Classroom

EXPERNOMICS

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Submissions and/or requests to be placed on our mailing list should be forwarded (by March 1, for our Spring, 1995 issue) to:

Greg Delemeester
Department of Economics
Marietta College
Marietta, OH 45750 (614) 376-4630
Fax: (614) 376-7501

or

John Neral
Department of Economics
Frostburg State University
Frostburg, MD 21532 (301) 689-4265
(301) 689-4386
Fax: (301) 689-4760
BITNET: e2ecner@fre.towson.edu
InterNet: e2ecner@fre.fsu.umd.edu

WHAT IS BEING TAUGHT IN VOLUNTARY CONTRIBUTION EXPERIMENTS?

*Jim Stodder**

The best known classroom economics experiment may be the one on providing a non-excludable public good. If dependent on voluntary contributions, this gives rise to a multi-person prisoners' dilemma. Voluntary contribution issues also arise in other games like Ultimatum or Dictator. I have participated in several demonstrations of such games by people well known in the experimental economics field. I have a complaint to make about the way they and many other economists teach problems of voluntary contribution.

Some of this complaint was already aired by the 1993 *Journal of Economic Perspectives* piece by Frank et al, "Does Studying Economics Inhibit Cooperation?", and in a 1994 working paper on Dictator games by Catherine Eckel of Virginia Polytechnic Institute and Philip Grossman of Wayne State University. Here I wish to focus specifically on issues of experimental pedagogy.

It is my strong impression that most teachers of economics ignore or, more commonly, deride as irrational, any apparently altruistic motive for voluntary contribution. This can be a serious mistake, for at least three reasons.

First, it is widely recognized that there are many long-term self-interested strategies. A strategy of conditional cooperation can be individually rational in a non-anonymous or one-shot game and in repeated games whether they are anonymous or not. Even in an anonymous one-shot game, voluntary contribution may be individually rational if the group has some long-term coherence. An individual may anticipate benefits from membership that are higher if the group's morale is higher, thus justifying a contribution. Such motivation involves expectations which may not be fulfilled but are not irrational on that account.

Conditional cooperation is of course not strictly altruistic; it can be self-interested in the narrow calculating sense. Several economists, however, have modeled non-conditional emotional commitment as individually rational in an evolutionary sense.

A second reason for not denigrating voluntary contribution arises in games with communication, whether or not one's moves can be detected afterwards. Those people who are perceived as able to keep emotional commitments own a valuable resource, one attractive to others in business and family life. People who can be recognized as feeling bound by their commitments may do better on average. I cannot do justice to the argument, but see Robert Frank's *Passions Within Reason* for an accessible yet subtle treatment of research in economics, psychology, and evolutionary biology.

My third reason for not mocking a voluntary contribution is independent of the first two. A person may know everything there is to know about a game's individually rational strategy and still decide not to play it. Such a person may adhere to principles that preclude what he or she sees as implied by self-interest alone.

This sort of ethical commitment should not be denigrated or assumed to imply a lack of understanding. I recall a well-known experimenter sharing with his class the record of a student who had made a full contribution every round in a public good experiment. His sly comment, rewarded by the class's giggles, was "This guy obviously didn't get it." The student's identity was protected by a pseudonym, but the teacher's comment was still insulting. More importantly, his inference was incorrect. It may be difficult for economists to grasp, but there is a difference between being individually irrational and being just plain stupid.

This raises a final point on experimental incentives. It is common practice in classroom experiments to offer small monetary or extra-credit grade incentives. The way such incentives are often applied in voluntary contribution experiments strikes me as ill-considered, both ethically and pedagogically.

Ethical and strategic issues in many games are trivialized by incentives focused on relative rather than on absolute performance. It is common to endow a class with nominal dollars, and then give a payoff in money or extra credit to the students who finish with the most dollars in their notional account. Such incentives destroy any possibility that conditional cooperation can be individually rational, in either a calculating or an evolutionary sense.

I am not against incentives in classroom experiments, but I think their use should be more carefully considered. This relative performance problem, for example, is much worse when the incentive is extra-credit rather than money. Most students understand that if everyone gets the same amount, extra-credit is no credit at all. Hence, any attempt at universal cooperation is irrational -- even if all

cooperators could be guaranteed a higher absolute score! An experiment may be ever-so carefully designed but with incentives tacked-on at the end that put students in a different game altogether.

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* *Economics Department*
Renssalaer Polytechnic Institute
Troy, NY 12180

The editors invite responses to this article, especially from readers who may adhere to some of the practices which have been critiqued above. We will print these responses (or excerpts thereof) in the next issue of Expernomics.

LAB MANUAL AVAILABLE

Readers of the Fall 1992 issue of *Classroom Expernomics* will recall an article on Reed College's laboratory-oriented Introductory Economics course written by Jeff Parker. In the article, Parker outlines four experiments which are integrated into the lab component of the principles course. Parker has also prepared an *Instructor's Laboratory Manual* covering the mechanics of implementing the experiments. The experiments included are 1) the double oral auction, 2) a posted-offer experiment, 3) a product quality experiment, and 4) a voluntary contribution experiment. If you are interested in obtaining a copy of the manual, please contact Professor Donald Wells at the Department of Economics, University of Arizona, Tucson, AZ 85721.

ECONOMIC EFFICIENCY AND THE ROLE OF PRICES: MARKET SESSIONS FOR USE IN THE CLASSROOM

* *Stuart Mestelman*

I. INTRODUCTION

In order to give economics students a better intuition for how an economy or a market works, exercises can be introduced directly into the classroom. The following three classroom games are designed to maintain student interest, promote involvement, and provide a way for the instructor to control the parameters of the game so that the outcomes directly relate to the basic concepts and lessons offered in the text. The concepts illustrated by the sessions are 1) the greater efficiency of resource allocation in a market economy as compared to a command economy, 2) the role of information in the efficient allocation of resources, and 3) that institutions matter.

II. THE MARKET SESSIONS

Three different kinds of markets were presented to 73 students enrolled in a second year microeconomics course at McMaster University. The sessions were held at the beginning of the term. None of the students had participated in sessions such as these before.

The first session characterized the command economy. The class was presented with the list of production costs which appears in column 3 in Table 1. The class was told that there were 36 potential consumers of this commodity and that none of the individuals could consume more than one unit of the good. Each person in the class was told to think of himself as the planner who must decide on the

amount of the good to be produced and how to distribute the output. Furthermore, the planner also has to decide how to finance the cost of producing whatever he decides to produce. The planner is free to present a tax bill to as many of the 36 potential consumers as he or she wishes. The planner, however, may not negotiate payments from consumers in exchange for goods. The final output, distribution of the output, and method of financing was determined by discussing the problem with the class.

The second market was presented at the next class meeting. Each member of the class was presented with a sheet of paper with one of the sets of information which appear in Table 2. When this session began there were 73 students in the classroom. Thirty-six students received information set A; the remaining 37 students received set B. Each of the 37 set B sheets had a cost drawn from column 3 in Table 1. In other words, each student could supply one unit of this product, and the aggregate supply schedule reflected the identical production conditions which faced the planner in the previous class meeting. However, none of the students knew any other student's production information, and none knew that the previous meeting's cost conditions were replicated. Each of the students receiving information set A had a "redemption" value drawn from the schedule appearing in column 2 in Table 1 (the 37th unit was not used in this session). The market operated as follows. When the trading period began, each student tried to find someone who would sell him a unit (if he was buyer) or to whom he could sell a unit (if he was a seller). A contract was made when a buyer and a seller agreed upon a price at which they would exchange a unit of the commodity. When such a contract was formed, the pair would come to the front of the room where I would verify that the contract was valid. The trading period lasted for fifteen minutes.

The third market session was run during the same class period as the second session. After the fifteen minutes of trading ended, all of the information sheets were collected from the traders who did not form contracts. Without providing any results of the second session, a new set of information sheets was distributed among the students (by this time there were 74 students in the classroom). The sheets were identical to those in the second session (with on additional sheet for the 37th buyer). The redemption values included on the buyers' sheets and the unit costs included on the sellers' sheets appear in columns 2 and 4, respectively, in Table 1. Traders who were buyers in the previous session were not necessarily buyers in this session. Session 3 operated as follows. I announced a price at which contracts may be made. I asked each buyer who wished to enter into a contract at that price to raise his hand. I then counted the number of potential purchasers at this price and recorded the number on the chalkboard. Next, I asked each seller who wished to enter into a contract at that price to raise his hand. I counted the number of potential sales at this price and recorded the number on the chalkboard. If the supply of units at the announced price was greater (smaller) than the demand for units at that price, I raised (lowered) the price. This process continued until a price was reached for which the number of units which traders were prepared to supply was just equal to the number of units which traders were prepared to purchase. When this price was realized, each of the buyers and sellers involved filled out their information sheets, indicating the profit they earned from successfully forming a contract.

III. THE RESULTS

The results of the three sessions are summarized in Table 3. After discussing possible output levels and methods of financing their production, the consensus in the class when session 1 was run was to produce one unit for each of the 36 potential consumers to levy a fee on each member of the group (all 36 individuals) equal to the average cost of production, $1.47. The class discussion revealed a strong feeling of equity which required that everyone get a unit of this commodity to consume and that all share the cost equally. None of the planners knew what benefits accrued to the consumers of the commodity.

The outcomes resulting from the students' decisions in session 1 were evaluated by using the redemption values allocated to the 36 consumers in session 2. This implied over-production is session 1. The total value of the 36 units to the 36 consumers is given by the sum of their redemption values less the $1.47 per person paid as taxes to the planner(s). The net benefit of the planners' decisions was $22.75, approximately 69 percent of the maximum potential net benefit. The maximum net benefit is realized if 19 units are produced and distributed to the nineteen individuals with the highest redemption values. The lessons in this session center on the derivation of supply and demand schedules from the individual information, on the problems of obtaining information about individuals' preferences (redemption values) in a command economy (especially if they believe that this information may be used as a basis to impose the taxes needed to cover production costs), and on the allocative inefficiency which can arise in a command economy.

The second session introduced an allocation institution which utilized a market pricing mechanism. After a fifteen minute trading period, 25 contracts were formed at an average contract price of $1.67. No contract price information was formally presented to traders during the trading period. Even though the outcome was not the competitive equilibrium (a price of $1.80 and an output of 19 units), resource allocation was more efficient than that in session 1. In terms of the efficiency measure described above, profits rose to $28.95, 88 percent of the total potential profit. The additional information conveyed through the interaction of agents helps to reduce the number of extra-marginal units traded.

At this point it is possible to point out how even more information can help reduce the inefficiency of this institution. If the mean contract price of $1.67 is announced, and a new round of trading begins (representing a new trading day), in which all traders have the same redemption values and costs as during the previous trading period, even more of the extra-marginal traders will be excluded. If traders know that in the previous period the average price was $1.67, sellers will be reluctant to enter into a contract at a price very much below $1.67, and buyers will be reluctant to purchase units at a price very much above $1.67. This will exclude all of the extra-marginal sellers who sold a unit in session 2 and will exclude all but one of the buyers who purchased a unit in session 2. Replication of the market session is, of course, the best way to demonstrate the power of the price mechanism.

The third session introduced the Walrasian auction market and ended after approximately ten minutes and ten price announcements. The announced prices and the units demanded and offered at each price are presented in Table 3. Nineteen contracts were formed at $1.60 a unit. Although session 2 describes an institution which characterizes many commodity exchanges, the best (and perhaps only) examples of the Walrasian auction market

are the gold and silver bullion price-fixing markets in London. In this market, traders have the incentive to hold back on revealing their true preference to buy or sell. Since excess supply results in a price reduction, buyers may try to drive price down by not indicating they want to buy at a price at which they can earn a profit. Sellers have a similar incentive not to announce that they will sell when it is in fact profitable for them to do so. This actually happened in session 3. An equilibrium was reached the second time the price $1.60 was announced. Three potential buyers (two of whom would have earned no profit) chose not to announce that they were willing to buy a unit; one seller chose not to announce his willingness to sell a unit. Because one unit costing 80 cents to produce was not sold, and one buyer whose redemption value was $1.80 did not buy a unit, the total profit earned by all traders was $36.00. The total potential profit was $37.00; approximately 97 percent of the total potential profit was realized. This market is very efficient at excluding extra-marginal traders.

IV. SUMMARY AND CONCLUSIONS

The three market sessions show a progression from relatively inefficient to relatively efficient allocation institutions. The framework in which the markets are introduced allows the instructor to develop the supply and demand model, and then provide a direct test of its predictions. Variations on these sessions as well as other types of market institutions can be incorporated into the classroom setting (for instance, markets for public goods, posted offer markets or sealed bid auctions which characterize the market for treasury bills).

A more complete version of this paper is available from the author.

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* *Department of Economics*
McMaster University
Hamilton, Ontario
L85 4M4

Table 1. Redemption Values and Production Costs

	Session I, II, III	Session I, II	Session III
Unit Number	Redemption Value of Each Unit	Marginal Cost of Each Unit	Marginal Cost of Each Unit
1	360	40	40
2	350	60	40
3	340	60	40
4	330	60	40
5	320	60	60
6	310	80	60
7	300	80	60
8	290	80	60
9	280	80	80
10	270	100	80
11	260	100	80
12	250	100	80
13	240	100	100
14	230	120	100
15	220	120	100
16	210	120	100
17	200	120	120
18	190	180	120
19	180	180	120
20	170	185	120
21	160	185	180
22	160	190	180
23	155	190	185
24	155	195	185
25	150	195	190
26	150	200	190
27	145	200	195
28	145	205	195
29	140	205	200
30	140	210	200
31	135	210	205
32	135	215	205
33	130	215	210
34	130	220	210
35	125	220	215
36	125	225	215
37	120	225	220

Table 2. Information Sheets

Sheet A: Buyers

You are a buyer. You may purchase one unit of the commodity that is sold in this market. If you purchase a unit, you will receive

_____

cents for this unit from me. You may not pay more than the above redemption value for this unit. Your profit on any contract you may enter into is equal to your redemption value less the contract price to which you agree.

Name:
Contract Price:
Profit:

Sheet B: Sellers

You are a seller. You may sell one unit of the commodity that is purchased in this market. If you sell a unit, the cost to you to acquire the unit from me is

_____

cents. You may not sell a unit for a price below the cost indicated above. Your profit on any contract you may enter into is equal to the contract price to which you agree less the cost of the unit.

Name:
Contract Price:
Profit:

Table 3.
Summary Statistics

Session 1
Optimal Output: 19 Actual Output: 36
Average Cost: $1.47
Surplus Realized: $22.75
Potential Surplus: $32.90
Market Efficiency: 69 percent

Session 2
Optimal Number of Contracts: 19
Actual Number of Contracts: 25
Competitive Equilibrium Price: $1.80
Actual Mean Contract Price: $1.67
Surplus Realized: $28.95
Potential Surplus: $32.90
Market Efficiency: 88 percent

Of the 25 contracts, 14 included traders who would have been excluded at the competitive equilibrium.

Session 3

Number of Buyers	Announced Price	Number of Sellers
6	2.00	19
6	1.90	22
6	1.80	18
9	1.70	17
12	1.60	17
21	1.50	15
20	1.55	18
20	1.58	18
20	1.59	19
19	1.60	19

Potential Demand at $1.60 is 22 and potential supply is 20.

Optimal Number of Contracts: 20
Competitive Equilibrium Price:
$1.60 < P < $1.70

Potential Surplus: $37.00
Actual Surplus: $36.00
Market Efficiency: 97 percent

A SAVINGS/CONSUMPTION GAME FOR INTRODUCTORY MACROECONOMICS

*Jurgen Brauer**

Earlier this year, I took a first step at building a compendium of non-computerized classroom games for college-level economics classes (Brauer, 1994). I discovered that there are a fair number of games/exercises/simulations available to cover almost all fundamental concepts of microeconomics, but there is a dearth of games for the macroeconomics class.

Here, then, is a game/simulation that can be played early on in a course on introductory macroeconomics. (I presume that it can be speeded up and 'juiced up' at the intermediate or MBA-introductory levels.) Most, perhaps all, textbooks and instructors, on the laborious way toward deriving an aggregate demand curve first derive an aggregate expenditure curve. The aggregate expenditure curve is usually built from an examination of the consumption function of private households, before an investment function and then governmental expenditures and net exports are added.

Beginning with a private household's consumption function makes good pedagogical sense since all students can easily relate to that (moreover, if you cover micro before macro, you can tell students something about the "micro foundations of macroeconomics"). Prepare and give to each student the handout which follows, possibly adding more income columns. (If you do not wish to expend class time on the exercise, hand the sheet out five minutes before class ends and collect them at the end of class, process the information, and present the results at the beginning of the next class.) Feel free to add/delete expenditure categories.

Ask students to fill in the form and hand it back to you. Using a prepared spreadsheet template (where all income levels are already filled in), you now merely enter, from each sheet, the saving component from each income column, and have the spreadsheet compute the average consumption expenditure for each income column. Then, have the computer graph the consumption and savings functions against the income range and display the result via an overhead projector attached to your computer. The detailed breakdown into expenditure components (food/household, housing, transportation, and so on), where 'savings' enters as merely one 'expenditure' component, is, of course, a device of diversion to keep students from guessing what the instructor may be after. You may need to explain with much care the "available savings" line. Of course, this is meant to capture the case where dissavings occurs to fund current household operations, not the case where households splurge on durable goods. (To make that point, it is perhaps appropriate to start with a lower income column, say at $500, and then progress to higher incomes.)

Here are some possible extensions of the exercise:

1. Hand out a second set of sheets, but announce that the job paying the respective income is to be terminated in three months time. (The consumption function probably will fall; the savings function will rise.)

2. Hand out another set of sheets and announce other such factors as your text mentions or your inclination suggests to result in consumption function and/or

savings function shifts.

3. To learn how income affects consumption and savings choices for large and very large classes, design the income numbers in the sheet such that you generate low-income, medium-income, and high-income nations or population groups within a nation.

4. For the ambitious instructor, reuse the sheet(s) later in the course but introduce explicit line-items for taxes and transfer payments under the income heading. Then, when discussing fiscal policy, change taxes and transfer payments. Also, of course, you can modify the savings line-item and provide a savings interest rate that can be changed as you discuss monetary policy and its effects. In this fashion, the same base-case may be used to carry through the entire course.

With luck, you should get something close to the textbook consumption and savings functions. Later on, to build an investment function, hand out similar sheets but ask each student to suppose that they are businesspersons who have to make decisions on investment. Again, with proper wording of the instructions (i.e., making implicitly clear that current income is not very informative for present investment decisions), you should get a nearly horizontal investment function or one, at any rate, with a slope smaller than that of the consumption function. Ideally, you should use the same income range and increments so that you can overlay, and then add, the consumption and investment functions on the road to the aggregate expenditure curve.

Properly conducted and appropriately debriefed, the game(s) can fully replace the textbook-based lecture as students themselves discover all the fundamental concepts covered in the typical chapter. What remains for the instructor to do is to fill in the gaps not self-discovered by the students.

Finally, if readers employ the game and/or variations thereof, I would appreciate if you mailed or e-mailed me (and/or this newsletter) a brief synopsis of how things went, what modifications in the suggested numbers you found helpful, and what the overall results were.

Reference

Brauer, Jurgen. "Games Economists Play: Non-Computerized Classroom Games in College Economics." Paper presented at the annual meeting of the Eastern Economics Association, Boston, MA March 1994. Available upon request.

* *School of Business Administration*
Augusta College
Augusta, GA 30904-2200
email: jbrauer@admin.ac.edu

INCOME/EXPENDITURE HANDOUT

Consider only income column 1 (labeled Col 1 -- $1,250). Suppose that $1,250 is your monthly net income, that it has been so for some time, and that you expect that you will continue to receive it for some time. How would you use your money?

When finished with column 1, repeat the exercise for the other columns, always under the assumption that you are receiving the indicated monthly income, have been receiving it for some time, and expect to receive it for some months to come. When finished with all columns, hand the sheet to your instructor.

DISPOSABLE MONTHLY INCOME (i.e., after taxes and transfer payments)	Col 1 $1250	Col 2 $1500	Col 3 $1750	Col 4 $2000	Col 5 $2250
MONTHLY EXPENDITURES					
Food/household (e.g., dishwasher liquid, etc.)	_____	_____	_____	_____	_____
Housing (e.g., rent, mortgage pymts, repairs) _____	_____	_____	_____	_____	
Transportation (e.g., gas, car repairs, bus fares)	_____	_____	_____	_____	_____
Medical (e.g., insurance premium)	_____	_____	_____	_____	_____
Entertainment/recreation (e.g., eating out) _____	_____	_____	_____	_____	
Other Ordinary expenses _____	_____	_____	_____	_____	
Savings/personal investments _____	_____	_____	_____	_____	
	_____	_____	_____	_____	_____
TOTAL EXPENDITURES	$1250	$1500	$1750	$2000	$2250
AVAILABLE SAVINGS	$4500	$5000	$5500	$6000	$6500

NOTE: If you find that you cannot cover your ordinary expenses out of your monthly income, you may deplete some of your savings. For example, you would write -$50 into the savings line when you withdraw from savings and +$50 when you deposit some of your income into savings.

BOOK REVIEW

***EXPERIMENTAL METHODS: A PRIMER FOR ECONOMISTS*, by Daniel Friedman and Shyam Sunder. New York, New York: Cambridge University Press, 1994, 240 pp., $49.95 (hc), $15.95 (pb).**

As the level of interest in and exposure to experimental economics has increased, it is only natural that more and more economists have considered trying their hand at conducting economic experiments of their own. But only a small minority of economics departments have an experienced experimental economist who can serve as a mentor to colleagues who would like to conduct their own experimental research. Fortunately, Friedman and Sunder have written this primer for individuals who would like to become involved in experimental research in economics, but who lack prior experience in conducting economic experiments and, perhaps more importantly, lack a mentor to teach them the craft.

Experimental Methods differs from most other experimental economics books in that it emphasizes experimental methodology rather than substantive results. Novices in any field tend to make mistakes, and in experimental economics these mistakes can result in particularly high costs. The goal of this primer is to "help you lower these costs and increase your scientific returns."

This volume contains advice on a wide range of topics including experimental design, the selection and motivation of subjects, conducting an experiment, the analysis of experimental data, and the reporting of experimental results. In each section, Friedman and Sunder identify common pitfalls which threaten the novice (and sometimes even the experienced experimenter) at each stage of the experimental process. Over one third of this volume consists of appendices, two of which are particularly useful: an extensive (though not exhaustive) reading list, and sample instructions and forms from a number of different experiments.

This primer is particularly valuable when viewed as a comprehensive yet concise statement of the rules of procedure which currently govern research in experimental economics. Experimenters who follow the advice laid down in this primer will be much less likely to have their work criticized by their peers (or dismissed by referees) on procedural or methodological grounds. It is a valuable resource for aspiring experimental economists.

- *John Neral*

DEPARTMENT OF ECONOMICS
FROSTBURG STATE UNIVERSITY
FROSTBURG, MD 21532