GRADE INFLATION: CAUSES AND CURES

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Abstract

Grade inflation has become a problem from community colleges to Ivy League Universities. In this paper, we develop an agency-theoretic framework that is useful in identifying the root causes of grade inflation and in providing some remedies for this problem. The paper also highlights the costs and benefits of student evaluations.

The paper shows the existence of an ideal level of emphasis to be placed on student evaluations. This level is found to be higher in institutions with smaller class sizes and highly motivated students. On the other hand, this level can be very low in institutions that have larger classes and attract poorly motivated students. In any event, emphasizing student evaluations beyond the ideal level is found to be the main cause of grade inflation.

Accordingly, we recommend that institutions that are experiencing grade inflation consider lowering their emphasis on student evaluations. We point out that this move while lowering student satisfaction will improve student knowledge and lower grade inflation. We recognize that some institutions may not want to lower the satisfaction level of their students. For these institutions, we recommend finding ways to increase the motivation level of their students and consider reducing the size of their classes. Both these measures will increase student knowledge and lower grade inflation. In essence, these measures move the ideal level of student satisfaction towards their current level.

1. Introduction

The 'gentleman's C' is not only alive and well but appears to be evolving into the 'generous B' or even A *From a Feb. 18th, 1998 New York Times Article*

Grade inflation is a problem that is prevalent from community colleges to Ivy League universities (Farley 1995; Benjamin 1997). The above New York Times article portrays colleges as adapting to student mediocrity, rather than students adapting to the requirements of the institutions. Why do professors inflate grades? Is it because they don't care about grade inflation? What role do students play in grade inflation? What are the costs and benefits of student evaluations in this regard? What are some potential cures for this problem? Theoretical research examining these questions is virtually non-existent. Accordingly, the objective of this paper is to develop a theoretical framework that can address these questions related to grade inflation.

In a recent educator's forum, Wallace and Wallace (1998) [hereafter referred to as W&W] point to the use of student evaluations in promotion and tenure decisions as the cause of grade inflation. In fact, they argue that this practice has even led to a reduction in student knowledge and manipulation in grading schemes. Overall, they express the *opinion* that costs of student evaluations have long since exceeded their value. In this paper, we develop an agency-theoretic model to formally investigate the impact of using of student evaluations in promotion and tenure decisions on variables such as student effort, professor effort, grade manipulation, and grade inflation. This exercise allows us to be more precise about the relationship between student evaluations and grade inflation. It also allows us to discover the root causes of the grade inflation problem.

The root causes of grade inflation, according to our model, are the decrease in the motivation of students, the increase in class size by institutions, and the decrease in the teaching effort by professors. These factors make students less satisfied with their learning experience, thereby making student recruitment and retention a problem for many institutions. The customer mentality of students and the increased competition among universities have led to institutions searching for quick fixes to boost student satisfaction. The solution advocated by many institutions is the utilization of student evaluations in the promotion and tenure decisions of the professors. Given that student evaluations are a direct function of student satisfaction, requiring a hurdle level of student ratings forces the professors to ensure that students are adequately satisfied with their learning experience.

Our results reveal that every university can benefit by the utilization of student evaluations in the promotion and tenure decisions. Student evaluations have the potential to motivate professors to put forth more effort at teaching, resulting in increased student knowledge and student satisfaction. Overall, we show that *student evaluations have the potential to play a positive role though they can end up causing more harms than good if over emphasized.* Based on our model, we also propose various recommendations for controlling grade inflation. First, we recommend that *institutions that are experiencing grade inflation consider reducing emphasis placed on student evaluations.* This would lead to tougher grading by the professors and consequently, more learning effort from the students. We recognize, however, that this recommendation is not always feasible as it may face opposition from the students. This is because reducing the emphasis placed on student evaluations is likely to reduce the satisfaction level of the students. *For institutions that may find this move difficult, we recommend finding ways to increase the motivation level of their students*. This would lead to more effort not just from the students but also from the professors resulting in more student knowledge and less grade inflation while increasing student satisfaction. *An alternative way to control grade inflation is to reduce the number of students in a class*. Smaller classes provide a better learning environment resulting in more student knowledge, less grade inflation and increased student satisfaction.

2. Definition of Grade Inflation

We begin our analysis by providing a working definition for Grade inflation (GI). Ideally, grades are meant to reflect the knowledge (K) a student acquires in a course. This acquired knowledge typically depends on the effort (α) the professor puts forth in teaching the course, and the effort (β) the student exerts in learning the subject matter. Following the multi-task structure introduced by Feltham and Xie (1994), we use a simple linear form to describe the relationship between acquired knowledge K and efforts α and β:

$$K = m\alpha + \beta, \quad 0 < m < 2/3 \qquad [1]$$

In equation [1], the parameter m is the motivation level of the student. First, it requires that the knowledge acquired through professor effort to depend on the motivational level of the student. Second, it ensures that student effort contributes more towards knowledge acquisition than professor effort. More specifically, the condition $m < 2/3$ requires that the contribution to knowledge from student effort is at least 1 ½ times that of professor effort.

Ideally, the grade the professor gives to the student should be based on the level of knowledge acquired (K). Unfortunately, K cannot be directly observed by the professor because the effort a student exerts in learning (β) is inherently unobservable. As such, the professor determines the grade based on some *reported* performance measure Y. We envision Y to be an aggregate score of exams, quizzes, projects, homework assignments and the like. Obviously, these performance measures are never a perfect measure of knowledge as they can be affected by other factors as well. For example, a student who is not very knowledgeable may do well in an exam if two of the questions happened to be the ones he reviewed just the previous night. As such, the reported measure Y will overstate the true knowledge level K. However, we do not consider this to be grade inflation, because in some other instances Y has the potential to understate the true knowledge. For example, a student who is very knowledgeable may do poorly on an exam because she developed a headache during the exam.

We say grade inflation is present if the "on average" or the expected grade is higher than the ideal grade. Formally grade inflation is defined as:

$$GI = E[G(Y)] - G(K) \geq 0 \qquad [2]$$

Here, E[ ] is the expectation operator and G( ) is the grade function. In real life, the grade function maps continuous scores of Y into ten discrete grades (A, A-, B+, B, B-, C+, C, C-, D, and F). For analytical simplicity, however, we assume the grade function to be continuous and linear in its arguments, i.e., G(Y)=Y , and G(K)=K. Substituting for the grade function in [2] results in,

$$GI = E[Y] - K \geq 0 \qquad [3]$$

Here, grade inflation is said to be present when the expected grade of the student is higher than his or her acquired knowledge. The level of grade inflation is basically the magnitude of the bias in the performance measure.

3. How do Professors and Students Contribute to Grade Inflation?

In the previous section, we identified that grade inflation is caused when the performance measures become a biased estimator of student knowledge. Before answering the question of *why* professors choose biased estimators, we specify *how* both professors and *students* contribute to grade inflation. We begin by defining the *true* performance (y) in the different assignments that make up the aggregate performance measure.

$$y = K + \varepsilon_y , \qquad y \in [0, 1] \text{ and } \varepsilon_y \sim N(0, n) \qquad [4]$$

Here, ε_y is the noise in the true performance measure, which is assumed to be normally distributed with zero mean and finite variance n. This noise can arise due to factors such as the mood of the student on the exam day, the clarity of the exam questions, the time pressure faced by the student, the class room environment, etc. When the class size is very small, most of these factors may not even be present, as there will be a better understanding between the professor and the students. But as the class size increases many of these factors come into play and begin to cause a significant difference between a student's knowledge and the true performance on the different assignments. For ease in illustration, we assume that these factors are directly proportional to the size of the class. Accordingly, we consider the variance n to be related to the number of students in a class. Note also that we have normalized the true performance measure to be between zero and one. This is consistent with the practice of specifying grading policy as a percentage between zero and one hundred.

Next, as pointed out in W&W, we argue that professors do not always *report* the true performance measure given in [4] above. It is well known that some professors, while grading the different assignments, tend to be "soft" with weaker students. It is also common to see professors offering "free" points across the board in one way or another. For example, some professors offer a 5-10% class participation score virtually for everyone in the class. Another common example is professors lowering the cut-off points for grades. In order to parsimoniously capture “soft grading” and “free points”, we specify the following relationship between the true performance measure y and the reported performance measure Y.

$$Y = y + (1-\lambda)(1-y) + \mu \quad , \quad 0 \le \lambda \le 1, \; 0 \le \mu \qquad [5]$$

According to equation [5], the reported performance Y is the sum of three components, namely the true performance y, soft grade $(1-\lambda)(1-y)$, and free points μ. Note that the soft grade is zero for a student who obtained a perfect score (y =1), and takes the maximum value for a student who scored the lowest (y = 0). In general, the weaker the performance, the greater is the boost given by the professor. Note also that λ serves as a measure of the toughness of grading. When λ=1, the professor is being very strict in that he does not favor any student while grading. But as λ decreases, the professor becomes softer in his grading. See Figure 1 below to visualize how these “free points” and “soft grading” cause the reported performance measure (Y) to be different from the true performance measure (y).

INSERT FIGURE 1 HERE

Proposition 1:

Both professors and students contribute to grade inflation. Grade inflation increases as professors

(i) become more soft in their grading (l¯)

(ii) offer more free points (m-), and

(iii) put forth less effort in teaching the course (a¯),

and, as students

(iv) become less motivated (m¯), and

(v) put forth less effort in learning the subject matter (b¯).

More specifically

$$GI = (1-\lambda)[1-(m\alpha+\beta)]+\mu \qquad [6]$$

Proof: The proof of Proposition 1 as well as all subsequent propositions can be obtained from authors.

The truth behind the first two statements can be easily seen as increases in soft grades and free points results in increases in expected grades without any increase in acquired knowledge. The last three statements are true because the variables described in these statements reduce both acquired knowledge as well as expected grades. However, according to equation [6], the reduction in the acquired knowledge is higher than the reduction in expected grades resulting in increased grade inflation.

4. Why does Professors Contribute to Grade Inflation?

In the previous section, we identified how professors and students contribute to grade inflation. Given the fact that students like higher grades but are averse to the learning effort, their contribution towards grade inflation is understandable. But why do professors use soft grading and offer free points, and hence, contribute towards grade inflation?

One prevalent view is that professors do not care about grade inflation. In this pessimistic view, professors are portrayed as individuals who want to minimize their time spent on teaching related activities so that they can focus on research related activities. We argue that this view is too simplistic. In our opinion, by simply passing the blame on to professors, this view fails to detect the root causes of grade inflation.

4.1 Professor’s Unconstrained Problem

In contrast, we argue that professors in general do not give away grades. This is because professors do not like to be perceived as those who pamper students. In essence, we argue that professors are averse not only to their teaching effort but also to grade inflation. More specifically, we assume that the professor in our model seeks to minimize the sum of grade inflation and effort disutility. Note that the units of effort disutility and grade inflation are not the same. To circumvent this problem, we express the effort disutility in terms of grade equivalents. More specifically, we assume the grade equivalent cost of effort to be a quadratic function in the teaching effort α. In summary, the professor’s objective is to:

$$\underset{\alpha, \lambda, \mu}{\text{Minimize}} \quad \{\mu + (1-\lambda)[1-(m\alpha+\beta)]\} + \{\alpha^2\} \qquad [7]$$

Here the first bracketed term represents grade inflation and the second bracketed term represents effort disutility. The professors' choice variables are the teaching effort α, toughness in grading λ, and free points μ. Note that lowering λ and increasing μ, increases the level of grade inflation. Increasing α, on the other hand, is helpful in reducing grade inflation, although it increases the effort disutility. The following proposition states the optimal choices of the professor in the absence of any constraints.

Proposition 2:

If professors are left alone, they will not allow for any grade inflation. More specifically, professors will follow a strict grading policy (l =1 and m = 0). However, they will put forth only the minimum effort at teaching (a =0).

Given that professors do not like grade inflation, they have no incentive to offer any free points or to be soft in their grading (i.e., $\lambda = 1$ and $\mu = 0$). In the absence of soft grading, decreasing teaching related effort does not cause any grade inflation either; the reduction in teaching effort will equally reduce both the grades and the acquired knowledge. On the other hand, decreasing teaching effort saves on effort disutility. This is why, if left alone, professors will put forth only the minimum teaching effort ($\alpha = 0$).

4.2 Student Satisfaction Constraint

We believe that the situation described in the previous section captures the environment professors faced more than two decades ago. More specifically, it ignores an important factor in today’s academic environment, namely student satisfaction. Increased competition among universities has led to students being viewed as customers. Following the importance placed on customer satisfaction in the market place, universities have also become very concerned about the satisfaction students derive from their educational experience (Beaver 1997).

In order to capture this important factor, we first develop a model of student satisfaction. As discussed in W&W, we too believe that the two most important variables that determine the satisfaction a student derives from a course are the grade that the student receives and the learning effort that he puts forth. Certainly, higher grades at lower effort levels are the dream of any student. As in the case of the professor, we express the student's disutility for effort in terms of grade equivalents. More specifically, we use a quadratic form to describe the effort disutility in terms of grade equivalents. Formally, the student's utility is stated as:

$$U(G,\beta) = U(G - \frac{\beta^2}{m}) \qquad [8]$$

Notice that a given level of learning effort is less costly to a highly motivated student. Also, note that students are forced to face grade risk as grades are a function of imperfect measures of knowledge.

We assume that students are averse to grade risk. A frequent complaint of students has been that their grades do not reflect the hard work they put into the course or the knowledge they have acquired in the process. Accordingly we assume that student satisfaction is concave in grades. More specifically, we use the following utility function:

$$U(G - \frac{\beta^2}{m}) = -\exp[-r(G - \frac{\beta^2}{m})] \qquad [9]$$

Here r is the constant absolute risk aversion of the student. Note that more learning effort, while increasing the disutility for effort, increases the grade through the acquisition of more knowledge. Clearly then, the student will choose his effort to maximize his expected utility function. Maximizing the expected utility is equivalent to maximizing the certainty equivalent of the expected utility. Formally, the student's problem can be stated as:

$$\underset{\beta}{\text{Maximize}} \quad [1+\mu-\lambda+\lambda(m\alpha+\beta)] - \frac{\beta^2}{m} - \frac{r}{2}\lambda^2 n \qquad [10]$$

First Order Condition:

$$\beta = \frac{\lambda m}{2} \qquad [11]$$

According to equation [11], the student's learning effort increases with his motivational level but decreases when a professor becomes softer in his grading. Substituting [11] into [10] gives the certainty equivalent (CE) of the student's expected utility (satisfaction level) as :

$$CE = 1+\mu-\lambda+\lambda(m\alpha+\frac{\lambda m}{2}) - \frac{\lambda^2}{4}(m+2rn) \qquad [12]$$

The increased competition for students has forced institutions to improve the satisfaction level of their students. Notice that three of the variables affecting student satisfaction are directly controlled by the professor, namely the toughness in grading λ, free points μ, and the professor effort α. Two of the variables, namely student motivation m and risk aversion r are characteristics of the student. Finally, the class size n is more under the control of the institutions. As such, the satisfaction level of the students depends on all three actors: students, professors, and institutions.

Changing the characteristics of the students (m,r) to improve their level of satisfaction is not an easy task. Financial constraints may prevent institutions from reducing class size (n) in order to improve student satisfaction. On the other hand, universities can easily influence the three variables that are under the control of the professors. This can be done by emphasizing the role of student evaluations in the promotion and tenure decisions of the professors. For example, W&W describe a hypothetical situation where a professor is pressured to obtain an evaluation of 4.0 out of 5.0. Notice that student evaluations tend to be a direct measure of student satisfaction.

Therefore, by adjusting the hurdle level of student ratings required for promotion and tenure, institutions could easily ensure that they obtain the desired level of student satisfaction. Anecdotal and empirical evidence seem to indicate that an increasing number of schools have started to use student evaluations in the promotion and tenure decisions of their professors.

Let t denote the critical level of student ratings the professor has to receive to demonstrate satisfactory performance in teaching. If she receives a rating below t, her teaching performance will be deemed unsatisfactory. Let S be the satisfaction level (in terms of certainty equivalent) that will produce a student rating level t. More formally,

$$t = f[U(S)] \qquad [13]$$

where f is a monotonically increasing function of U. Given that there is a one to one mapping between t and S, we focus on the critical student satisfaction level S, instead of the critical student evaluation level t. Accordingly, we denote the student satisfaction constraint faced by contemporary professors as:

$$1+\mu-\lambda+\lambda(m\alpha+\frac{\lambda m}{2})-\frac{\lambda^2}{4}(m+2rn) \quad \geq \quad S \qquad [14]$$

where, S is the minimum level of satisfaction (in terms of grade equivalents) needed to ensure that student ratings will not be lower than the required level t.

4.3 Professor’s Constrained Problem

Now the professor’s optimization exercise becomes a constrained minimization problem stated as:

$$\underset{\alpha,\lambda,\mu}{\text{Minimize}} \quad \left(\mu + (1-\lambda)\left[1-\left(m\alpha+\frac{\lambda m}{2}\right)\right]\right)+\left(\alpha^2\right)$$

Subject to

$$1+\mu-\lambda+\lambda\left(m\alpha+\frac{\lambda m}{2}\right)+\frac{\lambda^2}{4}(m+2rn) \geq \quad S \qquad [15]$$

How does the introduction of the student satisfaction constraint affect the previously discussed results of the professor’s unconstrained problem? More specifically, what is the impact of student evaluations on variables such as grade inflation GI, acquired knowledge K, professor teaching effort α, and student learning effort β? We find that the answers to these questions depend on the level of student ratings (t), or equivalently the level of student satisfaction (S) required from the professor.

5. Student Evaluations and Grade Inflation

In the previous section we stated that the impact of emphasizing student evaluations in promotion and tenure decisions depends on the required level of student
satisfaction. More specifically, it depends on the magnitude of S relative to class size n, student motivation level m and student risk aversion r. We find it convenient to break the emphasis placed on S into four ranges, namely, low, moderate, high, and excessive.

INSERT FIGURE 2 HERE

Proposition 3: Low Region

When the required level of student ratings is low (Region I), professors will not be constrained by student evaluations. In fact, they will expend only the minimum effort at teaching ($a = 0$) and follow a strict grading policy ($l = 1$, $m = 0$) that will not allow for any grade inflation (GI =0). As a result, students will put forth the maximum learning effort ($b = \frac{m}{2}$). Moreover, student satisfaction and consequently the student ratings will be higher than the required level.

In this region, the emphasis on student evaluations is so low that professors can easily obtain the required ratings, and as such will not be concerned about satisfying students. This is why they can afford to follow a strict grading policy that avoids grade inflation, and expend only the minimum effort on teaching. Knowing that professors are tough on grading makes the students put forth the highest level of learning effort.

The length of this region increases as student motivation level m increases and/or class size n decreases. In other words, this kind of phenomena is more likely to be observed in small classes with highly motivated students. For example, consider the Ph.D. and upper level masters courses where highly motivated students study hard while professors' face very little pressure to obtain high teaching evaluations.

Proposition 4: Moderate Region

Even when the required level of student ratings is at a moderate level (Region II), professors will follow a strict grading policy ($l = 1$, $m = 0$) that will not allow for any grade inflation (GI = 0). As such, students will continue to put forth the maximum learning effort ($b = \frac{m}{2}$). The main difference here is that the professors will expend a positive level of effort at teaching, and hence, the student knowledge would be higher than that in region I. In fact, increasing the required level of student ratings (S) in this region has the effect of increasing both the professor effort and the student knowledge.

In this region, the emphasis on student evaluations is high enough so that professors become mindful of satisfying the students. They can utilize the three choice variables (teaching effort α, soft grading λ, and free points μ) under their discretion to increase the satisfaction of students. Utilizing λ and μ will introduce grade inflation, whereas utilizing α will introduce effort disutility. To understand why the professor chooses the teaching effort over the other two, compare the marginal effort disutility as he begins to use the teaching effort (0), with the marginal grade inflation as he begins to use free points (1) or soft grading (1-K). Clearly then, in this region, satisfying students through teaching effort is much cheaper than through soft grading or free points.

A tough grading policy ($\lambda = 1$ and $\mu = 0$) continues to solicit the highest level of student effort and prevents the occurrence of any grade inflation. The highest level of student effort coupled with the increases in professor effort has a positive effect on student knowledge. In fact, increasing the required level of student ratings in this region will solicit more teaching effort . This is because the marginal benefit of teaching effort while diminishing will continue to be higher than the marginal benefit of soft grading or free points. In fact, increasing the required student ratings up to the end point in this region produces the highest level of student knowledge. Our finding in proposition 4 validates the common explanation given for the use of student evaluations, namely that it induces higher levels of teaching effort from the professors.

Proposition 5: High Region

When the required level of student ratings is too high (Region III), professors will introduce soft grading ($l < 1$) to increase student satisfaction. This leads to grade inflation and a reduction in both the student effort and the student knowledge. However, it continues to solicit more effort from the professor. Moreover, increasing the required level of student ratings, while soliciting more teaching effort from the professor, leads to an increase in grade inflation and a reduction in both the student learning effort and the student knowledge.

Here, the emphasis on student evaluations is so high that they become counter productive. Professors realize that additional teaching effort in this region is not only strenuous but also ineffective in increasing student satisfaction. As such, they begin to look for more effective ways to please the students. They realize that with the increase in knowledge that took place in region II, the marginal grade inflation due to soft grading (1-K) has significantly come down. But the marginal grade inflation due to free points continues to remain at one. As such, they find it more efficient to use soft grading along with increased teaching effort to increase student satisfaction. Moreover, seeing the professors become lenient on grading, students reduce their learning effort. Given that student effort is more important than professor effort in acquiring knowledge, this decrease in student effort causes a reduction in student knowledge. The soft grading and the reduction in knowledge contribute towards grade inflation in this region. Notice that almost all of the benefits of emphasizing student evaluations discussed in proposition 5 are gradually reduced as more and more emphasis is placed on student ratings.

Proposition 6: Excessive Region

When the required level of student evaluations are excessive (region IV), the professors will turn to the use of free points ($m > 0$). Increasing S in this region increases both the free points and grade inflation. However, an increase in S does not affect the level of soft grading, professor teaching effort, student learning effort or the student knowledge. While the professor effort is at the highest level throughout this region, the soft grading and consequently the student effort is at the lowest level throughout this region. The resulting knowledge will also be at the lowest level for poorly motivated students, i.e., when $\frac{1}{2}\left[\frac{m^2}{1-m}\right] < rn$.

In this region, the professors stop using soft grading because the marginal benefit of soft grading through higher grades equals the marginal cost of soft grading through grade inflation. Note the marginal benefit through higher-grade decreases with the level of soft grading as the students' utility function is concave in grades. On the other hand, the marginal cost of grade inflation increases with soft grading as student knowledge keeps decreasing. The point at which these offset one another is the beginning of region IV. Similarly, professors stop putting forth more teaching effort because the marginal benefit through higher grades and lower grade inflation exactly offsets the marginal cost due to effort disutility.

This is why an increase in required student ratings causes the professor to start giving free points to please the students. Free points while satisfying students through higher grades directly impact grade inflation, as increase in grades occur without any increase in student knowledge.

6. Conclusion

We conclude by identifying our main contributions. Our contributions are both methodological and substantive. Methodologically, we have provided a theoretical framework to investigate the thought provoking arguments and opinions expressed by W&W on the relationship between grade inflation and the use of student evaluations in promotion and tenure decisions. Substantively, we have pointed out some of the subtleties in the relationships between student evaluations and variables such as student and professor effort, student knowledge and grade inflation. We hope future research will build on this framework and lead to more insights into the problem of grade inflation.

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