]	[4.13]	
Macro Spring 2008		12.96***	13.11***	10.22***	
		[3.49]	[3.38]	[3.66]	
Micro Fall 2007		3.51	3.5	0.05	
		[3.80]	[3.64]	[4.11]	
College GPA			1.69*	5.08**	
			[1.02]	[2.13]	
Max SAT English			0	0	
			[0.01]	[0.01]	
Max SAT Math			0.04**	0.01	
			[0.02]	[0.02]	
Hours Working Outside Coursework				0.1	
				[0.14]	
Female				7.39**	
				[2.97]	
Asian				-0.78	
				[7.01]	
Black				-42.89***	
				[6.45]	
Hispanic				-12.73**	
				[5.35]	
Unknown Ethnicity				-5.3	
				[5.54]	
Elected Not to Respond				8.94	
				[7.15]	
Hard Sciences Major				6.58	
				[4.22]	
Business Major				0.25	
				[3.58]	
Other Major				-2.53	
				[2.95]	
Non-resident				-2.85	
				[2.74]	
Associates Mother Education				-0.93	
				[4.56]	
Blank Mother Education				39.89***	
				[11.96]	
Graduate Mother Education				1.81	

				[3.58]	
H.S. Mother Education				1.72	
				[4.63]	
No Degree Mother Education				-16.43	
				[11.18]	
Post Graduate Mother Education				2.42	
				[4.61]	
Some College Mother Education				-7.89*	
				[4.43]	
Blank Father Education				-17.70**	
				[8.25]	
Graduate Father Education				-0.53	
				[3.17]	
H.S. Father Education				0.19	
				[6.67]	
No Degree Father Education				8.54	
				[5.86]	
Post Graduate Father Education				10.79***	
				[3.40]	
Some College Father Education				5.71	
				[5.15]	
Student random effects	No	No	No	No	Yes
Constant	74.39***	65.34***	32.58***	36.54***	74.08***
	[3.31]	[4.01]	[11.37]	[14.01]	[3.13]
Observations	174	174	174	174	174
R-squared	0	0.15	0.2	0.44	
Number of SID					170
Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Excluded dummies are Micro Spring 2008, Third Exam, Male, White, Bachelors Mother, Bachelors Father Econ Majors, and Colorado residents					