

# USING REFLECTION PAPERS IN PRINCIPLES OF MACROECONOMICS CLASSES

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## ABSTRACT

*Economics teachers constantly try to find better ways to help students apply the material learned in economics classes. Previous research (Powell and López, 1989) demonstrates deeper learning takes place when students recognize how course content directly relates to their daily lives, and when they reflect on their own experiences, rather than memorizing content from textbooks. Facilitating students' realization of how much the topics in "Principles of Macroeconomics" relate to their daily lives while giving them the chance to reflect on the material, we instructed students to write several reflection papers over the course of a semester. We compared examination scores of students who wrote reflection papers with students who did not write reflection papers to identify if writing reflection papers helped students retain significant amounts of material covered during class.*

## INTRODUCTION

Writing is important for students of economics on many levels. Not only is the ability to write an important skill for the job market, but writing is also a tool that helps students to develop critical thinking and discernment skills. Furthermore, writing as part of an economics class makes the learning process more active and becomes an important assessment tool for higher-level learning. Hence, several authors suggest including writing as a means of assessment in economics classes for testing higher-level learning skills while preparing students for national job markets (Becker, 1997; Emig, 1977; Walstad, 2001). This study targeted one particular form of writing—reflective writing—to examine if reflective writing assignments impact the exam performances of students. Brewer and Jozefowic (2006) found “integrating open-ended journal assignments and reflection papers” in Principles of Economics classes to be an “effective tool for breathing life into class dynamics and fostering the development of higher-level thinking and analytical skills.” However, their study was qualitative; our quantitative study adds empirical evidence to their findings and thus helps further develop the understanding of impacts of reflective writing on student performance in economics.

In the following sections we start by considering the literature on writing in economics in general, since this literature provides an insight into the empirical tradition of evaluating writing in economics. We then present the study methodology and data description. This is followed by

the discussion of the results. The paper concludes with a summary of the major findings, implications for teaching practices and suggestions for future research.

## **WRITING IN ECONOMICS**

Reflective writing is a new idea in economics and it has not been studied empirically. However, the importance of writing in general has been recognized for the additional benefit of improving student learning and retention of information; as a result writing assignments have been introduced to economics classes. These writing assignments have been studied empirically in order to evaluate their impact on students' success.

Research suggests that writing benefits student learning (Bangert-Drowns et al., 1991; Butler and Winne, 1995; Langer and Applebee, 1987; Hayes and Flower, 1980; Hayes, 2000; Winne, 1997, 2001) and in particular improves learning in economics classes by introducing an active learning component (Crowe and Youga, 1986; Simpson and Carroll, 1999). Furthermore, Chizmar and Ostrosky (1998), Dynan and Cate (2005, 2009), Greenlaw (2003), and Stowe (2010) identify various forms of writing assignments (one minute papers and more comprehensive writing assignments), which improved examination performance for students in economics classes. However, the empirical studies by Chizmar and Ostrosky (1998) and Stowe (2010) focused on one-minute papers used only one class as the treatment group, and thus the results of these studies could potentially be spurious due to selectivity bias or the behavior of the instructor. The empirical studies by Dynan and Cate (2005 and 2009) and Greenlaw (2003) that concentrated on more comprehensive forms of writing required students to write several (up to 10) longer papers and thus required very labor intensive grading and evaluation by instructors. It would not be realistic to ask economics instructors teaching four or more classes each semester to start engaging in such labor-intensive evaluation and feedback practices, even if student performance outcomes might improve.

This study concentrated on reflective writing as described by Brewer and Jozefowic (2006). At the same time, we advance the understanding of writing in general by using a smaller number of writing assignments (three) and prolonging the study duration to three semesters. In such a way, our approach to writing in economics classes could be used by any economics instructor without adding an unmanageable workload, and the empirical analysis provides enough rigor to draw valid and generalizable conclusions.

## **METHODOLOGY**

The study objective was determining if short reflection papers (150-300 words) improved student learning as measured through examination performance. However, instead of asking students to write six reflection papers as Brewer and Jozefowic (2006) did, students were asked to write three reflection papers to decrease instructor's workload for grading and evaluation.

While the literature finds including writing assignments into the economics curriculum positively affects students' exam performance, many instructors do not follow the recommendations of the literature due to the increased time required for evaluating these assignments. Thus, the goal of this study is twofold: we not only set out to determine if reflective writing affects examination performance positively, but also if three reflective papers are enough to make an impact on student learning and course performance.

For each reflection paper students can choose a topic to be covered on an upcoming examination. During the study, three sections of "Principles of Macroeconomics" students completed reflective writing assignments (one per semester). The study also included four sections of students in "Principles of Macroeconomics" who did not write reflective papers as a control group (one during the first and third semesters, two during the second semester). Treatment and control groups were assigned randomly; however, students voluntarily entered in classes, so it was not possible to randomly assign students to control and treatment groups. Data was carefully analyzed to detect possible biases among the two groups. There were no statistically significant differences in students' characteristics between treatment and control groups. The study was conducted during Spring and Fall 2010 and Spring 2011. Treatment and control group sections were taught by the same instructor. The study was conducted at a Public University in the Midwest. The University primarily serves an undergraduate population from the local and regional community. Diversity noted in University classrooms is due to a strong foreign exchange program.

## DATA

The original sample included 271 students; however, many of these students did not have ACT scores available and were removed from the study sample. The final sample used for the study consisted of 168 students. Of the remaining students in the sample, 51% were male, 44% were majors in Business or Economics, and 40% of the students were juniors. The grade point average (GPA) prior to enrollment in this course was 2.99. The average comprehensive ACT (American College Testing) score of those enrolled in the study was 22.79. Students in this class completed 91% of their homework assignments and the students' average age was 21.64 years. On average students had already taken three<sup>1</sup> Business or Economics classes before taking the Principles of Macroeconomics class and were enrolled in 15 credits while participating in this class. The descriptive statistics can be found in Table 1.

Variable	Description	Mean	Std. Dev.	Min	Max
Exam1	Percentage questions correct on Exam 1	79.11	10.03	48	100
Exam2	Percentage questions correct on Exam 2	80.88	11.41	45	100
Exam3	Percentage questions correct on Exam 3	67.19	14.22	29	97
AvgExam	Average of percentage questions correct	75.72	9.06	50	97

Variable	Description	Mean	Std. Dev.	Min	Max
Reflection	Reflective Writing Section =1	0.48	0.50	0	1
Actcomp	ACT comprehensive Score	22.79	2.95	15	31
GPA	Prior term cumulative GPA	2.99	0.57	0.6	4
Age	Average age of students	21.64	1.49	20	29
Credits	Credits currently enrolled in <sup>1</sup>	15	1.77	9	20
Priorclass	Prior class in Business or Economics <sup>2</sup>	3	2.93	0	17
Hwcomp	Percentage of homework asgn. completed	0.91	0.11	0.375	1
Gender	Gender: Male =1	0.51	0.50	0	1
Slevel	Level of Studies, Freshman=1, Sophomore=2,...	2.92	0.86	1	4
BusEcon	Majors in Business and/or Economics = 1	0.44	0.50	0	1

## **EVALUATING THE INFLUENCE OF REFLECTIVE WRITING ON EXAM PERFORMANCE**

The researchers were interested in determining if reflective writing improved student performance on objective content examinations. An educational production function following Hanushek (1979) was applied for testing the impact reflection papers made on examination performance. The education production function suggests student performance, as measured by course grades, is affected by background (gender, university class, and age), motivation (homework completion, major, credits) and ability (GPA, ACT). Following Hanushek's approach we estimated the following function:

Percentage exam questions correct =  $f(\text{background, motivation, ability, reflective writing})$   
 We expect the general ability level of students (GPA and ACT) is positively correlated with performance as noted by examination scores. The background variables are supposed to control for student specific characteristics. The economic education literature generally finds female students do not perform as well in economics classes as male students (Ballard and Johnson, 2005; Walstad and Robson, 1997). Thus, we expect the sign on our gender variable to be positive (gender dummy male=1). Furthermore, it is possible students develop better study and test taking strategies as they get older and have taken more classes. We would expect the signs of the age coefficient and the university class coefficient to be positive. On the other hand, it might also be possible there are students not interested in the class that are required to take it for their major/minor. Additionally, students may participate in the class at a later stage (junior/senior year) of their university career. Potential lack of interest might cause the coefficient to be negative. Hence, we might have two opposing influences, ultimately causing the coefficient to be insignificant altogether.

Furthermore, we expect homework completion scores are positively correlated with examination scores. This effect might either result from a practice effect or simply identify students who are more engaged and interested in course content. We might also identify individuals completing more homework perform better on course examinations. It would be expected students majoring in business or economics would exercise more effort in these classes,

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as the class is required for their major-thus affecting in-major GPA. Influence of major on exam scores might also be caused by simple selection. Students knowing their academic performance will likely be strong in these classes might actually chose taking them, leading to a positive coefficient on the major variable. Furthermore, the credit load students take during any given semester can influence exam scores in both directions; good students might take more classes than bad students, because the good students might actually need less time for class preparation, leading to a positive correlation between exam scores and credits. It is also possible taking high numbers of credits give students less time to spend studying per class leading to a negative correlation between exam scores and credits. Finally, we also include the number of classes a student has taken in Business and/or Economics prior to taking Principles of Macroeconomics. Most of the classes students have taken before enrolling in Principles of Macroeconomics are Business or Accounting classes, thus it is not clear how well those classes would prepare a student for a class in Principles of Macroeconomics. It is possible students become familiar with the type of conceptual arguments made in Business and Economics by taking these classes, and are more prepared for them. Thus, we expect that the number of previous classes taken in Business and/or Economics will positively influence exam performance in Principles of Macroeconomics. All of these results can be found in Table 2.

In a second set of regressions (Table 3) we separated the students by the median of their exam scores to further estimate the impact of the reflective writing assignments on students' examination performance.

Results of the OLS regression (Table 2) show students with higher comprehensive ACT scores were positively correlated with examination performance. The ACT variable was 95% significant in the regression using the average exam scores as the dependent variable. It was further noted for each individual examination regression results were 95% significant for exam 1, 90% significant for exam 2, and 99% significant for exam 3. As expected, the GPA in the semester before participating in the course had a strong positive correlation with examination performance during study analysis. The GPA variable was at least 90% significant in all basic regressions (Table 2). In addition, as data in Table 2 illustrate, the more credits a student was enrolled in during the study, the worse the student performed on the first examination. Credit load (Credit) and student performance was correlated. For each additional credit taken, examination scores dropped by 0.86%, and average examination scores lowered by 0.59% for each additional credit hour taken. This confirmed the study hypothesis taking more credit hours reduced the amount of time students spent preparing for class, resulting in poorer academic performance on examinations. The credits variable is 90% significant and negative in the regression including the average exams scores of students and 95% significant in the regression including only the results from the first exam. Furthermore, in deference to what the scientific literature indicates, female students did not have lower exam scores than their male peers (Gender). In fact, we found with 95% significance male students had 1.95% lower scores on the first examination. Students majoring in Business or Economics also had better exam scores

(BusEcon). However, we only found a positive effect at the 95% level of significance for performance on the first exam. Students majoring in Business and/or Economics scored 2.95% higher on the first exam compared to their peers. The choice of major was not a significant indicator for exam performance for the other exams. Study results also found the number of classes taken in Business and Economics prior to taking Principles of Macroeconomics did positively influence average examination performance (priorclass). The coefficient is significant at the 90% level in the regression where average exam scores are the dependent variable. Each additional class taken increased the average exam score by 0.3%. However, prior classes taken did not significantly impact any of the regressions using separate exam performances as the dependent variable. Contrary to the study hypothesis, homework completion scores (hwcomp), age, nor grade level (slevel) had any significant impact on examination performance.

One key result to note includes students enrolled in the treatment sections did not have higher examination scores than students in the control groups<sup>2</sup>. It should be noted for the purposes of this study students only wrote three reflective papers during the course of the semester. Even though study results determined reflective writing did not statistically impact examination performance, insufficient number of reflective writing assignments could have contributed to these results

It is also possible high performing students already have learning techniques and study strategies for succeeding academically in place, and their performance was not benefitted by the pedagogical technique of reflective writing. Splitting the sample of students at the median examination score<sup>4</sup> gives us a possibility to test this hypothesis. Results for these regressions can be found in Table 3.

Splitting the sample by the median of the percentage of correct answers for each exam provided further insights into the effectiveness of the reflective writing assignments. Students in the treatment group having scores below or equal to the median benefited from incorporating reflective writing assignments into the course. These students answered 3.5% more questions correctly than the students in the control group (Table 3 Column 7). Data demonstrates an impact only on the third examinations score for these individuals. It is possible it took several weeks for the benefits of the writing assignments to be empirically observed on objective testing. Results are offered in Table 3. Overall, the study documented reflective writing assignments had merit as an active learning tool, especially when the instructor is concerned with the performance of students at the lower end of the performance spectrum.

	(1)	(2)	(3)	(4)
Dependent Variable	Average of Percentage Exam Scores	Percentage of correct answers - Exam 1	Percentage of correct answers - Exam 2	Percentage of correct answers - Exam 3
Reflection	0.537 (1.226)	-1.379 (1.056)	1.186 (1.372)	1.804 (2.034)
Actcomp	1.035**	1.118**	0.781*	1.204***

	(1)	(2)	(3)	(4)
Dependent Variable	Average of Percentage Exam Scores	Percentage of correct answers - Exam 1	Percentage of correct answers - Exam 2	Percentage of correct answers - Exam 3
	(0.308)	(0.412)	(0.337)	(0.297)
Credits	-0.591*	-0.864**	-0.061	-0.850
	(0.258)	(0.249)	(0.634)	(0.637)
GPA	7.210***	4.146*	7.445***	10.039***
	(1.240)	(2.136)	(1.740)	(2.120)
Priorclass	0.337*	0.162	0.323	0.528
	(0.145)	(0.297)	(0.269)	(0.328)
Gender	-1.462	-1.930**	-1.150	-1.306
	(1.190)	(0.624)	(2.206)	(1.401)
Slevel	0.359	0.275	0.011	0.793
	(0.814)	(0.631)	(0.990)	(1.474)
BusEcon	1.776	2.950**	0.910	1.468
	(1.224)	(1.035)	(2.057)	(1.898)
Age	0.252	0.562	0.150	0.045
	(0.428)	(0.472)	(0.501)	(0.494)
HWcomp	-5.517	-2.546	-14.454	0.449
	(7.334)	(5.924)	(8.907)	(11.644)
Constant	36.603	43.375	-14.454	16.282
	(11.078)	(14.006)	(8.907)	(17.328)
R <sup>2</sup>	0.372	0.218	0.212	0.273
N	168	168	168	168

Data source: Author's university; Statistical significance is indicated as follows: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01; Standard errors are reported in parenthesis; OLS regression with standard errors clustered by classes<sup>5</sup>

In general with regards to the control variables, the results for the split sample (Table 3) matched the results of the full sample (Table 2). ACT scores and GPA scores are still positively corrected with exam performance. The evidence on the influence of credits enrolled on exam performance appears to be less in the split sample regression. The variable is only significant at the 90% level for the group of students scoring below the median (Table 3 column 1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Average of Percentage Exam Scores		Percentage of correct answers - Exam 1		Percentage of correct answers - Exam 2		Percentage of correct answers - Exam 3	
Sample splitting rule	<=	>	<=	>	<=	>	<=	>
	Median of dependent variable		Median of dependent variable		Median of dependent variable		Median of dependent variable	
Reflection	1.810	-0.667	-0.032	-0.468	1.216	-0.221	3.489***	-1.694
	(1.684)	(0.728)	(1.670)	(0.851)	(2.388)	(0.745)	(0.863)	(0.967)
Actcomp	0.663*	0.346	0.577	0.470*	0.964**	-0.002	0.720*	0.356
	(0.289)	(0.230)	(0.379)	(0.218)	(0.391)	(0.046)	(0.333)	(0.322)
Credits	-1.185*	-0.104	-0.825	-0.317	-0.582	-0.016	-1.123	-0.661

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Average of Percentage Exam Scores		Percentage of correct answers - Exam 1		Percentage of correct answers - Exam 2		Percentage of correct answers - Exam 3	
Sample splitting rule	<=	>	<=	>	<=	>	<=	>
	Median of dependent variable		Median of dependent variable		Median of dependent variable		Median of dependent variable	
	(0.502)	(0.137)	(0.545)	(0.197)	(0.929)	(0.132)	(0.586)	(0.386)
GPA	2.787**	3.889***	3.898**	2.363*	2.173	2.183	3.753*	5.145**
	(1.133)	(0.789)	(1.342)	(1.097)	(2.049)	(1.228)	(1.536)	(1.675)
Priorclass	0.148	0.311**	0.037	0.256**	0.682	0.234	0.288	0.064
	(0.331)	(0.114)	(0.276)	(0.083)	(0.488)	(0.177)	(0.416)	(0.227)
Gender	-0.931	-0.102	1.066	-1.652*	-2.719	0.940	-5.436	0.082
	(1.688)	(0.716)	(1.595)	(0.802)	(2.632)	(0.649)	(2.828)	(0.616)
Slevel	0.376	0.066	-0.070	1.022*	0.317	0.351	-0.249	-1.082*
	(0.836)	(0.444)	(0.746)	(0.469)	(1.048)	(0.334)	(1.158)	(0.530)
BusEcon	0.209	0.629	2.865*	1.126	-1.495	0.674	0.286	0.293
	(0.855)	(1.079)	(1.276)	(1.056)	(2.463)	(0.870)	(1.489)	(2.107)
Age	0.205	0.337	-0.019	-0.345	-0.402	-0.167	-0.468	0.364
	(0.430)	(0.327)	(0.712)	(0.535)	(0.416)	(0.383)	(0.339)	(0.331)
HWcomp	-5.732	-4.077	-2.652	-15.59**	-10.200	-3.671	2.837	-7.533
	(5.449)	(3.554)	(5.361)	(5.609)	(13.334)	(2.954)	(8.607)	(5.463)
Constant	-341.548	-603.698	98.809	772.624	862.688	416.750	975.068	-649.103
	(853.89)	(647.33)	(1417.7)	(1061.3)	(819.93)	(760.32)	(679.02)	(657.47)
R <sup>2</sup>	0.231	0.236	0.206	0.399	0.151	0.154	0.240	0.219
N	78	90	101	67	96	72	89	79

Data source: Author's university; Statistical significance is indicated as follows: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01; Standard errors are reported in parenthesis; OLS regression with standard errors clustered by classes

The number of classes taken previously still appears as a significant influence on exam scores. However, only students who are above the median exam scores for the first exam and the average exam scores benefitted from having taken prior classes in Business and/or Economics. The coefficient (priorclass) is significant at the 95% level for these two groups. Each additional class raised their exam scores by 0.31% (average exam scores Table 3 column 2), or respectively 0.256% (Table 3 column 4). Different to the results for the full sample, we found the class level (slevel) was 90% significant in two cases. However, data points in opposite directions in each case. Having advanced one level (e.g. Junior to Senior) increased the exam performance by 1% for students above the median for the first exam. It was also found having advanced one level decreased the exam performance by 1% for students above the median for the third exam. The positive effect for the first exam could be caused by advanced study skills and strategies students develop in school (Table 3 column 4). The negative effect on the third exam however, could be caused by students being familiar with final exams and being over confident and thus not preparing as carefully as students at a lower level of studies (Table 3 column 8). Another supposition is lack of time management as the semester comes to a close, resulting in inadequate study and test taking preparation. The results for Business and/or Economics majors were

partially confirmed. However, the positive significant effect of the major on exam performance is restricted not just to the first exam, but to only the group of students below the median exam scores. This group had 2.9% higher exam scores on the first exam (Table 3 column 3). Lastly, we identified completing more homework assignments had a negative and significant impact on exam performance for students above the median on the first exam (Table 3 column 4). However, it is likely the result is affected by the course policy dropping the lowest three homework scores from the calculation of the final overall course grade. Thus, it is likely that students who already had high average scores, chose to skip certain assignments, explaining the negative relationship between homework completion percentages and examination performance.

### **CONCLUSIONS AND FUTURE RECOMMENDATIONS**

In conclusion, the researchers believe writing reflection papers influenced students' examination performance even though mixed statistical results were found. A statistically significant influence of reflection papers was limited to the students below the median examination score performance. These individuals had higher examination scores during the third exam. This is an important result that allows instructors to specifically target struggling students. Reflective writing helps the weaker students to take charge of the material and relate it to their own lives. Thus, by using reflective writing assignments we not only help these students to achieve more success on exams, but also give these students the tools to apply economic concepts in their lives after school. In addition, as we have shown, this positive outcome can be realized with a rather limited number of extra assignments. The positive impact of reflective writing on the exam performance in our study was limited to the third and final exam of the semester, thus we can conclude that three is the minimum number of reflective writing assignments to gain a measureable impact on student performance. Incorporating reflective writing into the curriculum also benefits the students in other ways. After an instructor grades and evaluates the reflective writing papers, the instructor is equipped with examples that are more closely related to the lives of the students. These examples can then be included in future classes and improve the learning of future students.

Finally, because we were unable to find a positive impact of the reflective writing assignments on exam scores for students above the median, it is also possible that quantitative assessment through final examination scores does not accurately reflect improvements in retention of knowledge and application of concepts gained in "Principles of Macroeconomics" classes. An improvement may only be measureable by performance in the workforce long after graduation, and a study of quantitative and qualitative impacts of student performance in the workforce following graduation can be conducted. Furthermore, more research is recommended for considering modifying course assessment schema and finding a balance between writing enough papers for generating positive quantitative effects on students' examination performance and the time constraints faced by instructors while employing reflective journaling as a method

for teaching and learning in the classroom. A future study should separate students in three different groups: a group that does not write any reflection papers, a group that writes three reflection papers and a group that write more than three reflection papers. This setup would allow research to gain more insight into the effectiveness of the exercise. Furthermore, the quality of the reflection papers could be used as another determining variable for the exam performance of students. Finally, assigning specific topics for reflection and then testing the comprehension of exactly these topics could lead to more measurable results, instead of allowing the students to choose from a range of topics.

### ENDNOTES

- 1 Rounded to a meaningful whole number
- 2 Most commonly, students had already taken Introduction to Accounting, Principles of Microeconomics, and Principles of Marketing
- 3 Controlling for reflection paper grades or the number of students who actually turned in their reflective writing assignments did not influence the results.
- 4 Splitting the sample at the median GPA or median ACT scores did not provide any further insights
- 5 The authors tested for interaction effects of all independent variables with the reflection dummy, no results were found; the authors also used SUR for all three exams and did not find any further results beyond the basic OLS regression.

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## APPENDIX

### **Reflection Papers Guideline for Students:**

The guidelines provided to the students participating in the Macroeconomics class are provided here. Students (You) are required to write three reflection papers during the semester. Each reflection paper is due the day after the review sessions for the exam. The papers should be 150-300 words long explaining how one of more of the just-completed textbook chapters relates to your life. There are no wrong answers, but a summary of the chapter is not acceptable. You are expected to reflect on the material from the chapter and determine the way(s) in which it is meaningful to you either for the past, present, or future. Your evaluation is based on the originality and insightfulness of your work and not the quantity. The reflection papers need to be submitted into the appropriate dropbox on D2L (submit a .doc or .docx file that includes your name and class section in the header – files that do not follow the rules will not be graded). The purpose of the reflection papers is getting you used to applying the language of economics, to creatively express your understanding of economic principles while developing written communication and higher-level critical thinking skills. Please, use an appropriate amount of time to finish the reflection papers (format for reflection papers derived from Brewer and Jozefowic, 2006).

### **Grading**

Three forms of grades were given for the reflection papers: good performance - appropriate example together with correct use of economic terminology; average performance - just providing example without relating it to economics topic; poor performance - incorrect use of economic terms and not inappropriate example.