Common Economic Principles Illustrated in Ordinary Classroom Activities

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For some students, taking a course in economics is a trying experience. It=s not that the concepts are difficult, but they seem unfamiliar. This need not be the case. After all, economics is simply the study of making choices, and students make choices. Students routinely apply economic concepts in their everyday classroom activities. Pointing out the economic concepts that underlie familiar activities can demystify the process of learning economics. Both teachers and students of economics benefit when economic principles are illustrated with examples which are common to them.

It is useful to point out to students that economics relates directly to the things they care most deeply about. One thing students care about is earning good grades. They are well aware that anytime you enroll in a course, you run the *risk* of getting a poor grade. They also appreciate that there are more than one kind of risk involved. There is always the risk of doing poorly because one doesn=t put forth his best effort. One may cut classes and fail to do assignments. In this way, a student may do poorly, even in a class in which it would be easy to earn a good grade. Students will also be aware that this is not the only source of grade risk. They know that even diligent students earn grades they are not pleased with in some courses. Some courses cover inherently demanding material (thus those Ahonk if you passed P-Chem@ bumper-stickers). Also some professors are much stricter or more demanding than others. Thus there are two kinds of grade risk; those related to the behavior of the student, and thus peculiar to each student (idiosyncratic), and those related to the nature of the course and/or professor, and thus common to all students (systemic). Although the terms idiosyncratic and systemic may be unfamiliar to students, the concepts are definitely familiar. They should have no trouble extending the idea to the area of finance, where idiosyncratic risk applies to the performance of an

individual asset (stock or bond) and systemic risk affects the market as a whole.

The way idiosyncratic risk is overcome in markets is through diversification. It is much more prudent to invest in a variety of assets than in a single asset. Students may appreciate a connection here to considering the number of assignments on which one=s grade depends. In law school courses it is not unusual for a student=s grade to depend on only two factors; being prepared when called upon in class and a final exam. Such grading criteria may prove unnerving. Failure to perform well on the exam can be devastating. Students might prefer several exams, with the opportunity to recover from a single poor showing. Interim assignments also generate extremely valuable information regarding grading criteria.

Students, of course, have a much better chance of avoiding systemic grade risk than investors have of avoiding systemic market risk. Students can often simply select another course. In a world with perfect information, they will know which courses to take and which to avoid. Information can be scarce, however, giving students plenty of first-hand experience relating to the economics of information. One way to get some very useful information about potential courses would be to attend every course under consideration during the drop-add period. This might not be possible and, in any case, would be very costly. We see here the concepts of search cost and opportunity cost illustrated. Even if none of the courses under consideration met at the same time, attending very many classes during the first week or so of school can be physically draining, and takes away from other things that one could be doing, such as buying books, doing homework, socializing or relaxing. That is, there are opportunity costs involved B every time a student attends a class, he must forgo whatever he would have chosen to do with that time, given the opportunity. The concept of opportunity cost is even more explicitly apparent when two candidate classes meet at the same time. Each class is the opportunity cost of the other. To attend one you must forgo the other.

Opportunity cost may be illustrated with reference to individual class sessions as well as whole courses. If an individual class were cancelled, due to weather, for instance, what would

students do instead? For most morning classes, it seems that the opportunity cost of attending class is sleeping.

Returning to the issue of course selection, the problem is one of asymmetric information. The professor has better information regarding the nature of the course than a student who is unfamiliar with that professor. The student would like to have the professor reveal his type. Is the professor an easy or hard grader? Is he interesting or boring? The student potentially faces another problem of asymmetric information, in that the professor does not know the student=s type. Is the student hard working or lazy? Problems of asymmetric information can be overcome by signaling and screening. A student may be interested in screening out hard graders, while a professor may be interested in screening out lazy students. A student seeking a course from a relatively easy grader may need to proceed carefully in order to extract useful information regarding the professor without sending an unwanted signal about the student=s own type. Simply asking a professor how hard it is to get a good grade might not be the most advantageous course of action. Talk is cheap, and if the professor is trying to boost enrollment in his course, he may mischaracterize the course as easier than it really is. He may also interpret the question as a signal from the student that the student is lazy. In that case he might wish to screen the student out, and inflate the difficulty of the course in his answer. He may also retain a negative impression of the student, which may later hurt the student to the degree that grading is subjective. Students can also exploit the subjectivity of grading, and asymmetry of information between professor and teacher, to improve their grade. By signaling their type as being industrious and intelligent, students may gain the benefit of the doubt in marginal grading situations. For that reason, it is advantageous to students to attain the highest possible scores on early assignments.

In determining the type of the professor (hard/easy, boring/interesting), the student ideally would search for more reliable signals than the professor=s cheap talk. This is one the merits of actually attending a class before making final course selections. Other, less costly means would be canvassing other students regarding the professor=s reputation. These days, it would not be

unusual for either formal or informal class evaluations to be available on-line.

A very reliable signal that students can relate to is a college degree. Most of what any student will be asked to do, when they finish school and get a job, will be learned on the job, not at college. Why, then, do employers seek out college graduates? Their college diploma is a very reliable signal that the student is intelligent and hard working B that he can stick with a tough task and learn new skills. A diploma from a good school is a signal that lazy or unintelligent individual cannot easily duplicate.

Given the information about courses is valuable to have, but costly to acquire, how much effort should students expend finding out about courses and professors? That is, how much in the way of search costs should a student incur in pursuit of an optimal schedule? If the expected benefit to the student of attending one more candidate class, or going on-line to check out one more class is greater than the cost to that student, he should definitely do so. If the cost is greater than the expected benefit, he should not. That is, just as in every other activity in life, the student should engage in the search process up until the point where marginal cost is equal to marginal benefit. How long should one keep studying for an exam? How long should one keep searching for more references for a paper? For that matter, how much effort should one put into pursuing a relationship with that special someone? Continue only as long as the marginal benefit remains in excess of the marginal cost. Stop when they are equal.

Contemplating the optimal length of time to study (or do anything else) may give students an appreciation of the principle of diminishing marginal productivity. Studying another hour is likely to increase one=s mastery of the material, but as additional hours are applied, students may find the next hour of studying proves less productive than the last. That is, the amount of knowledge acquired increases with increasing study time, but it increases at a decreasing rate.

Given that optimizing individuals equate marginal benefit and marginal cost, an astute student might ask an insightful question. Why do professors grade final exams? The process is costly, and it is

not clear that anyone benefits from the process. Certainly, students are unlikely to acquire any additional knowledge in that course after they have taken the final. Why not just give every student an A on the final? The problem is one of incentives. Students are likely to behave differently if they know their efforts will not be monitored by grading the exam. Failure to grade then introduces a problem of moral hazard. If the exam is not graded, the professor will not know the student=s level of knowledge acquisition (another example of asymmetric information). Since the student is relieved of the cost of not studying, less studying occurs. This is similar to the potential problem of moral hazard if shareholders do not monitor corporate managers. Relieved of the costs of scrutiny, managers may pursue their own self-interests, rather than those of the shareholders. In the corporate world that problem may be overcome by tying the managers= compensation to share price. In the classroom it is overcome by grading the exam. Another problem of asymmetric information is adverse selection, where a selection process results in too many applicants of the wrong type. If word got out that a professor awarded all students *A*s instead of grading exams, a disproportionate number of lazy students are likely to enroll in his course. This is a similar problem to that faced by insurance companies. Those most eager to purchase insurance are those most likely to expect incurring an insurable cost. This is something about which the insured will have better information than the insurer. Insurance companies may avoid this by screening applicants for health and life insurance via a medical exam. Professors overcome the problem by grading the final exams.

The optimal circumstance for the professor here is to have the students believe the exams will be graded, but once they have studied and taken the exam, to change policy and issue grades without actually reviewing the exams. That way the benefit of teaching is achieved without the cost of grading. The professor faces time inconsistent incentives. At the outset of the semester the announced policy should be one of strict grading. Once the students have dutifully studied, the optimal policy is to forgo grading exams. This is similar to time inconsistent policy options for central banks. If a small dose of unanticipated inflation is a useful stimulus to an

economy,[1] then central bankers would like to convince citizens that they will maintain a tight monetary policy, and then loosen that policy when it is not expected. Central banking, like teaching however, is a repeated rather than a single-shot game. The ideal strategy in a single-shot game, where one will not face the same other players again, is often different from repeated games, where the other players are free to cooperate or retaliate based on past experience. Once central bankers inflate, or professors choose to forgo grading, any future announcements to maintain strict policies will not be *credible*. We see here the importance of reputation as a means to overcome problems of asymmetric information.

[1]I am personally unconvinced of the benefits of unanticipated inflation. I am using this example for illustrative purpose only.

The way one solves repeated games is through backward induction. We look at what the best strategy would be in the final round (if one exists), and then work backwards towards the beginning. The final round is essentially a single-shot game since there will presumably be no further interaction amongst players. This can lead to some counter-intuitive results, such as proving the impossibility of giving a surprise quiz. If a professor were to announce that one surprise quiz will be given during the semester, it should be obvious that he cannot wait until the last class to give it B it would not longer be a surprise. But by the same token he cannot wait to give it until the second-to-last class. Since it can=t be given the last class, it would need to need to be given in the second to last class, but that would mean it is no longer a surprise. The process proceeds all the way back to the first class of the semester, demonstrating that surprise quizzes cannot be given. In relation to repeated games of cooperation and defection, backward induction shows us that if the number of rounds of the game is known from the beginning, players should defect at the first opportunity, but if the number of rounds is unknown, cooperation is a more profitable strategy.

Economics is about making choices, and the object of choosing is to select an action now that will provide a desirable future outcome. The future, however, is uncertain. It is important, therefore, to have an appreciation of expected value. The expected value of some future event is a weighted average of possible outcomes, where the weighting is given by the probability of the various outcomes occurring. If we forecast that there is a 50% chance that a firm will earn an 80% return on some project, and a 50% chance that they will realize a 10% loss, the expected return is 35%. The mathematics involved is identical to determining one=s final grade as the weighted average of various assignments (homework counts 20%, final grade 30%, etc.). My favorite means for illustrating expected value is from the old story of the students who missed an exam because they had a flat tire, and asked to take a make-up exam. The professor, suspecting something was amiss, made up an exam, which the students were required to take separately. The exam had one question, AWhich tire?@ If the students were truthful, they will

certainly agree on which tire was flat, but if their flat tire story was fabricated, they are likely to disagree. In that case, what is their expected grade? Since there are four tires, even if they each randomly name a tire they are expected to agree 3 of the time. Therefore their expected grade is 3 (100) + : (0) = 25.

Participating on group projects with other students illustrates problems of public goods and collective action. A public good is one which is non-rival, and non-excludible. Grades are non-rival. Unless the professor is grading on a curve, the fact that one student earns an *A* does not mean there are less *A*s available for the other students. If all group members receive the same grade for their project, the grades are non-exclusive within the group as well, so that the grade is a public good for that group.

The amount of effort any group member contributes is a cost borne by that group member alone. The benefit, however, is shared equally among all group members. There is a mismatch between the marginal benefit and marginal cost for group members. Each student has an incentive to free ride on the efforts of his fellow team members. The problem increases as the group size increases, since each group member=s contribution has a smaller proportional influence on the group=s grade, and it also becomes more costly to monitor each group member=s level of effort. As a result, diseconomies of scale (or decreasing returns to scale) may be observed. That is, an increase in the group=s size results in a less than proportional increase in group productivity. It is also possible for groups to enjoy economies of scale (or increasing returns to scale). Some sorts of tasks may be simply impractical for very small groups to accomplish, so an increase in group size might result in a greater than proportional increase in productivity. In the business world economies of scale are observed when a firm increases to the size that it becomes practical to use such methods as assembly lines. Diseconomies of scale are observed with corporations grow so large that the layers of management impede the flow of information or make it difficult to monitor the activities of employees.

The group project / public goods situation can be modeled as

a form of the prisoner=s dilemma game.[2] Consider a two-person group project where team members like to get high grades, but are willing to accept a lower grade if it means less work. The nature of the project is such that if both work hard, they will get an A. If one works hard, and the other slacks off they will get a B. If both slack off, they will get a C. They may value the following outcomes in this order:

[2]In the classic prisoner=s dilemma game, a prosecuting attorney has enough evidence to convict two conspirators of a minor offense, but needs a confession to convict them of a major offense of which they are guilty. He offers each a deal if they will confess and implicate the other. The payoff structure is such that the expected outcome is for each conspirator to confess even though if both were to remain silent, they would both be better off. Thus the dilemma.

Receive a B, but expend little effort	Utility = 4
Work hard and get an A	Utility = 3
Expend little effort and get a C	Utility = 2
Work hard but only get a B	Utility = 1

The students have two strategies to choose from, work hard or slack. Their payoffs depend on both their efforts and their partners efforts. The resulting game appears as follows, where the first number is Student A=s payoff, and the second is Student B=s.

Two Student Group Project Game		Student B Work	Slack
Student A	Work	3, 3	1, 4
	Slack	4, 1	2, 2

If Student A works, Student B maximizes his payoff by slacking. If Student A slacks, Student B also maximizes his payoff by slacking. Student B therefore slacks, and since this game is symmetrical, so does student A. That is, for both of them, slacking is the dominant strategy. They end up both slacking and getting a C (the Nash equilibrium for this game), when both would be better off if they both worked hard and got an A (a Pareto superior outcome).

When discussing costs of production, students learn that marginal cost curves intersect average cost curves where average cost is at a minimum. The students sometimes do not gain an intuitive appreciation of why that need be the case. Discussing the relationship between marginal and average grades can clarify it. If we regard the most recent homework grade as the marginal grade, students can easily comprehend that if the marginal grade is below one=s average grade, it pulls the average down (average grade is falling). If the marginal grade is above the average grade, it pulls the average up (average grade is then increasing). Only if the marginal grade is equal to the average grade is the average neither rising nor falling. Likewise the relationship between marginal and average cost. When they are equal to each other, the average can be neither rising not falling. More formally, marginal cost equals average cost where the first derivative (slope) of the average cost curve is zero. If costs curves are U-shaped, this occurs at the minimum point of the average cost curve.

Relating the economic principles discussed above to ordinary educational experiences should demystify economics for students. After all, they have long been applying key principles of economics in their everyday lives. A significant portion of learning economics is simply learning a formal structure which encompasses procedures with which the students are already familiar.