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Are economists different? They profess to have a distinctive way of understanding and interpreting the world. But are they different in more fundamental ways? Do they make choices that are measurably different? Some evidence suggests they do. In a well-known study of the provision of public goods, Marwell and Ames (1981) found that free riding was significantly greater among a group of economics graduate students than among other student groups in their experiments. Marwell and Ames offered two conjectures for why economics students might in fact behave differently. First, students who are particularly concerned with economic incentives might self-select into economics. In addition, or alternatively, economics students might adapt their behavior over time to the basic axioms of the theories they study. These conjectures may be called respectively the selection and learning hypotheses.

In this paper we explore whether Marwell and Ames' result is robust—whether economists are indeed different. In particular, we use a simple ultimatum bargaining experiment to test whether economics students behave more in accordance with predictions of the rational/self-interest model of economics. Finding that a behavioral difference does exist, we then conduct tests to discriminate between the selection and learning hypotheses. The discussion of our experiment here is kept deliberately brief, but additional details concerning procedures and results are available from us upon request.

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How Might We Tell If Economists Are Different?

In designing our experiment, we wanted to allow for both selection and learning effects. Hence, using randomized lists provided by the college registrar, we recruited 92 student subjects from four populations at the College of the Holy Cross: (1) freshman noneconomists, who had declared a major other than economics and were not enrolled in an economics course; (2) freshman economists, who had declared economics as their major and were enrolled in the first-semester macroeconomics course; (3) senior noneconomists, who had majored in a subject other than economics and had taken no college courses in economics; and (4) senior economists, who were completing a major in economics.

Potential subjects were invited to participate in an experiment which involved "decision-making processes" and would require approximately 30 minutes of their time. Experimental sessions were scheduled during evenings over a one-and-a-half week period. Uniformity across sessions was maintained by conducting the experiment with a tape recording and printed instructions. Subjects were given $2 for participating and were told that additional monetary payments would be made subsequently depending upon the outcome of the experiment.

The experiment involved a simple ultimatum bargaining game similar to that used originally by Guth, Schmittberger, and Schwarze (1982) and modified by Kahneman, Knetsch, and Thaler (1986). Thaler (1988) presents a succinct introduction to ultimatum games in this journal; additional reviews are provided by Sutton (1987) and Ochs and Roth (1989). The particular game we employed consists of two players, called here Proposer and Responder, whose task is to divide $10 between themselves. Proposer proposes a division of the $10. Any division is permissible as long as the two amounts are in multiples of $0.50 and sum to $10. Responder decides whether the proposed division is acceptable. If Responder accepts the proposed division, the $10 is divided accordingly. If Responder rejects the proposed division, each player receives $0.

The game-theoretic solution is straightforward, at least in comparison to many other experimental games. Assume that both players act in accordance with the rational/self-interest model. Responder prefers any positive offer to $0. Knowing this, Proposer proposes a division with $9.50 to Proposer and $0.50 to Responder. Responder accepts.

The experiment was designed to solicit from subjects their decisions for both the Responder and the Proposer roles. First, from the position of Responder, subjects were required to indicate which divisions, if proposed by Proposer, were acceptable and which were unacceptable. From this information we determined each subject's minimum acceptable amount as Responder. Next, from the position of Proposer, they were required to propose a division of the $10. From this information we determined each subject's proposed amount to

Table 1
Sample Mean Amounts

A. Sample Means for Responder's Minimum Acceptable Amount

	Freshmen	Seniors	Total
Economists	1.38	1.98	1.70
	(1.54)	(1.82)	(1.70)
Noneconomists	2.85	1.98	2.44
	(1.57)	(1.70)	(1.67)
Total	2.21	1.98	2.09
	(1.70)	(1.74)	(1.72)

B. Sample Means for Proposer's Amount Kept

	Freshmen	Seniors	Total
Economists	6.30	6.02	6.15
	(1.41)	(1.36)	(1.37)
Noneconomists	5.65	5.20	5.44
	(1.07)	(0.49)	(0.87)
Total	5.93	5.61	5.77
	(1.25)	(1.10)	(1.18)

Standard deviations are in parentheses.

be kept as Proposer. These two amounts, Responder's minimum acceptable amount and Proposer's amount to be kept, constitute the dependent variables in our statistical analysis. For convenience, we call them amount acceptable and amount kept. At the completion of the experimentation, subjects were randomly paired, roles assigned, and payoffs determined and distributed.

Economists Accept Less and Keep More

In Table 1 we report sample means for our two dependent variables: Responder's amount acceptable and Proposer's amount kept. Note that on average economists accepted a minimum of $1.70 and proposed to keep $6.15. Corresponding figures for noneconomists were $2.44 and $5.44, thus suggesting that economists are different. In the discussion which follows, we use regression analysis to test for significant differences between these and other selected means in Table 1. We first test for differences between economists and noneconomists and then focus on the selection and learning hypotheses.

To determine whether economists are different, we regress each of the dependent variables on a constant and a dummy variable which identifies economists. Regression results for amount acceptable and amount kept are reported in columns 1 and 4 of Table 2. In both cases the null hypothesis of no difference is rejected at better than the 2.5 percent significance level (one-tailed). Pooling freshmen and seniors, economists' behavior on average is closer to that

Table 2
Regression Results for Amount Acceptable and Amount Kept

	Amount Acceptable			*Amount Kept*		
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Constant	2.44	2.85	3.10	5.44	5.65	5.52
	(10.12)	(8.74)	(9.04)	(33.59)	(25.53)	(24.76)
Economist	−0.74	−1.47	−1.39	0.71	0.65	0.55
	(−2.10)	(−2.98)	(−2.87)	(3.01)	(1.92)	(1.66)
Senior		−0.87	−0.61		−0.46	−0.53
		(−1.83)	(−1.26)		(−1.42)	(−1.66)
Senior Economist		1.47	1.39		0.18	0.20
		(2.11)	(2.04)		(0.38)	(0.44)
Correct Solution			−0.74			0.58
			(−2.07)			(2.39)
R-Square	0.05	0.10	0.14	0.09	0.12	0.17
N	92	92	92	92	92	92

Note: *t*-statistics are in parentheses. The economist variable equals one if a subject is an economics major and zero otherwise. The senior variable equals one if a subject is a senior and zero otherwise. The senior economist variable equals one if a subject is a senior economist and zero otherwise. The correct solution variable equals one if a subject can deduce the economic solution for the respective player position (Responder for amount acceptable and Proposer for amount kept) and zero otherwise.

predicted by the economic model: economists accept less and propose to keep more. But why?

Economists Are Born, Not Made

To test the selection and learning hypotheses, we add to our regression model a second dummy variable which identifies seniors and a third which identifies senior economists. The coefficient on the economist dummy variable now measures the difference between freshman economists and freshman noneconomists; hence it reflects any effect of self-selection. The coefficient on the senior dummy variable measures the difference between senior noneconomists and freshman noneconomists; hence, it serves to control for possible maturation effects. Lastly, the coefficient on the senior economist dummy variable measures the difference between senior economists and freshman economists, after allowing for maturation effects; hence it captures any effect of learning economics. Regression results for amount acceptable and amount kept are reported in columns 2 and 5 of Table 2.

Is the behavior of economists somehow associated with their self-selection into the economics major? Our data strongly suggest so. If the selection hypothesis is true, then freshman economists should accept less and propose to keep more than freshman noneconomists, and this is precisely what we find. Based on the estimated coefficient for the economist dummy variable, the null

hypothesis of no selection effect is rejected at better than the 5 percent significance level (one-tailed) for both amount acceptable and amount kept. Freshman economists behave more in accordance with the economic model than do freshman noneconomists.

Does economics training shape behavior in accordance with the rational/self-interest model? Our data suggest not, but they raise something of a puzzle. If the learning hypothesis is true, then any initial difference between economists and noneconomists should widen as economists advance from their freshman to senior year. As seen in Tables 1 and 2, a contrast emerges between the results for our two dependent variables. For amount acceptable, the initial difference, rather than widening, narrows and indeed disappears in the movement from freshmen to seniors. In column 2 of the regression analysis, the estimated coefficient on the senior economist dummy variable is positive and hence of the opposite sign predicted by the learning hypothesis; further, the coefficient is statistically significant. For amount kept, on the other hand, the initial difference widens but only slightly. In column 5 of the regression analysis, the estimated coefficient is positive and hence of the same sign predicted by the learning hypothesis; however, the coefficient is relatively small and statistically insignificant. We can offer no compelling explanation for the contrast. Our conclusion is simply that the data in both tests fail to support the learning hypothesis.

To summarize, we find that economists are different, but they are already different when they begin their study of economics. Our results are mixed as to whether the difference persists, but we find no evidence that it widens with economics training. Of course, this is perilously close to saying economists are different because they are different. Can we say more?

It's More Than Just Logic

Perhaps economists are no different in terms of sentiments. Perhaps they are different only because they are more skilled at the sort of deductive logic required to recognize and determine opportunities for economic gain. In short, perhaps self-interested calculation is a skill at which economists excel. In an attempt to allow for this possibility, at the end of our experiment we asked subjects two questions which tested whether they could deduce the economic solution to the bargaining game:

> Assume Responder makes choices based exclusively on the goal of maximizing his own monetary wealth. Which, among the following, is the smallest amount that he would accept if offered by Proposer? [Multiple choice answers followed.]
>
> Assume Proposer makes choices based exclusively on the goal of maximizing her own monetary wealth. Also, she believes that Responder makes choices based exclusively on the goal of maximizing his own monetary wealth. What division of the $10.00 would Proposer propose?

In the question pertaining to Responder, the sample proportions of correct answers were similar for economists and noneconomists. However, in the more complex question for Proposer, the sample proportions for economists were noticeably higher. Pooling freshmen and seniors, 44 percent of the economists answered correctly, contrasted with 29 percent of the noneconomists. The difference in sample proportions ($z = 1.56$) is statistically significant at the 6 percent level (one-tailed). Hence, we find in our data some evidence that economists are more skilled at the sort of thought process associated with rationality. Does this then account for our earlier regression results?

To address this final question, we add to our regression model a dummy variable which identifies subjects who can deduce the economic solution for the respective player position (Responder for amount acceptable and Proposer for amount kept). Regression results for amount acceptable and amount kept are reported in columns 3 and 6 of Table 2.

It is little surprise that the ability to deduce opportunities for economic gain favors economic choice; in both cases the null hypothesis is rejected at better than the 2.5 percent significance level. More interesting for our purposes is that the estimated coefficients on the economist dummy variables are reduced only slightly and remain statistically significant. Controlling for the ability to deduce the economic solution, we again find that economists in our experiment behave differently. Something more than deductive skill is involved.

Concluding Remarks

Several final points about our experiment should be noted. First, some student subjects might have taken an economics course in high school, thus allowing learning (and selection) prior to the freshman year. Clearly, it might be useful in future experimentation to control for this possibility. While we have no data, our sense is that in the past only a small minority of freshmen have had prior training in economics. Also, we are somewhat reassured by the fact that our senior economists had completed three years of undergraduate study in economics, yet for them we found no clear learning effect. This also lessens our concern that the freshman economists had completed two months of economics principles at the time of the experiment. Further, these two months involved macroeconomics, not microeconomics where the axioms of neoclassical economics are more explicit.

Some readers have also expressed concern that if our subjects were permitted to play the bargaining game, say, four or five times, their choices would converge toward the economic solution due to increased understanding of the game; the gap between economists and noneconomists would thereby narrow. In experiments more complex than ours, Neelin, Sonnenschein, and Spiegel (1988) and Ochs and Roth (1989) find no such convergence in multi-

stage ultimatum games with repeat play. Moreover, as indicated above, when we controlled for subjects' understanding of economic incentives, we still found that economists were different.

Lastly, we note that while economists in our experiment behaved more in accordance with the rational/self-interest model, this does not mean that their behavior was accurately predicted by the model. Economists in our sample on average were willing to accept no less than $1.70, four standard deviations from the predicted $0.50. On average they proposed to keep $6.15, fifteen standard deviations from the predicted $9.50. Forty percent of them proposed an even split of the $10.00. It seems even economists sometimes fall short of the behavior expected of all good homines economici.

Our results, like those of Marwell and Ames, indicate that economists are different. Reactions to our findings have ranged from "yes, just what I thought" to "no, I just don't buy it." We fall somewhere in-between and would like to see more evidence generated. We are happy to provide complete instructions for our experiment. Our hope is that others will try the experiment or one like it at their schools and let us know what they find.

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