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Abstract
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Keywords
Academic departments, higher education, Cornell University, median grades

Comments

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DO MEDIAN GRADES VARY ACROSS DEPARTMENTS?

By

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I. INTRODUCTION

Students have become perpetually worried about course grades to the point that grades as an outcome play a significant role in the decision of a student as to whether he or she should enroll in a particular class or major in a certain subject. Sabot and Wakeman-Linn (1991) showed that at a set of liberal arts colleges, enrollments have been influenced by certain departments distributing lower grades than others, effectively dividing the school into high and low grading departments and grading students away from certain subjects through low scores. Grades in economics, math, and the sciences have been documented to be lower than those in other social sciences and the humanities (Becker 1997; Shea 1994). Therefore, this phenomenon of grading away from certain subjects may be working to offset efforts that have strived to increase undergraduate interest and study in the sciences. In addition, it has been shown that students who take introductory economics courses by professors whose overall grade averages are higher are more likely to take upper level courses (Fournier and Sass 2000). This finding is significant because it allows for the possibility that professors can grade students *towards* particular subjects, as well as away from them. Freeman's (1999) explanation regarding grade divergence revolves around the pricing of courses relative to their market benefits, measured by their expected incomes.

This state of affairs does not bode well for students with a curious interest in a subject but consternation over the possibility that different departments will grade differently. For instance, a freshman with an interest in mathematics may fail to pursue math coursework for fear that the grades they will receive will put them at a comparative disadvantage to his or her peers. Professors or entire departments can become labeled as easy graders or tough graders, influencing the subsequent enrollment in the class.

This study will analyze if median course grades systematically vary across departments in Cornell University's College of Arts and Sciences. After briefly discussing other factors that might be expected to influence median grades and thus must be included in the analyses, I present my empirical findings. A final section discusses the implications of my findings.

II. Other Variables That Influence Median Grades

Class size is one of the primary suspects in the determinants of grades. Given two classes with different sizes taught by the same professor with identical subject matter, it is extremely likely that the class with the fewer students (and consequently, the lower student to faculty ratio) will receive higher grades. Students may obtain a greater command over the subject matter if they have learned it in a more intimate setting in which interaction with the professor is a reality and not a promise made in a college brochure. In addition, the professors themselves have a better chance of truly getting to know their students, so they can assess them based on participation, effort, and motivation, in addition to more objective criteria. Given the alternative context of a large lecture where students file in and out and contact is kept to a brief minimum, it should follow that a rise in class size would signify a fall in grades. In fact, Dickson (1984) has found that departments with low student to faculty ratios give out higher grades[1].

Another factor that may come into play is the level of the class taken. Here, however, there are two forces that may oppose each other. On the one hand, the nature of the subject matter in lower level classes differs from that in upper level classes. Though throwing a number of new, broad concepts at an undergraduate can often leave them more confused than when they began, it is usually the case that introductory level classes are less difficult than intermediate or

[1] It may be worth mentioning that Dickson believes this is an outgrowth of faculty worries concerning job security. This is a point I will return to later.

advanced level classes. This is ostensibly to make the material more accessible to those with little exposure and provide a broad framework upon which study of more advanced topics can be based. One would therefore expect higher grades in the lower level classes.

On the other hand, the composition of classes differs between upper and lower level courses. Those students who elect to enroll in upper level classes are likely those who have already succeeded in introductory classes and/or have a strong interest and enthusiasm in the subject matter. Meanwhile, some of those taking introductory classes have cursory interest in the subject and may even simply be taking the class to fulfill a graduation requirement. Given this, one would anticipate higher grades in the advanced classes, independent of class size. Controlling for class size is important because larger class sizes are skewed toward the introductory classes, so it may simply be the fact that upper level classes are small that is having a positive effect upon grades.

The tenure status of a faculty member may also play a role in the grades a student receives. At one extreme, a lecturer, who in most cases has little to no job security, might hypothetically grade students the highest in the hope that this will lead to more favorable student evaluations. Put another way, lecturers may have a disincentive to grade low; if they do, this might increase the danger they will lose their jobs. At the other extreme, tenured faculty, who enjoy nearly unparalleled job security, would have no such fear and be free to grade in whatever manner they see fit.

One would expect graduate students and assistant professors without tenure to lie somewhere in the middle along this continuum. Graduate student instructors are probably not in danger of losing their assistantships if they dole out lower grades, and so in this manner they are actually more like tenured faculty than lecturers. On the other hand, they are often so busy with

their own studies that they would just as soon just give someone an A rather than have to argue with a student about why their grades were as low as they were. In addition, as recent undergraduates, they may sympathize with the plight of many students trying to get high grades and may be more lenient than professors. The decision about whether to give an assistant professor tenure is probably predicated to some extent on student evaluations (along with research), and so they would likely be less discriminating with their grading policy. Therefore, such a professor who wants the security of tenure may not want to take any chances with students that complain loudly about grades, and so might be lenient.

III. Data, Methodology, and Results

For the last six years, Cornell University has been posting data on the median grades granted in each course on student transcripts and on its website. To analyze whether there are indeed differences between departments with regards to grades, median grades were obtained for the Fall 2001 and Spring 2002 semesters at Cornell University. Only courses from the College of Arts and Sciences (A&S) was considered in the analysis because this college provides a wider range of humanities, physical sciences, and social sciences classes than any other college at Cornell. Data on class sizes, number of sections, and names of instructors were gathered from Course and Time Rosters published each semester. The names of professors were then searched on department websites to determine their tenure level. This data was then merged with the median grade data for nearly every A&S class offered during the 2001-2002 school year. A total of 836 classes were included in the analyses.

Classes that were cross-listed in more than one A&S department were categorized under the department in which the professor has his primary appointment. Classes that were cross-

listed between A&S and another college were included as an A&S class regardless of the instructor's department. Class sizes were adjusted by dividing the total class size listed by the number of lectures or meetings that were taught in that semester for that class. Sections, usually conducted weekly by graduate teaching assistants, were ignored unless the section constituted a more significant part of the class than the lecture (i.e. foreign language classes in which section is a four day a week class, while the lecture is a one day a week overview)[2].

Dichotomous variables were used to distinguish the type of instructor in a class. For classes in which there was more than one instructor, fractions of a binary variable were assigned dependent on the fraction of classes that were taught by faculty members of each type. For example, if two assistant professors and one full professor taught intermediate microeconomics, its tenured faculty variable would be assigned the value of 1/3 and its assistant professor variable assigned the value 2/3. Faculty type was divided into five categories: Full/Associate Professor (tenured), Assistant Professor, Graduate student, Lecturer, and Visiting Professor (of any level).

Undergraduate classes in the college are denoted as introductory (100 level), lower level (200), upper level (300), and upper level open to graduate students (400). Separate dichotomous variables were created for each level. Similarly, the size of a course was represented by dichotomous variables for less then 15 students, between 15 and 30 students, between 31 and 60 students, between 61 and 150 students, and greater than 150 students. Finally, each department was assigned a unique dichotomous variable. Only departments with more than 10 observations (e.g. number of classes during this school year) were included in the analyses.

A regression was estimated with the median grade for a class as the dependent variable and class size, class level, faculty type, and department as explanatory variables. All explanatory

[2] Biology courses at Cornell are taught in Cornell's Division of Biological Sciences and are not included in my sample.

variables were dichotomous, and one variable was omitted from each category to avoid perfect collinearity. The coefficient estimates are thus comparisons to the omitted categories. The omitted categories were the Theater Arts department, upper level classes that graduate students can also take, 150+ student classes, and faculty members who were visitors. Table 1 summarizes my findings.

The first constant represents a median grade point of 3.65, somewhere between a B+ and an A- for the reference group. Even the variables that have the largest effect on grades only lower them by approximately .25 on the 4.0 scale. Turning to tenure level, it is clear that having a professor with tenure has a significant negative effect on median grades in a class, relative to having a visiting professor, in line with my hypothesis. However, having an assistant professor also has a significant negative effect on grades (albeit slightly less than associate and full professors) relative to visiting professors, which tells us that untenured professors at this major research university do not appear to worry about creating negative student evaluations when they determine their grades. Graduate students and lecturers effects are not significantly different from visiting professors, which is also roughly consistent with my hypothesis.

Looking next at course level, the lower the level of the course, the lower median grades appear to be, ceteris paribus. In contrast, the smaller the size of a class, the higher the median grade proves to be.

Finally, turning to the central issue at hand of whether there are observable differences in grades by department holding constant all of the factors previously discussed, the model indicates that a few departments' grades are significantly different from the baseline. Only in the cases of Asian Studies and German Studies does department per se have a positive and statistically significant effect on grades. However, median grades in courses in Astronomy,

Chemistry, Economics, Mathematics, and Physics, are significantly lower by at least –0.20 (out of 4.0). These departments, probably not coincidentally, are among the same departments observed by Wakeman-Linn and Sabot (1991) in their study of departments at a diverse group of colleges and universities.

IV. IMPLICATIONS

What is the commonality between these latter five departments that lend them giving out lower median grades than the other Cornell Arts and Sciences departments? It is possible that this division into low and high grading departments is simply an outgrowth of random, unplanned grading decisions on the part of individual departments and instructors. However, it seems more likely that there are number of factors that bind these departments together. These unifying threads include the presence of a strong quantitative component, a scientific element, and grading that is more objective rather than subjective.

The quantitative component could make the courses difficult, especially for the 21st century student that is averse to numbers and heavy calculations. Although Ehrenberg (2000) correctly argues that experimental research is increasingly the modus operandi for scientists in universities today, students in these disciplines must still learn the numbers and the theory grounded in equations before they can even begin to think about applying this information in the laboratory. Therefore, this quantitative component is still important. That exams in these disciplines are more heavily reliant on exact answers to problems means that there is little leeway for instructors in terms of grading an answer more leniently. This contrasts with other disciplines such as Asian Studies or English where grading is a much more subjective exercise when it comes to evaluating papers or presentations.

Another possible explanation proposed by Freeman (1999) is that low grades in these departments are a compensating differential for higher post-graduation salaries that their graduates receive. While undergraduates who major in the sciences, Economics, or Mathematics are nearly always in high demand, it seems unlikely that this would provide a motivation for instructors to grade harder in these fields.

Dickson (1984) presents a third explanation, namely that differences in grades are an outgrowth of faculty worries concerning job security. According to this theory, departments that are in danger of being downsized or eliminated would give higher grades to students, ensuring that demand for their classes remain high and their funding is maintained on campus. However, Cornell's humanities departments are all highly ranked as graduate departments, and it is unlikely that Cornell would take any actions to jeopardize these rankings. Indeed, given that fewer and fewer students are majoring in the sciences and many have proclaimed a crisis in the United States in terms of not producing sufficient native-born scientists, one would expect higher grades in Chemistry and Physics to attract top students and ensure the size of the departments. This is not the case, as they are two of the lowest grading departments. It is true, however, that the demand for their courses is not likely to wane as students still need to take these courses to fulfill pre-medicine and engineering requirements.

The clearest concern about differences in grading is that if students feel that grades in a department are too low, they will gravitate away from taking classes in that department. However, given that at Cornell the median grades in any class is rarely below a B, it is likely that motivated students will look past the "bad" grade they fear getting and instead pursue classes and majors that interest them or reward them with practical skills. In addition, Cornell embarked upon the policy of denoting median grades on transcripts not only as a way to give students and

outside evaluators a more accurate idea of a student's performance, but also to encourage students to take courses in which the median grade is relatively low.

A second concern is that the lower median grade departments have a greater capacity to signal strengths and weaknesses of particular students. This is also a theme in the expansive literature on grade inflation. If the median grade in a class is too high, there is likely compression so that many students are clustered around that median grade. There is a reduction in the number of grading categories because instructors cannot assign grades higher than, say, an A+. The value of a grade received in the class is diluted in that there is little difference between the good and the bad students. However, if the median grade is lower, instructors are able to convey more about a student with the grade, because the number of *usable* grading categories in the rubric is maintained.

What changes might be made in light of the differences that I observed? One possibility is to specify median (or mean) grade requirements for courses, as some law schools currently do. The second change is for faculty members to think seriously about stemming the tide of grade inflation, so that the grades received in all departments are more meaningful than the status quo allows. This is important if faculty want to provide students with better information about that student's relative strengths and weaknesses, and to make comparisons across students who major in different disciplines.

TABLE 1

Median Grades as a Function of Class Size, Level, Tenure Level, and Department

Explanatory variable	Coefficient	Standard Error	T statistic
Constant**	3.65071	0.09334	39.11
Tenure			
Full/Assoc Prof**	-0.12897	0.04694	-2.75
Assistant Prof**	-0.11042	0.05367	-2.06
Graduate Student	-0.07590	0.06268	-1.21
Lecturer	-0.02747	0.05269	-0.52
Level			
Introductory class**	-0.20697	0.04109	-5.04
Lower level class**	-0.17269	0.03859	-4.48
Upper level class**	-0.10492	0.03491	-3.01
Size			
< 15**	0.20988	0.05565	3.77
Between 16 and 30**	0.17209	0.05311	3.24
Between 31 and 60	0.08294	0.05504	1.51
Between 61 and 150	0.01776	0.05525	0.32
Department			
Anthropology	-0.02315	0.07212	-0.32
Art History	-0.07191	0.07820	-0.92
Africana Studies	-0.07679	0.08214	-0.93
Asian Studies**	0.14154	0.06480	2.18
Astronomy**	-0.18898	0.09302	-2.03
Chemistry**	-0.23409	0.07651	-3.06
Classics	-0.01074	0.08109	-0.13
Comparative Literature	-0.05764	0.08298	-0.69
Economics**	-0.25068	0.07040	-3.56
English	0.04776	0.05866	0.81
German Studies*	0.15109	0.08058	1.88
Government	-0.09862	0.06770	-1.46
History	-0.06410	0.06499	-0.99
Linguistics	0.10851	0.09036	1.20
Mathematics**	-0.22365	0.06669	-3.35
Music	0.10646	0.07612	1.40
Near Eastern Studies	-0.00768	0.08355	-0.09
Philosophy*	-0.13511	0.07555	-1.79
Physics**	-0.24635	0.07275	-3.39
Psychology	0.04106	0.06878	0.60
Romance Studies	-0.02899	0.05928	-0.49
Sociology	0.06788	0.07716	0.88
Science & Tech Studies	-0.01652	0.08200	-0.20

Notes: N = 836; * indicates significance at the 10 percent level; ** indicates significance at the 5 percent level.

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