Active Learning Strategies for Microeconomic Theory

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Introduction

Students enrolled in Microeconomic Theory courses frequently express their disenchantment with the emphasis on theoretical models viewed as simplistic or inapplicable to real-world scenarios. This disenchantment can rapidly lead to student disengagement, resulting in poor academic outcomes in the course and an inadequate grounding in theoretical concepts necessary for success in advanced courses.

To promote student engagement and increase students' comprehension, I have developed an approach to teaching microeconomic theory that incorporates empirical data into classroom exercises. Unlike a textbook's boxed applications or a numerical example during a lecture, this approach requires students to work collaboratively in analyzing economic data and reporting their findings to the larger class.

Applying economic models to actual data reinforces students' understanding of the underlying concept and illustrates applications of economic theory to "real-world" problems. Requiring students to collaborate in small groups promotes peer learning and provides students experience in group-based problem solving. Since students are required to analyze their findings in written work and in discussions, they gain experience in the craft of empirical work and presenting empirical findings in written form. This experience is valuable to students in advanced courses and senior thesis seminars that require the application of economic models to data.

The paper below outlines the infrastructure requirements for incorporating these exercises in the classroom and the structure of the exercises. Four specific exercises are described in detail, and preliminary observations on student outcomes are reported.

Infrastructure Requirements

Because many of the exercises use in-class analysis of data, a computer classroom or student laptops are necessary.[1] To conduct the analysis, students need access to a statistical package such as Stata.

To facilitate communication between student groups outside of the classroom, an Internet-based message board is helpful. We use the discussion group feature in Blackboard, which allows students to exchange ideas with both group members and their classmates.

[1] If class sizes and/or hardware requirements prevent implementation of in-class analysis of data by student groups, the data analysis could be conducted outside of classroom time.

Time Requirements

Each exercise requires approximately 75 minutes of class time, including description and directions, small-group breakouts, in-class writing exercises and entire class discussion. We find it most effective to confine the in-class component to one class meeting, although the exercises could be split across class meetings.

For students, preparing for the in-class exercises (typically reading the data description and group assignment summary) requires 30 minutes of preparation outside of class. Participation in the online discussion groups requires varies by topic, but averages approximately 20 minutes per week. Each individual must also submit a one-page summary of their findings, which requires 45 minutes to 1 hour of preparation outside class.

Because of the demands on classroom time and student time outside the classroom, I have adjusted student workload by requiring fewer readings (such as relevant articles from the *Journal of Economic Perspectives*) and modifying problem sets. I have also relied on technologies such as Blackboard's discussion groups to shift some discussion of problem set exercises online.

Structure of In-Class Exercises

Group Structure

In completing the in-class exercises, students work in groups containing four or five students. During the first class, students complete a survey that gathers information on: previous economics coursework and proficiency with statistical analysis. I then form groups to ensure an equal distribution of experience and empirical skills across groups. Within each group, one student is appointed as spokesperson, and she or he facilitates the group discussions and reports the group's findings to the entire class.

During the first half of the course, I maintain group composition but rotate the spokesperson every two weeks. Students who exhibit a reluctance to participate in discussions within the small groups are appointed the role of spokesperson early on to force a higher level of participation.

In the second half of the semester, I reconstitute the groups based on my observation of student abilities and group dynamics. Students who have not yet served in the spokesperson role are appointed spokesperson for their group.

During the final four weeks of class, I allow students to form their own groups. Active-learning exercises at this point in the course involve more complicated data analysis and even some data collection, and I have found that voluntary groups have greater cohesiveness.

Incorporation of Exercises into Lectures and Assignments

I will typically introduce each in-class exercise during the prior lecture. This process includes some brief in-class comments describing the nature of the assignment, the posting of relevant data sets and/or readings on the Blackboard site, and an "Exercise Description" sheet that outlines the learning objectives for the exercise.[2] Students are expected to prepare for the exercise outside of class (e.g. transforming variables in data sets), but the questions raised in the exercise are to be addressed in groups during class time.

During the in-class portion of the exercise, students have roughly 30 minutes to implement their empirical analysis or discuss a reading, followed by 20 minutes of analysis and summary of results. The final 25 minutes of class time are devoted to a discussion of the exercise at the level of the entire class rather than the individual groups.

Based on within-group analyses and large-group discussion, I prepare an "Exercise Reaction Assignment" and post on Blackboard.[3] The reaction assignments are posted within 24 hours of lecture and are due at the next class meeting. The purpose of the reaction assignments is for students to reflect upon their own group's findings as well as synthesize the results of the entire-class discussion. Students' reaction papers are not to exceed two pages in length and are evaluated based on rigor of economic analysis and clarity. (Grammar and spelling count.)

Student Accountability

Students face direct and indirect incentives to participate meaningfully in the classroom exercises. Twenty percent of a student's final grade is classroom participation, which is based primarily on a student's contributions to their group as well as participation in the entire-class discussions. During the portion of class time in which groups are implementing their analysis and preparing summaries of their findings, I move from group to group and observe students. In the large-class discussions, I note which students participate, as well as the quality of their arguments. I provide each student three written feedback reports on their class participation during the semester. Finally, I review the discussion board for each exercise on Blackboard, as students are expected to read the board and participate in the online discussion of the exercises.

In addition, fifteen percent of a student's final grade is based on their exercise reaction papers, which I comment on and grade each week.

Indirectly, the learning objectives from the in-class exercises are incorporated into weekly problem sets and exam questions. At least two problem set questions each week are based on the in-class exercises.

[2] Please refer to Appendix A for an example of an Exercise Description sheet.
[3] Please refer to Appendix B for an example of an Exercise Reaction assignment.

Since the composition of the groups is held constant across multiple periods, students self-police their peers regarding inadequate preparation or unacceptable levels of participation at the group level. Allowing this moral suasion to operate informally rather than through formal peer evaluations avoids the tendency of peer evaluations to exhibit the ebay feedback phenomenon of inflated review (A+++ all the way).

Description of In-Class Exercises

The in-class exercises allow us to illustrate the application of microeconomic theory in more detail than is possible in assigned readings and problem set exercises. Using small groups provides opportunities for peer learning while introducing a less intimidating forum for participation and active questioning. The most tangible benefit to using in-class exercises in a microeconomic theory course is the promotion of "doing" economics as opposed to "talking about" economics.

In-class exercises develop students' economic analysis skills in two dimensions. First, working with data illustrates to students how economists measure concepts such as elasticities, unit costs, and marginal revenue products. The use of empirical exercises quickly develops critical analysis skills in students, as they begin to ask: What do the data tell us? Are these results consistent with an author's claims? What theory or theories can explain the empirical findings? Second, students are required to present their analysis – in verbal arguments and in written reaction papers. Students gain practice in framing an economic question and presenting their findings, skills which are too often absent from core economic courses.

Below, I describe four in-class exercises to illustrate the ways in which I use in-class empirical analysis projects and discussions to promote active student learning.

Estimating Demand Functions: Major League Baseball

In this exercise, students are asked to estimate simple demand functions for attendance at Major League Baseball games. The exercise introduces students to the empirical estimation of demand functions (in both levels and logs), and enables them to estimate own-price elasticities.

This exercise also raises a variety of questions that allow us to engage in a broader discussion of firm (team) behavior and pricing strategy. Students are puzzled to find own price elasticities of demand that are frequently positive, and in some cases positive and statistically significant. This finding allows us to explore questions surrounding data quality, empirical specifications, and questions related to pricing under market power and related-goods pricing.

In fact, we explore these questions in a later exercise on pricing with market power, which is described below.

Pricing with Market Power: Major League Baseball Ticket Prices and Attendance

We revisit the estimation of demand functions for Major League Baseball attendance when we study monopoly and market power. In particular, we use this exercise to explore why major league baseball teams are pricing on the inelastic portion of the demand curve.

The student groups are given more detailed data on determinants of attendance and ticket prices to test whether the finding of inelastic or positive own-price elasticities of demand are robust and consistent with team profit-maximizing behavior.

The first data set contains richer information on demand, including: available substitutes (number of pro sports teams in metropolitan market); price of substitutes (movie ticket prices); prices of related goods (concessions prices and parking costs); and ballpark characteristics such as age and seating capacity. Student groups using this data investigate joint-pricing hypothesis for observed own-price elasticities, as well as potential model misspecification arising from omitted variables. Students also explore the use of alternative measures of price, such as the total cost of game attendance (Fan Cost Index).

The second data set contains data on teams in shared markets to explore whether attendance in shared markets is a function of "other" team ticket pricing and on-field success (winning percentage). These student groups are given a short article on the difficulties of the Chicago White Sox in attracting fans at U.S. Cellular Field.[4] The students are then asked to estimate demand functions using pooled data from 1980-2005on the four shared-market teams to see whether the success of the other team in the shared market impact's own attendance. The groups are also given data on the New York Mets and New York Yankees from 1980 to 2005 to test whether the other team's ticket price affects own attendance. This exercise introduces students to concepts of market definition that are relevant for discussions of the exercise of market power.

The remaining student groups explore questions of data quality, specifically the issue of whether the weighted-average ticket price is an accurate reflection of the costs of game attendance. Using individual game data from a major league baseball team's 2004-2005 seasons on the quantity of group discount tickets, discount prices and promotional pricing, these groups explore the informational value of richer price information in estimating demand elasticities.

This exercise illustrates to students the richness of economic behavior. Economic theory predicts that firms possessing market power will choose to price on the elastic portion of the demand curve, but this prediction holds only for the static case of a simple monopolist producing a single good or service. Baseball teams might be pursuing dynamic pricing strategies to increase attendance and frequently have ability to set (or at least influence) concessions and parking costs.

[4] Ahlberg, Erik. "White Sox Are Hot, So Why are Fans in Chicago So Blasé?" *Wall Street Journal*, (June 15, 2005).

More important, the exercise provides an object lesson in the challenges of undertaking careful empirical work. Newspaper articles frequently tout the positive correlation between ticket prices and season attendance as evidence of the irrationality of fans, baseball owners, and/or both. What this "conventional wisdom analysis" fails to consider, however, is that this simple correlation fails to control for a large number of determinants of attendance and that ticket pricing in baseball is more sophisticated than simple weighted-average ticket price calculations capture.

Estimating Marginal Revenue Products: Pitchers in Major League Baseball

Students often struggle with understanding the concept of marginal revenue products, because their own experiences suggest that most work is not analogous to piece-rate schemes.

Data from professional sports is particularly useful in this case, because even in team sports, the productivity of individual players is observed directly and detailed performance data are readily available.

One approach to estimating a player's marginal revenue product involves estimating cross-sectional or longitudinal regressions of player salary on an array of performance measures. While this approach is instructive, a host of constraints and regulations on player salaries (limited free agency, long-term contracts) mitigates the direct linkage between previous performance and pay in a particular period. While life-cycle approaches to marginal revenue product theory and the incorporation of uncertainty partially address these issues, legitimate concerns remain.

An alternative approach to measuring the marginal revenue product of athletes focuses on the direct estimation of a player's impact on marginal revenue. Pitchers in Major League Baseball are ideal for such a study, because their performance is instrumental to a team's success, and the predictability of pitching rotations allows fans (at least on a walk-up basis) to attend particular games.

In this exercise, students are assigned an article to read in preparation for the in-class portion of the exercise.[5] The article advances two claims: the effect of superstar pitchers on attendance is greatly exaggerated; and superstar pitchers mainly redistribute attendance rather than generate net attendance increases. The article, however, suffers from two shortcomings. First, it uses career measures of a player's impact on attendance, which is problematic as there is significant life-cycle variation in the productivity of pitchers. Most pitchers struggle early in their careers and then improve until age reduces pitching velocity and increases the likelihood of debilitating injury. Thus, using lifetime attendance effects for pitchers seems to bias downward a pitcher's impact on attendance (and hence revenue). More important, the article measures the raw difference in attendance of a particular pitcher's home starts *vis-à-vis* the remainder of the team's

[5] Schwarz, Alan. "When the Stars Come Out, Do the Fans Follow?" *New York Times* (Sunday, June 19, 2005), Section 8, p. 5.

home games. Since the team's opponent and day of the week are likely to influence attendance, the analysis of raw attendance differentials by pitcher is not particularly informative.

I provide students two data sets on attendance at Detroit Tigers games for the 1976 season. The first data set contains information on attendance at individual home games as well as: game characteristics (day of week, day/night game, Tigers' winning percentage, opposing team, opposing team winning percentage, whether opponent's starting pitcher is a star); and identifiers for the specific Tigers pitcher starting the game.[6] The second data set contains information on average attendance at the Tigers home series against each American League opponent, including similar game characteristics and an indicator variable denoting the home series in which Mark Fidrych was a starting pitcher.

For this exercise, I assign all groups the same task: 1) Determine whether Fidrych generated a positive and significant effect on game attendance for those games he started; and 2) attempt to measure whether Fidrych increased total attendance or merely diverted it away from home games started by other Tigers pitchers. Each student group designs the empirical tests of these questions and chooses the regression specifications they deem appropriate.

Measures of Market Concentration and Antitrust Concerns: Vertical Integration in Meat Production

Not all of the exercises involve students completing empirical work. This exercise is similar to a case study investigating consolidation and vertical integration in the meat production and meat processing industries, as well as the observed trends in market concentration.

Students are assigned two articles documenting and discussing these trends.[7] At the beginning of the in-class exercise, I supplement the readings with a brief overview of meat production and meat processing. Small-group discussions are assigned particular focus questions such as: potential and actual cost efficiencies in consolidation of livestock production and processing; factors driving the trend toward vertical integration of the meat industry; the calculation of measures of concentration such as the 4-firm concentration ratio and the Herfindahl-Hirschman index; and whether structural measures of concentration are *per se* evidence of market power.

This exercise provides an excellent opportunity to consider the larger debate over the appropriate role of antitrust policy in markets where consolidation generates cost

[6] The 1976 Detroit Tigers are of particular interest due to the popularity of one of their pitchers, rookie Mark "The Bird" Fidrych. Star pitchers are defined as those pitchers who finished in the top 10 in Cy Young voting in their league in the previous year.

[7] The articles assigned are: Barkema, Alan; Drabenstatt, Mark; and Novack, Nancy. "The New U.S. Meat Industry." *Kansas City Federal Reserve Bank Economic Review*, (Second Quarter, 2001), pp. 33-56; and U.S. Senate Committee on Agriculture, Nutrition and Forestry, (October 29, 2004).

advantages (scale economies) but provides the potential for remaining firms to exercise significant market power.

Student Outcomes

Based on three semesters of data covering approximately 90 students, using small student groups to implement in-class empirical and writing exercises has had noticeable effects on student attendance and student learning outcomes.[8] Attendance has improved significantly, particularly among students who entered the course with lower cumulative and within-major GPAs.[9] I believe that peer expectations play as important a role in boosting attendance as the grade incentive provided by the reaction papers, although I cannot separately identify these effects. Student performance on problem sets and exams has increased as well, and the proportion of students receiving final course grades of D and F decreased from 16.67 percent in 2004-2005 to 4.44% from Fall 2005 through Fall 2006.

Student Grade Distributions: 2004-2006		
Letter Grade	**Semester Range**	
	Fall 2004-Spring 2005	Fall 2005-Fall 2006
A through B+	13.46%	16.67%
D and F	21.15%	4.44%

A long-term return from the incorporation of these in-class exercises is a marked improvement in the quality – particularly the level of economic analysis – of the required economic analysis paper, in which students pose a well-defined question and apply an economic model or models in the analysis of this question. Prior to the introduction of the in-class exercises, the majority of students produced mediocre papers in which the analysis rarely extended beyond restating the findings of other economists and authors. Since the exercises stress investigating questions, presenting findings and engaging in focused discussion of the question, students are better equipped to frame research questions and conduct meaningful economic inquiries into these topics. Within the economics major, this early exposure to empirical analysis and the implementation of economic research will likely pay dividends in the advanced-level courses and seminars.

There are, however, disadvantages to the incorporation of in-class exercises in a microeconomic theory course. The obvious cost is the loss of class time previously used for lecture and problem set review. This reallocation of class time requires a revision of lectures – fewer empirical examples and cases are discussed during the lecture. Similarly,

[8] The incorporation of in-class exercises was the only substantive change to the Intermediate Microeconomics course from the 2004-2005 academic year to the present. The same text is used, the same amount of material is covered, and the number of other assignments was held constant.

[9] Our Dean granted permission to collect grade-point average information for students enrolled in the Microeconomic Theory course.

less time is available to work through problems and review problem sets. To compensate for this, we now use a Blackboard discussion group to review some of the problem set exercises. Shifting class time to in-class exercises requires revision of the lecture format, but can be accomplished without significant disruption of student learning outcomes.

In designing the classroom exercises, care must be taken to keep the exercises, particularly the empirical components, tractable and accessible to all students. Most students in the microeconomic theory course will have a rudimentary understanding of ordinary least-squares regression, but many students have only a limited understanding of model specification, indicator variables and interpretation of regression coefficients. Many of the exercises have interesting issues that require a thorough understanding of applied econometrics. Previous experience suggests that student comprehension of the core learning outcomes suffers when the exercises attempt to incorporate more sophisticated econometric issues. Instead, instructors might want to summarize these concerns in a supplementary handout.

One final challenge in successful implementation of the in-class exercises is the issue of engaging the reluctant student. Some students do not participate actively in their groups and group spokespersons do not possess experience in pedagogical methods necessary to foster participation. To date, I cannot report that all students participate extensively in the small-group discussions, but I have been able to engage reluctant students by personally joining in the group deliberations. During a particular in-class exercise, I will sit in on two or three groups and prompt reluctant students for input and ideas.

Conclusion

Designing and implementing effective in-class exercises requires a significant investment of time to build-out data sets and instructions, as well as comment on reaction papers. Further, it requires the willingness to redesign the format of the classroom learning experience. In our experience, there has been a clear, significant positive impact on student engagement and comprehension of the core material in the microeconomic theory course.

Works Cited

Ahlberg, Erik. "White Sox Are Hot, So Why Are Fans in Chicago So Blasé?" *Wall Street Journal*, (June 15, 2005), p.A1.

Barkema, Alan; Drabenstott, Mark; and Novack, Nancy. "The New U.S. Meat Industry." *Kansas City Federal Reserve Bank Economic Review*, (Second Quarter, 2001), pp. 33-56.

"Economic Concentration and Structural Change in the Food and Agricultural Sector." United States Senate Committee on Agriculture, Nutrition and Forestry. (October 29, 2004).

Scwharz, Alan. "When the Stars Come Out, Do the Fans Follow?" *New York Times* (June 19, 2005), Section 8, p. 5.

Appendix A: Exercise Description Sheet
Estimating Demand Elasticities

Learning Objectives: In this exercise, we will use ticket price and attendance data from Major League Baseball to explore different empirical estimations of demand and to estimate own-price elasticities of demand.

You will find the data for this Exercise in the Data Sets folder on the Blackboard course page. The data sets contained in the Exercise Two folder are:

mlb85.dta
mlb91.dta
mlb96.dta
mlb01.dta
mlb05.dta

Each of these data sets contains the following variables:

Attendxx (Team attendance for the XX season, in thousands)

Pricexx (Weighted average ticket price for the XX season, in dollars)

Medhhixx (Median household income for year XX, in thousands of dollars)

Popxx (Population of Metropolitan Statistical Area in year XX, in thousands)

Prevwpxx (Previous season winning percentage, as a decimal proportion of 1000)

Currwpxx (Current season winning percentage, as a decimal proportion of 1000)

Groups 1 and **2** will be using the 1985 and 1996 data sets.
Groups 3 and **4** will be using the 1991 and 2001 data sets.
Groups 5 and **6** will be using the 1996 and 2005 data sets.

In preparing for the in class exercise with your group, I recommend:

1. *Printing out the summary statistics (sample means and std. deviations) for the variables in your data sets.*
2. *Generating natural logs of all the variables.*
3. *Thinking about what specification(s) you will use in estimating demand for MLB games. (You might wish to reference the* Interpreting Empirical Results *handout distributed during the first class meeting.)*

During our in-class discussion, you will be using the assigned data sets to estimate own-price and income elasticities of demand for MLB games, and more generally discussing the empirical specification of demand functions.

Appendix B: Exercise Reaction Assignment #2
Estimating Demand Elasticities

Posted: September 20, 2006
Due: September 26, 2006 at the beginning of class

Comment on the advantages of the log-log specification of demand functions, particularly for estimating elasticities.

In both the groups and the subsequent class discussion, we noted the following results:

1. The estimated own-price elasticity of demand for attendance was frequently of the wrong sign, and in recent seasons was positive and significant.
2. Market size (measured as MSA population) and current season winning percentage were typically positive and significant, although these findings were not robust across all time periods.
3. Median household income was not found to be statistically significant in explaining attendance.

We also considered a variety of explanations for our empirical findings, including:

1. Market power stories
2. Related-goods pricing
3. Model misspecification (including omitted variables problems and measurement error)

To help shed light on some of these issues, I distributed a handout that included scatterplots of ticket prices and attendance and more complete demand specifications for MLB attendance that included substitute goods prices, more complete measures of the cost of game attendance, stadium effects, and team performance measures.

In your reaction paper, comment on the general results we found, as well as the various explanations we considered.

We will revisit some of these issues, particularly superstar effects, substitute goods prices and errors in measuring ticket prices in a later empirical exercise.