The Effects of Dropping a Grade in Intermediate Macroeconomics

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ABSTRACT

When preparing a course at the start of a semester, instructors must consider how students will be assessed. One commonly used approach is to allow students to drop their lowest grade on an assignment or test. However, the effect of this policy is debatable.

This study adapts the model used by Sewell (2004) to investigate student performance in Intermediate Macroeconomics over six semesters at a public Midwestern university. Allowing students to drop their lowest test score does not appear to artificially inflate their final grade in class. Performance in previous economics courses, overall GPA and class status are strong predictors of the final grade.

This grading approach does lead to strategic test-taking on the part of students. Some choose not to take an optional end-of-semester exam that can potentially raise their final grade. Probit analysis shows this decision is positively related to the student's score going in to the exam, their concurrent course load and the variance in their prior test performance. Surprisingly, it is not related to the minimum score needed to raise their final grade.

INTRODUCTION

Faculty members face a question at the beginning of each semester as to how they will assess students. One issue is how to deal with students who miss an exam. There are several common approaches, each with its challenges.[1]

One approach is to allow a make-up exam. However, it is difficult to ensure that a new exam is comparable to the original in construction or grading. At the same time, if the student is allowed to take the original test, there is no way to be sure how much the student learned from those who took it at the scheduled time. A second approach is to reweight the exams that the student did take. However, this is problematic since the student is now being assessed differently than his or her peers. A third approach, and the focus of this study, is to allow all students to drop their lowest score.[2] This may relieve the instructor of the responsibility of make-up exams. In addition, this policy allows for a nice response to the dreaded question: "Can you curve the grades?" A concern with this approach is the potential impact on the student's grade. Many are concerned that such a policy may artificially inflate grades. However, is this

the case? Does allowing students to drop an exam lead to higher final grades when compared with other students who are not permitted to drop their lowest exam score? This approach as well as the re-weighting approach also suffers from the potential for a student to miss out on material completely if there is no comprehensive final examination.

Sewell (2004) offers up the only research related to this question.[3] In a single semester of Introductory Microeconomics, two sections were allowed to drop their lowest score while two were not.[4] The author finds the student's performance on a comprehensive final exam is positively related to SAT score, class status (upperclassmen fare better), gender (male) and major (business majors perform better). Of particular interest, allowing students to drop their lowest test score had a negative impact on the comprehensive final.

The current study follows the approach implemented in Sewell (2004). However, there are key differences between the studies. This study investigates the impact of dropping the lowest exam on the course grade using six semesters of Intermediate Macroeconomics with a single section in each semester. In contrast, Sewell (2004) investigated the impact of dropping the lowest exam score on the comprehensive final exam using four sections in a single semester of Introductory Microeconomics.

This study does not find that grade dropping has a significant effect on the final course grade nor does it appear to lead to artificially higher grades. The final grade is affected by overall GPA, the grade in Principles of Macroeconomics and class year. This grading approach leads to strategic test taking where students who have an opportunity to raise their grade through an optional fourth exam may decide not to take it. The likelihood of taking this fourth exam is positively related to the student's course load, grade going in to the final and variance in their prior test performance. Surprisingly, it is not related to the improvement required to raise their final grade.

DATA

This study uses data collected from six classes over four years.[5] The data on performance in Intermediate Macro were gathered by the instructor. The remaining data on demographics and overall academic performance were provided by the Registrar. A summary of student data is available in Table I. There were 180 students in the six classes. Eighty-one percent of the students were white while eight percent were black, three percent Asian and two percent Hispanic. This matches closely with the demographics of the university (white – eighty percent; African-American – six percent, Hispanic – four percent, Asian – one percent). Women accounted for only twenty-three percent of the students. This is significantly less than the university (forty-nine percent). However, women are commonly underrepresented in an upper level economics course.[6] These demographics are consistent across the two assessment styles (Drop vs. No-Drop). The majority of students in the class were seniors (sixty-one percent). However, some juniors (thirty-one percent) and graduate students (eight percent) as well as a single sophomore enrolled in the course over the four years. There were no freshmen.

Table I. Descriptive Statistics - Students			
	Full Sample	No Drop	Drop
Number of Students	180	46	134
Female	42	10	32
Male	138	36	102
White	145	35	110
African-American	14	5	9
Asian	6	2	4
LatinAmerican	3	1	2
Other	12	3	9
Freshman	0	0	0
Sophomore	1	0	1
Junior	55	12	43
Senior	110	28	82
Graduate Student	14	6	8
Introductory Macro grade (4 point scale)	3.14	3.05	3.17
	(0.83)	(0.93)	(0.80)
Concurrent course load	14.78	14.46	14.89
	(2.55)	(2.55)	(2.55)
GPA (4 point scale)	2.96	3.04	2.93
	(0.68)	(0.60)	(0.71)
Econ majors	75	23	52
Other business major	66	14	52
Non-business major	39	9	30
Standard deviations are included below in parenthese, where appropriate.			

Since this class was required for Economics majors, it is not surprising that they made up a large portion of the class (forty-two percent). Other Business majors such as Accounting, Marketing, Management, Finance, Human Resource Management and Information Management took the class (thirty-six percent). In addition, non-Business majors such as Political Science, Journalism, Math, History and Computer Science were enrolled (twenty-one percent).

Each semester, a single section was offered. Since there was a single section per semester, the sample is truly randomized. However, the sample may vary over time. Class size ranged from a low of twenty-four to a high of thirty-seven students. All six sections were taught by the same instructor.

Over the six semesters, the grading scheme varied. For two of the classes, the final grade was the average of four exams. For the remaining four classes, the final grade was the average of the three best of four exams (seventy-five percent) in addition to homework assignments (twenty percent) and a class participation grade (five percent). In both cases the final exam was simply the fourth exam and was not cumulative.[7] In the classes where a grade was dropped, no make-ups were offered. In the other sections, make-ups were possible.

A summary of the test performance is found in Table II. The average final grade across all sections was a 74.9 out of 100 total points. Surprisingly, it is slightly higher for the classes where all exams counted, 76.2, than for those allowed to drop the lowest exam, 74.5.[8]

REGRESSION EQUATION AND RESULTS

To test the impact of the different grading schemes on final grades, the following regression equation is applied.[9]

$$\text{FinalGrade} = f \begin{pmatrix} \text{Drop, GPA, Grade in Principles, Course Load,} \\ \text{Business Major, Non - Business Major} \\ \text{Female, Black, Asian, Hispanic} \\ \text{Sophomore, Junior, Grad} \end{pmatrix}$$

Table II. Descriptive Statistics - Test Scores			
	Full Sample	No Drop	Drop
Final grade	74.9	76.2	74.5
	(20.9)	(14.8)	(22.7)
Final grade (4 point scale)	2.56	2.57	2.55
	(1.27)	(1.22)	(1.28)
Test 1 results	77.2	72.7	78.7
	(15.2)	(14.1)	(15.3)
Test 2 results	73.4	71.5	74.1
	(19.1)	(17.0)	(19.8)
Test 3 results	70.3	67.3	71.4
	(19.1)	(19.4)	(19.0)
Test 4 results	70.4	74.4	67.5
	(17.4)	(16.4)	(17.7)
All scores are in percent except Final grade (4 point scale)			
Standard deviations are included below.			

Variable	Definition
Drop	= 1 if enrolled in section where the lowest grade is dropped.
GPA	the student's overall grade point average on a 4.0 scale.
Grade in Principles	the student's grade in Principles of Macroeconomics on a 4.0 scale.
Course Load	the number of credits the student was taking concurrently with Intermediate Macroeconomics.
Business Major	= 1 if student is majoring in business (other than economics).
Non-Business Major	= 1 if student is a non-business major
Female	= 1 if student is female.
Black	= 1 if student is black.
Asian	= 1 if student is of Asian origin.
Hispanic	= 1 if student is of Hispanic.
Sophomore	= 1 if student is a sophomore.
Junior	= 1 if student is a junior.
Grad	= 1 if student is a graduate student.

It should be noted that, since there are dummy variables for Business Majors and non-Business Majors, the default is an Economics major. Similarly, the default ethnic group and class are white and senior, respectively.

The results of this regression are found in Table III. Though positive, the coefficient on Grade Dropping is statistically insignificant, offering no evidence that allowing students to drop their lowest test score will artificially inflate the overall grade in the course.

Table III. Regression Results		
	Coefficient	t-statistic
Drop	3.719	1.448
GPA	14.671**	5.951
Grade in Principles	3.545*	1.993
Course Load	-0.222	-0.397
Business Major	-3.646	-1.334
Non-Business Major	-3.725	-1.188
Dummy-Gender	-0.764	-0.28
Dummy-African-American	8.162	1.692
Dummy-Asian	3.556	0.586
Dummy-Latin American	-0.703	-0.073
Dummy-Sophomore	-62.012**	-4.564
Dummy-Junior	-7.444**	-2.848
Dummy-Grad	-2.262	-0.334
Adjusted R-squared	0.504	
F-stat	10.79**	
N	137	
** and * indicate significance at the 1% and 5% levels, respectively.		

On the other hand, the student's grade in Principles of Macroeconomics and overall grade point average were each found to be strong indicators of performance in Intermediate Macroeconomics with each positively affecting the final grade in the course. Class status is also a significant contributor to performance where seniors and graduate students fare best while juniors and sophomores struggled.[10] This is likely due to the experience these students have, both in economics and college in general.

No significant effect was found for gender or ethnicity. Men and women performed similarly as did white, black, Asian and Hispanic students. Further, no significant difference was found between Economics, Business and non-Business majors. Finally, the number of credit hours taken was not found to significantly influence the final grade.

STRATEGIC BEHAVIOR

While allowing students to drop their lowest grade does not seem to affect the final grade students receive for the course, it is possible it affected their behavior. Of the 134 students who took the course with the grade dropping option, seventy-nine missed an exam. A disproportionate number, fifty-six, missed the fourth exam.

Table IV shows the decision making process students faced. It shows, by grade going in to the final, the student's options, the decisions they made and the resulting impact on their final grade. For instance, under this grading scheme, twenty-four students had an A going in to the final exam. Not surprisingly, they all opted out of the elective fourth exam. Meanwhile, of the thirty-nine students who had a B going in to the final, twenty-five had the potential to raise their grade.[11] Twenty-two chose to take the exam, and six raised their grades to an A. It should be noted that plusses and minuses were not grading options and that, given the grading structure; it is not possible for the fourth exam to lower a student's grade.

Table IV. Test Taking Strategies

Grade Going In to the Final	Number of Students	Was a higher grade possible?	Took the final	Improved their grade with the fourth exam	Final Grade
A	24	n/a	0		32
B	39	25	22	6	40
C	34	27	21	7 [1]	37
D	16	16	15	10 [2]	8
F	14 [4]	9	5	4 [3]	10
Total	127	77	63	27	127

[1] 2 students with C's going in to the final improved their grade to an A.

[2] 2 students with D's going in to the final improved their grade to an B.

[3] 2 students with F's going in to the final improved their grade to an C.

[4] 7 students withdrew from the course before final grades were submitted.

Overall, of the seventy-seven students who could have raised their grade only sixty-three made the attempt. Twenty-seven of the students did manage to raise their grade by at least one letter-grade, and six raised their grade by two letter grades.[12] One question that comes to mind while reviewing this data is 'Why would a student skip the final if a higher grade is possible?' There are two likely explanations for this. First, some students may be satisfied with their grades. This is certainly the case for the A-student but it is a possibility for other students as well. Second, while a higher grade is possible, it may require a Herculean effort. Both of these explanations should be considered since the fourth exam takes place during final exam week – a most harrowing time.[13]

In addition, many students opted out, not just of the fourth exam, but of the last portion of the course. Table V presents, by grade going in to Test 4, the number of students who skipped the fourth homework assignment and, of those, how many skipped the fourth exam. It is clear that a substantial number simply wrote off the final segment of the class.

Table V. More Test Taking Strategies			
	Number of Students	Zero on Homework 4	Zero on Test 4
A	24	10	10
B	39	6	6
C	34	5	5
D	16	5	1
F	14 [4]	8	7
Total	127	34	29

[4]7 students withdrew from the course before final grades were submitted.

The strategic behavior of students can be analyzed more fully using probit analysis. This shows the effect of various factors on the likelihood of taking an exam. The probit equation is:

$$\text{Prob}\left(\text{take final} = 1\right) = g\left(\begin{array}{l} \text{GPA, Course Load, Current Grade,} \\ \text{Test Variance, Minimum Score} \end{array}\right)$$

GPA and Course Load were defined earlier. Current Grade is the students' grade going in to the last exam. This will be their grade if they either skip the last exam or take the last exam but fail to improve on their lowest score. Test Variance is the variance in the results of the first three exams in the semester. Minimum Score is the lowest score the student can earn on the last exam and achieve the next highest

grade. That is, it is the score the student must get to bump his/her grade up by one letter grade. Those students who were assured of an A were excluded from this analysis.

The results, found in Table VI, indicate students were influenced by a number of factors. As Test Variance rises, students are more likely to sit for the fourth exam. This is likely due to students with high variance in performance seeing the opportunity to replace a grade substantially below their average with a grade significantly above it. Students with lower variance would not expect to raise their grade substantially with the optional exam.[14] It would also appear students were more likely to sit for the exam the higher their grade was going in to the exam. Remember, this analysis excludes those students that had already earned an A.

Table VI. Probit analysis of students completing the final exam.		
	Coefficient	z-statistic
GPA	-0.107	-0.369
Course Load	0.199**	2.944
Current Grade	0.027*	2.151
Min. Score	0.036	0.032
Test Variance	11.661*	2.556
Log Likelihood	-45.253	
N	84	
** and * indicate significance at the 1% and 5% levels, respectively. The coefficient on the constant term was not reported.		

Two results were surprising. One would expect increased credit load to raise the opportunity cost of sitting for this final, making it less likely the student would take the fourth test. However, the greater the student course load, the more likely they were to sit for the exam. This is certainly a surprise. In addition, Minimum Score was not found to be significant. Contrary to expectations, the level of the threshold for improving their grade does not appear to influence their decision.

CONCLUSION

The purpose of this study was to evaluate the effects of allowing students to drop an exam. This study found no evidence that this grading policy artificially inflates the final grade of students. In fact, the average final grade was lower in the sections allowed to drop a score than in sections where no such option was provided. Those who have done well in earlier economics courses (Principles of Macro) and other courses (overall GPA) do better in Intermediate Macroeconomics as do more 'mature' students

(seniors, graduate students). Ethnicity, gender, and major do not appear to affect the final grade in this course.

While the policy does not seem to affect the student's grade, it does appear to alter his/her behavior. A substantial portion of the class, when given the option, chose to skip the last exam. Several students passed up the opportunity to raise their grade when faced with the rigors of final exam week. This decision was based, in part, on their grade going in to the fourth exam and their concurrent course load. Surprisingly, the greater the course load, the more likely the student would sit for the exam. On the other hand, students with a higher grade going in were more likely to take the test. While the variance in their prior test performance was a factor, the effort required, as seen in the minimum score needed to raise their grade, was not.

A closing comment on this grading policy is in order. There are many reasons to choose a grading policy that allows students to drop their lowest score. However, in light of the results presented above, I believe that allowing students to drop one of a handful of equally weighted exams in the absence of a comprehensive final exam is faulty. The grading structure (A, B, C, D, F – no + or -) likely had an impact. Due to these large gaps in the grading scale, many students found a higher grade beyond reach. At other institutions, with different grading hierarchies, these results may vary.

While dropping a grade does not appear to artificially inflate grades, it would appear several students simply wrote off the final portion of the course.[15] In the absence of a comprehensive final exam, students appear to have little incentive to continue their studies. This, of course, is easily remedied by incorporating a required comprehensive final.

ENDNOTES

1. See Davis (1993) and McKechie (1999) for discussions of these approaches as well as other useful teaching tips.

2. Other less common approaches are scheduling an optional replacement test, usually the last week of class, which can be used to replace the lowest score for the semester or an oral exam as a substitute. In addition, some instructors allow students to choose their grading structure from a list of alternatives where one of these alternatives is dropping an exam.

3. Several studies investigate the various factors contributing to student performance in undergraduate economics classes. See Borg and Stranahan (2002a), Borg and Stranahan (2002b), and Kontolaimou, Pseiridis and Psallidas (2005) are recent examples.

4. As the author acknowledges, by assigning entire classes to one group or the other, the experiment is not randomized. For instance, athletes and student workers may have more rigid schedules and end up in a morning class.

5. Data on two other classes were available but not included due to substantial differences in assessment style.

6. See Dynan and Rouse (1997) for some explanation of the causes of this disparity.

7. Consequently, this study differs somewhat from Sewell (2004) since that study focused on the impact of the grading policy on performance on a cumulative final exam.

8. A t-test reveals that there is no statistically significant difference between these two measures.

9. This is quite similar to the equation used in Sewell (2004). The main difference is the absence of a measure of risk attitude derived from survey data which was insignificant in the Sewell study.

10. Recall that there was only one sophomore in the entire sample.

11. Given the grading approach, it is possible for a students whose average is just above the minimum threshold for a B to find an A is impossible, regardless of how well she does on the last exam while a C-student could find an A achievable. For a simple example imagine a B-student who scored an 80 on each of the first 3 exams would find an A is impossible even if she aced the last test. At the same time, a C student who scored 100, 90 and a 47 could earn an A in the class with an 80 on the last test. It was impossible for their grade to drop as a result of the final exam.

12. Four of those six had missed an exam earlier in the semester.

13. It is not possible to do with the data as structured, but it would be interesting to determine the timing of this decision. That is, of the students who decided to forego the fourth exam when a higher grade is possible, how many made that decision the night before the fourth exam, once the stresses of finals week took effect and how many made the decision immediately upon receiving the graded third exam.

14. Consider two students, each with an average score of 70. The first has earned a score of 70 on each of the three exams. The second scored 40, 80 and 90 on the three exams. The first student would likely forego the opportunity to take the optional exam. After all, based on previous performance he would likely expect his grade to be in the neighborhood of 70. There is little upside potential. The second student, on the other hand knows that she can do well. Even if her performance is just 'average,' it will replace the outlier and significantly improve her grade. Thus we see students with higher variance in test scores may be more likely to sit for an optional fourth exam.

15. It should be noted the third exam was offered very late in the semester. There was only a handful of new material presented in the remaining classes. In addition, given the nature of Intermediate Macroeconomics and the structure of the class, the material and the fourth exam were cumulative if not necessarily comprehensive.

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