POMONA COLLEGE

Maximizing and Satisficing:

Learning Effects are Associated with the Study of Economics

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I. Introduction

Rationality: A rational assumption?

The description of humans as logical, calculated entities has been the norm throughout the history of the social sciences. The tenets of Rational Economic Theory, otherwise referred to as the Standard Socioeconomic Science Model (SSSM; Smith, 2003)[1], hold that humans follow a narrowly defined set of principles which guide "rational" decision-making. These assumptions are used to establish a predictable framework upon which theories and equations can take hold, in order to construct models that are said to describe the actions of human agents. The assumptions of these theories can be summarized in two central tenets; 1) Self-Interest: Economic agents choose options that promote their own levels of utility, and 2) Maximization: Economic agents seek out the best possible option, by calculating the expected values of every potential choice and choosing the option of the highest expected value.

The presumptions of the SSSM and the predictions of its informed models represent the backbone of Economics. They are the basis of economic theory, the building blocks of policies, and the way we formally think about human decision-making and behavior. However, the assumptions of the SSSM have long been criticized for their reductive nature. For many, self-interested rational theories do not provide a sufficient description of human behavior. This dissent comes on two grounds; explanatory power and normative concerns.

[1] Also: The canonical model (Henrich et al., 2001);

Explanatory Power: Do Economists Get It Wrong?

The self-interest rational theories contained within the SSSM exhibit dehumanizing qualities, and effectively describe human rational agents as self-interested supercomputers. Decision-makers are idealized as "cognitive machines"; omniscient figures that possess perfect information and utilize it to be limitlessly calculated and strategic. Furthermore, the SSSM makes no attempt to incorporate "emotional influences in human decision-making" (Sanfey et al., 2003), or to account for fundamental principles of interpersonal fairness (see discussion of *inequality aversion;* page 9)

It is of no surprise then, that though the SSSM does a decent job of predicting behavior in "impersonal" exchanges, it fails miserably in predicting behavior in "personal" exchanges (Smith, 2003). Even when experimental protocols make every attempt to control for social factors via computerized methods and blind transactions, participants frequently stray from the SSSM's predictions and shade towards prosociality (e.g., Zak et al., 2005) . It seems that the SSSM is only somewhat reliable when experiments are stripped of the human interaction component contained in nearly all real-life decisions, and removing this component is still not enough to reveal the idealized "Homo economicus".

It should be noted that explaining all of human decision-making is not an easy undertaking—one could argue that on a fundamental level, assigning a single enveloping theory to human decision-making might be flawed from the outset. Since any fixed, formalized model is destined to have some error in predicting outcomes, we should not expect a unifying theory of human choice to perfectly describe and predict the human decision-making process. This being said, today's rational economic principles, which are pillars that hold up the *social* sciences, are fundamentally absent of the social

concepts that psychologists and other social scientists have long been aware of. In a field whose primary aim is to model human behavior, one may argue that the lack of such integral concepts is unjustifiable.

As Franklin D. Roosevelt once said, "We have already known that heedless self-interest was bad morals: we now know that it is bad economics." Though FDR's words were spoken nearly 100 years ago, rational economic theories still reign supreme in the economic sphere. Backlash against reductive economic principles has been a recurring theme historically, and this movement has especially gained steam in the past couple decades with the expansion of experimental economics. In the 1990's and early 2000's, Nobel Prize-winning researcher Daniel Kahneman (along with his late research partner Amos Tversky) achieved his 2002 distinction by creating new models of individual preference known as Prospect Theory. Empirically derived, and guided by social-psychological findings, these models fit the observed behavior of human agents far better than those guided by standard rationality assumptions.

The work of Kahneman and Tversky paved the way for the emergence of the integrative field of "behavioral economics". In the past couple decades, behavioral economists have achieved brilliant strides in the understanding of human valuation and decision processes, by blurring the perhaps unnecessary academic distinction between psychology and economics. However, the economic undergraduate major is still dominated by traditional, rational self-interest theories of human behavior, and undergraduate exposure to experimental methods is comparatively very low.

Normative Issues: Self-Fulfilling Self-Interest?

Though traditional economists would likely defend the reductive nature of economic models on grounds of parsimony, these models may also have ill effects that extend beyond that of a loose-fitting model. FDR observed that we all know that "self interest [is] bad morals", as cited earlier—so why do we teach it to young economists? It has been argued that the SSSM "requires, justifies, and promotes selfish behavior" (Smith, 2002), as it is largely based on concepts of self-interest and maximizing individual attainment.

There exists academic concern that the teachings of rational theories may be equally *prescriptive* as they are *descriptive* (Ferraro et al., 2005; Frank et al., 1993; Frank et al., 1996; Schwartz, 1997; Miller, 1999). Our reliance on (and subsequent justification of) illusory conclusions about human behavior may be more dangerous than we realize. Economic principles geared towards profit maximization are the norm in America's for-profit industries, which are by no means free of perverse incentives, moral hazards, and the creation of inequality. A controversial, yet intriguing observation is that while the decisions and tactics of a corporation are typically based on theories deemed "rational" by economists, these same strategies most closely resemble that of a psychopath, as identified by a psychologist.[2] Such an "ethic of unfettered capitalism" (Hedges, 33) is

[2] From Chris Hedges's "Empire of Illusion":
"The cult of self dominates [America's] cultural landscape. This cult has within it the classic traits of psychopaths: superficial charm, grandiosity, and self-importance; a need for constant stimulation, a penchant for lying, deception, and manipulation, and the inability to feel remorse or guilt. This is, of course, the ethic promoted by corporations. It is the ethic of unfettered capitalism. It is the misguided belief that personal style and personal advancement, mistaken for individualism, are the same as democratic equality…We have a right, in the cult of self, to get whatever we desire. We can do anything, even belittle and destroy those around us, including our friends, to make

easily maintained when self-serving behaviors can be "rationalized", in the most academic sense of the word, by the very principles by which economists are trained.

Our acceptance of the SSSM may serve as an "insidious ideology", or "a process by which false claims about human nature come to look true as a result of institutional practices that are shaped by those very claims" (Schwartz, in press; see also Schwartz, 1997). The teachings of Game Theory, a formal extension of Rational Economic Theory, show young economists that cooperative strategies are frequently dominated by other, more competitive strategies that maximize individual levels of utility. The implementation of such strategies typically results in utility gains for defectors at the expense of the cooperative players.

As an example, games such as the classic Prisoner's Dilemma (see page 15) illustrate the effectiveness of strategies that destroy social surplus in order to increase levels of personal utility. In this "rational" world, cutthroat competition is the norm, and Nash Equilibria rarely coincide with socially optimal outcomes. Perhaps most importantly, students learn within the same course that their decisions should be made based on beliefs regarding other players' strategies—and if they are not ruthless, the next "rational" agent will be. In a room full of trained utility maximizers, any reward for promoting cooperative, socially optimal strategies is quickly eroded, and self-interested strategies gain steam.

It seems logical then, that familiarization with the dominant strategies of these games may serve to justify acting out of self-interest. By teaching students self-interest

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money, to be happy, and to become famous. Once fame and wealth are achieved, they become their own justification, their own morality" (pg 33).

theories, self-interest becomes understood to be an optimal decision-making strategy. In turn, this promotes the same asocial (and sometimes antisocial) behaviors predicted by rational self-interest theories in the first place. This is the self-fulfilling nature of ideology; our explanations of human behavior give rise to actions that resemble the very same assumptions that produced them.

The purpose of the current investigation is to investigate the effects of student exposure to rational self-interest theories. Previous research has attempted this, with mixed results, and is outlined in the next section. Theories of rationality endorse strategies with two presumptive components: 1) Self-interest: that an economic agent makes decisions in search of personal attainment, as defined by their individual preferences, and 2) Maximization: the individual will weigh each opportunity, choosing the absolute *best* outcome available. Though previous research has looked at impact of studying economics on the first assumption, none have measured its impact on the second assumption, Maximizing.

An empirical investigation of Maximizing behavior at the undergraduate level is presented, in order to assess to what extent college course exposure may shape the decision-making strategies of students. This portion of the investigation seeks evidence for the accusation that rational economic theories may serve as insidious ideology, by swaying students to act in line with the behaviors predicted by the same theories. In this way, students exposed to rational self-interest theories are hypothesized to report higher levels of Maximizing-type behavior.

II. Relevant Research

As discussed in the previous section, one could realistically hypothesize that exposure to rationality-based theories would encourage behavior resembling the theories' predicted outcomes. In 1981, Marwell & Ames reported that economics graduate students were significantly more likely to free ride in a public goods game, in comparison to students of other disciplines. This study was the first to show that economics students make decisions differently, and opened the flood-gates for many researchers to question the effects of studying economics. The resulting research sought to answer the question, "Are economists different, and if so, why?"

The Ultimatum Game

The majority of the research on the effects of economic training is focused on measures of self-interest. The standard for measuring such a quality is a bargaining game called the Ultimatum Game (UG). The game has two players, the "proposer" (otherwise referred to as the allocator) and the "responder" (also referred to as the receiver). The proposer is given $10, and instructed to propose a division of this sum to the responder. In turn, the responder may choose one of two options; they may accept the offer, receiving the payoff proposed by their experimental partner, or reject the offer, in which case each participant walks away empty-handed. To control for social factors, the UG is a one-shot, anonymous game—experimental designs typically set up participants in separate rooms, and the game is only played once. The anonymity of the game eliminates players' concerns for reputation, while the one-shot design removes the potential of responders rejecting an offer in order to motivate larger offers in the future.

The UG represents a classic confrontation between "fairness and reason" (Nowak et al., 2000). According to rational self-interest theories, responders will be willing to accept all offers exceeding $0, and be indifferent to offers of zero. The logic supporting this is that even an offer of $0.01 is better than receiving nothing, which the responder will receive if they elect to reject the offer.

However, psychological studies have shown that there is more to this game than just logical reasoning. In a functional neuroimaging investigation, Sanfey et al. (2003) showed that the UG triggers both *cognitive* and *affective* elements of decision-making. While cognitive elements are conscious, effortful, and occur in frontal brain regions, affective (emotional) elements are largely subconscious and are facilitated in subcortical midbrain regions. The conflicting motivations of these parallel systems are highlighted by activation in the anterior cingulate cortex (ACC), a region associated with the experience of mental conflict. Activation in the ACC was shown to mediate the interaction between cognitive motivations to accept non-zero offers and emotional motivations to punish unequal offers. This groundbreaking research provided tremendous insight into the mechanisms by which the brain handles the decision-making paradigm of the UG.

However, economic theories make no attempt to account for emotional pressures in decision-making, and therefore only represent one aspect of the decision-making process. In the authors' words, the rational self-interest model has "ignored the influence of emotions on people's decision-making behavior, idealizing the decision-maker as a perfectly rational cognitive machine" (Sanfey et al., pp. 1755).

In Sanfey et al., results showed that unfair offers recruited regions implicating an aversive emotional response. These regions had been previously associated with the

experience of emotional anger and even physical disgust (Sanfey et al., pp. 1756). This is likely a physiological manifestation of *inequality aversion*; that is, the tendency to perceive offers that stray far from a 50/50 split as unfair and unpleasant. Research has shown that this phenomenon naturally develops early in childhood, especially between the ages of 3-8, suggesting that "human egalitarianism…[has] deep developmental roots" (Fehr, Bernhard, & Rockenback, 2008). Furthermore, an investigation of the decision making of isolated indigenous tribes (Henrich et al, 2001) provides evidence of the universality of inequality aversion. Though each society exhibited varying norms for fairness, these cultures each shared the ideal that the greater the level of inequality, the less acceptable the offer. Each of these societies showed willingness to "leave money on the table" and reject offers that did not reach their individual standards for fairness.

As another vein of literature has speculated, perhaps members of separate academic camps may too have differing norms for fairness. Research has shown that the self-interested behavior of economists tends to systematically differ from that of non-economists. In a seminal study, Carter & Irons (1991) compared UG behavior of undergraduate economics students to that of non-economist undergraduates. Their finding was that the economists "accepted less, and kept more" in the UG.[3] That is, the UG behavior of economics students was more likely to exhibit self-interest. This finding, at first glance, supports the hypothesis that studying economics pushes individuals towards asocial behavior, as guided by rational self-interest theories.

[3] In this case, "accepted" refers to the lowest-value offer participants would be willing to accept as a responder, and "kept" is the amount the participants retained, or their $10 initial endowment minus the amount offered to their experimental partner. Outcomes: Average 'Economist' accepted/kept = $1.70/$6.15, respectively; average 'Non-economist' accepted/kept = $2.44/$5.44, respectively (Carter & Irons, 1991).

However, as Carter & Irons demonstrate, this may not be the case. While there is potential for a *learning* effect, in which an individual's decision making strategies are altered by their academic environment, there could also exist a *selection* effect, in that students who are inclined to agree with theories of self-interest and outcome maximization gravitate towards a field that endorses these same principles. That is, incoming students exhibiting decision-making behavior consistent with rational economic theories would be more likely to choose to study economics in the first place.

Upon further investigation, Carter & Irons find that the differences in UG behavior between economics majors and non-economists were primarily driven by selection effects, rather than learning effects. Though economics majors as a whole were more "rational" in the UG, this difference existed in their sample of freshman undergraduates, before the students had received their college-level economic training. Furthermore, the gap between the decision-making of economists and non-economists did not widen significantly in samples of older students. Their conclusion was that economists are "born, and not made", implying that certain decision-making traits provide a disposition to entering the economic academic field.

However, this literature is not without contention, and many researchers have weighed in with their own interpretations of the Carter and Irons results (Tullburg, 2002; JEP Correspondence, 1992). Most interestingly, Oxford's Ralph Lattimore observes that if the participants in this sample were actually playing the UG, economists would have been "beaten by non-economists in their own game" (JEP Correspondence, pp. 200).

While Carter and Irons were only interested in soliciting the subject's strategies in the game, they did not infer the likely outcomes. But by using Carter and Irons' reported data, means and standard deviations can be used to infer these outcomes. Using this

approach, Lattimore reports that though economists slightly outperform non-economists as responders (a statistically insignificant finding driven by the economists' willingness to accept less), non-economists significantly outperform the economists as proposers, due to their willingness to offer larger amounts. The amounts that non-economists forfeit by offering larger splits are more than offset by the gains they create by completing more successful transactions and reducing rates of rejection. The ultimate result is that the expected value of the strategies employed by economists in Carter and Irons' sample is exceeded by those of the non-economists. Lattimore proposes that economists under-perform due to their "[misperception of] the behavior of responders: they make the error of thinking that other agents are as indifferent to equity as themselves" (JEP Correspondence, pg 200).

So, not only do economists act more consistent with economic theory than non-economists, their "rational" behavior causes them to fare worse in the game, as they interact with players who have a higher standard for generosity than themselves. Assuming self-interest is only an adaptive strategy if decisions are made in an environment of self-interest (see Todd & Gigrenzenter [2003], discussion of *ecological rationality*). In this way, the dehumanizing fundamentals of rational economic theory provide a disservice to the economics students—they are, in fact, interacting with everyday humans, and not an idealized version of homo economicus. These findings support the sentiment that assumptions of rational self-interest do not adequately represent the actions of human agents, and show the shortcomings resulting from the reliance on these inaccurate assumptions in informing strategies (see the "Explanatory Power" position, page 3).

In a related study, using a separate data set, Kroncke, Jr. and Mixon, Jr. (1993) utilized a multilinear regression framework to assess whether previous exposure to economics in junior high school, high school, or college would be predictive of UG split proposals. In a sample of two principles of macroeconomics courses, none of the economics experience variables were significant. However, the authors observed a marginally significant (7% level) and positive grade-level coefficient, as well as a statistically significant (5% level) positive coefficient for a dummy variable identifying engineering majors. While this does support the hypothesis of a learning effect, in that UG offers change in correspondence with grade level, the direction of this effect is opposite of what would be theoretically expected (it would be expected that learning rational theories would *decrease* generosity, and lead to *smaller* UG offers). This finding could be explained by the observation that older students generally give greater weight to social concerns than younger counterparts (Frank et al, 1993; pp. 160), and Frank et al. observed similar findings in their own investigations (see later in this section, page 16).

Furthermore, Kroncke and Mixon make no attempt to compare econ students to students of other backgrounds, labeling all students in intro-level economics courses as economics students. In fact, these courses are widely popular for economics non-majors. For example, in the sample used for the current investigation, of 40 students surveyed in principles of macroeconomics courses, only 14 of them listed either an Econ-related major or indicated a potential interest in pursuing an Econ-related major. Finally, the courses that are the most intensive in teaching self-interested, utility-maximizing strategies are microeconomics courses, and higher-level economic courses such as game theory. So, the academic exposure of economics students to rational self-interest theories is likely to be poorly represented by the metrics used in the Kroncke and Mixon study.

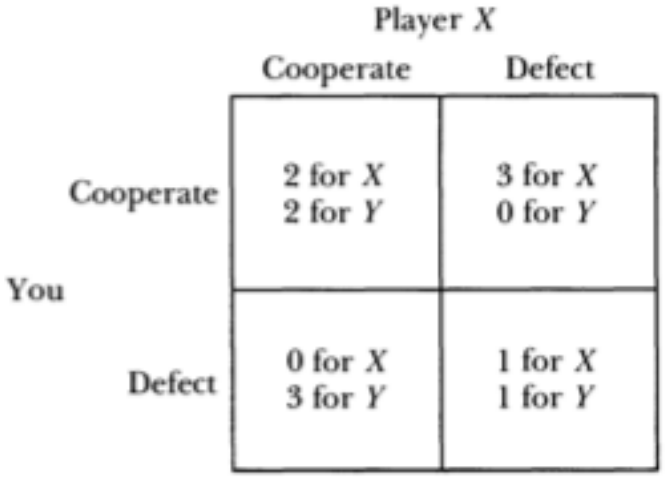
Perhaps the most comprehensive research regarding the unique decision-making qualities of economists comes from work by Frank, Gilovich, and Regan (1993). These authors present a series of investigations indicating that economists behave less cooperatively in multiple realms, namely charitable contributions and economic games measuring fairness.

In their investigation of charitable giving among college professors, the authors find that by some measures, college economics professors exhibited lower levels of generosity compared to colleagues of other academic fields. Besides economics professors (n=75), the other academic groups were characterized by 'other social sciences' (n=106), 'math, computer science, and engineering' (n=48), 'natural sciences' (n=106), 'humanities' (n=94), 'architecture, art, and music' (n=68), and 'professional' (n=87; total N=576). Findings stated that the percentage of economists who donated nothing to charity (the pure "free-ride" solution, as predicted by rational self-interest theories) was 9.3 percent. In the other academic groups, this proportion was significantly lower, ranging from 1.1 percent to 4.2 percent (Frank et al., pp. 162).

Frank et al. also investigated economists' decision making in the widely popular one-shot fairness game known as The Prisoner's Dilemma (PD). The payoff matrix for such a game, as used by Frank et al., is shown below.

Figure 1: Monetary Payoffs for a Prisoner's Dilemma Game

[Source: Frank et al., (1993)]



In the PD, two players, X and Y, are given the choice to either 'cooperate' or 'defect'. This decision is made simultaneously; neither participant makes their decision knowing the action of the other. The dilemma lies in that *it is in either player's best interest to defect*, regardless of the actions of the other player. That is, if you are player Y, whether player X has decided to cooperate or defect, your payoffs are higher for choosing the defect option. So, in order to achieve the socially optimal outcome (Cooperate-Cooperate), each player must forfeit some level of utility by choosing a (personally) suboptimal response.

It is of no surprise then, that rational self-interest theories predict rational players will not elect to cooperate, instead selecting the option that maximizes personal gain. In the case that the rational player is paired with another rational agent, this produces the Nash Equilibrium of Defect-Defect, in which the minimum level of social welfare occurs[4]. If a rational agent is paired with a trustworthy decision-maker who elects to

[4] Note: Social welfare is defined by the sum of all participants' outcomes, and is a measure of the well-being of the entire sample.

cooperate, self-interest theories assume that the rational agent will still choose the Defect option. This act destroys a unit of social welfare, creates inequality within the market, and extracts profits from other participants in order to maximize the defector's individual payoffs.

In Frank et al.'s experiments, the researchers used multiple "versions" of the PD to understand the reasoning behind decision-makers' actions. In the 'unlimited' version of the game, undergraduate participants were told they could make promises to each other in the meeting time before the task. In the other two versions, the 'intermediate' and the 'limited' versions, subjects could interact for either 30 minutes (in the intermediate case) or no more than 10 minutes (in the limited group), but they could not make any promises about behavior strategies in the game.

In all trials combined, economists defected 60.4 percent of the time, while economics nonmajors only defected in 38.8% of trials ($p < 0.005$). Next, a regression was created to control for other potential contributors. The researchers included variables for PD "version" played, sex, and grade level. After controlling for these factors, the probability of defection remained 17% percent higher for economists than non-economists.

The regression also indicated that as levels of communication increased, so did the levels of cooperation. Interestingly, the researchers found that when subjects were allowed to make promises to cooperate (as in the 'limited' and 'intermediate' conditions), the marked difference between economists and non-economists essentially disappeared. The realization that the economists' differences in PD behavior are "largely attributable to the no-promises condition of the experiment" (Frank et al., pp. 166) seems to indicate that the economists expected their experimental partners to choose the defect option with

a higher probability than did non-economists. The authors cite that "the self-interest model…encourages such an expectation" (pp. 167), and note that in other studies, when participants are told that their partner will defect, the vast majority of these participants defect as well.

Upon further investigation, the participants were given a qualitative survey, asking them to state the reasons for their choices. The researchers hypothesized that the economics students would offer self-interested explanations for their behavior, such as descriptions of the game structure, while non-economists would be more likely to describe the emotional and social aspects of the game. This finding was supported; while 31% of the economics students referred to only the structural features of the game in influencing their decision-making, this was true for only 17% of noneconomists ($p < 0.05$).

In comparing their DG observations by grade level, Frank et al. reported that defection rates fall as students mature. That is, higher grade-level students exhibit higher levels of cooperation. However, when looking at economics students, this effect is "virtually absent". For non-economists, defection rates in upperclassmen are 25% less than their underclassmen counterparts. However, economics upperclassmen only exhibited 5% more cooperation than economics underclassmen. This suggests that economics students maintain their initial levels of untrustworthiness, while other students realize the positive effects of prosociality and cooperation. This phenomenon could perhaps be supported by training in self-interest and utility maximization, reinforcing the economics students' self-interested decision-making tendencies.

As a final piece of evidence, the researches administered a survey to the students of an upper-level finance course at Cornell University. The survey asked that that if the

students knew, *with certainty*, that a paired partner in the DG would cooperate, would the students cooperate, or defect? In a sample of Cornell non-economists, the prevalence of a defect response was only 34%. However, of these 31 finance students, more than half (58%) said that they would defect against a cooperating partner ($p<0.05$). This finding indicates that, at least in this small sample of economists, differences in levels of cooperative behavior between economists and non-economists cannot be attributed solely to misinformed notions of human nature—in this sample, the finance students were simply more ruthless in their levels of selfishness.

Identifying Literature Gaps

Though the existing literature on the effects of studying economics contains a wealth of revealing findings, there are still opportunities for research of interest. First of all, as mentioned earlier, though the differential behavior of economists on measures of self-interest has been well-tested and identified, the second tenet of rationality, Maximization, has not. Though measures for Maximization strategies exist (Schwartz et al. [2002]; Diab et al, [2008]), little research has focused on how individuals learn to maximize, and which groups of people are maximizers. Since it has been shown that self-interest shares a special link with economists, this finding may be generalizable to measures of Maximization, the second leg of rationality.

Additionally, many of the decision-making investigations cited above are lacking potentially relevant variables. For example, only Frank et al.'s charitable donation investigation coded data for all academic majors, while nearly all other investigations only formed distinctions between economists and non-economists. Others only included variables for additional majors of special interest, like engineering.

Furthermore, as mentioned in the discussion of Kroncke and Mixon (1993), appearance in a course of an academic major does not necessarily indicate a student is a member of that academic major. That is, there is a distinction between economics students (students appearing in econ courses) and economics majors (students pursuing an economics-related degree), and this distinction is not typically made in the existing literature. Moreover, classifying students' academic interests by only one course does not take into account the rest of their academic schedule, which is equally likely to shape their decision-making.

Many studies also omit gender variables, which could be predictive of decision-making. Furthermore, gender variables can be predictive of academic major. Failing to control for gender variables could overestimate the magnitude of the coefficients of variables exhibiting this colinearity, if gender plays any role in affecting decision-making.

Finally, students don't only learn in school; exposure to relevant extracurricular activities, such as varsity sports, may play a role in determining how individuals face a decision. Alternatively stated, it may be that the qualities that motivate students to participate in varsity sports may also be predictive of certain patterns of decision-making. By coding for these variables in the current data collection, analyses more accurately control for and measure contributors to decision-making style.

Finally, the literature is lacking measurements for the learning effects of economics exposure on a *within-subjects* level. With the exception of Frank et al.'s honesty surveys (see Frank et al. *Figure 3*, pp. 169), conclusions have been drawn by comparing separate students of different grades as if they were the same student at different points in the academic time-course. However, a within-subjects model allows

concrete evidence that the decision-making of a single individual may be altered by exposure to certain course materials. With this in mind, the present investigation will utilize a two-wave data collection, surveying students once during the first weeks of a semester, and again at the end of the semester.

Maximizing vs. Satisficing: Introduction and Relevant Literature

In our modern consumerist world, we have more choice than ever before. As customers, we are offered hundreds of variations of the same products at grocery stores, department stores, and everywhere else throughout the marketplace. In the entertainment sphere, dish and cable networks allow hundreds of TV viewing options, and "OnDemand" style programming even allows the consumer the freedom of watching whatever they like, whenever they like.

On top of this, the internet has completely transformed what is possible for anybody with a computer, providing a seemingly unlimited set of choices in any domain imaginable. Megasites like Amazon.com allow the purchase of nearly any product, all under one cyber-roof, and search engines point consumers to whatever they can *think* to ask for. Even in the dating sphere, online dating sites and social networking have expanded the number of potential mates there are to choose from, completely reshaping how many of us meet, date, and marry.

But how do we deal with all this choice? With it comes responsibility, which can at times be overwhelming. Paradoxically, the explosion in American "autonomy" can actually have *crippling* effects for those of us who have a "tough time deciding" (the "Paradox of Choice"; Barry Schwartz, 2004).

Our radical upward shift in autonomy increases the importance of the tactics we use to guide our decision-making. If larger levels of choice and freedom exist, then the manner in which we identify opportunities and decide between them becomes more critical in determining the quality of our outcomes. How do we handle a set of potential options, and what strategies do we employ to settle on a specific choice? What strategies exist, and do people differ in their approach to decision-making? Is there an optimal strategy?

As discussed in the previous sections, the field of economics would identify the tenets of rational economic theory as guidelines for the "optimal strategy". It seems intuitive that we want the *best outcome we can achieve*. To an economist, this entails choosing the option that secures the highest level of personal utility. That way, when we aggregate all the outcomes of our choices, a bunch of optimal decisions will add up to the maximum amount of decision-making success. The title of such a decision maximizing strategy is "Maximizing", and one who exhibits such a strategy profile is referred to as a "Maximizer". Maximizing strategies are supported by rational economic theories, and the teachings of Game Theory (a formalized expression of Rational Economic Theory) are rooted in the assumption that economic agents seek to maximize their expected values of personal utility.

However, this seemingly sensible approach may not truly be the optimal strategy, according to social psychologists and behavioral economists. RET relies on the ability of a human agent to estimate an expected value, which is comprised of two components: 1) a measure of utility earned by the fruition of a potential outcome, and 2) an estimate of the probability that that outcome will transpire. However, social psychology teaches us that humans can be consistently unsuccessful at guessing the hedonic impact of outcomes

(Wilson & Gilbert, 2003), and also show overconfidence in their ability to assign the likelihood of probabilistic outcomes (Arkes et al., 1981). So, it is documented that human agents will struggle to accurately make the kinds of calculations necessary to adopt a strict, objective maximizing strategy.

Furthermore, maximization may be an inherently flawed strategy when dealing with uncertainty (Schwartz, Ben-Haim & Dacso, 2010), which nearly all difficult decisions contain. If a decision contains any level of radical uncertainty, in which the probability of a given outcome cannot be determined or estimated with any degree of precision, no logical expected value can be calculated. In this case, ranking and choosing by expected utility is impossible.

Rationality-based economic theories also do not typically take into account the psychological costs of decision-making, or the preference for easy choices and less cognitive exertion. RET assumes that all agents have perfect information, both about their own preferences and the preferences of others. As *Strategy*, an undergraduate-level Game Theory textbook, states, "Standard game theory assumes that the players are sophisticated and they can handle whatever difficult calculations needed for payoff maximization" (pg. 47). However, this assumption is completely thwarted by common sense and social psychology alike; the human brain has limited resources, no matter how "sophisticated" the individual may be.

The human brain represents roughly 2% of a human's body mass. However, the brain still manages to use 20% of the body's total metabolic energy. With such a large energy requirement, the brain is very conservative in its energy use, and automatic processes that require less cognitive exertion tend to be favored. In psychology, the process by which we automate our thinking and decrease the use of cognitive resources is

the use of heuristics, or mental shortcuts. Though these shortcuts sometimes lead us to mistakes and incorrect decisions, it doesn't mean we don't use them, and doesn't undermine their effectiveness in easing the burden of decision-making. Heuristics free up mental energy, to be rationed away for the most complex or worthwhile decisions.

Even ignoring the cognitive relief gained by forgoing search costs, research has suggested that the use of common heuristics can actually "enable greater accuracy than [information-intensive strategies], in some cases" (Todd & Gigerenzer, pp. 145). These strategies have been shown to perform equally well and sometimes better than maximizing approaches, as illustrated by probit analyses. This research feeds a literature vein supporting *bounded rationality;* the idea that human decision-making is bounded by both internal and external constraints. Internal constraints arise from the cognitive limitations of the human brain, while external constraints come from the complexity of the informational environment (high search costs, large amounts of choice, etc.). When these two distinct constraints are combined, the authors present their account of human decision-making; *ecological rationality*.

Todd & Gigerenzer (drawing from Simon, 1947; 1955; 1956; 1981; 1990) present ecological rationality as the tendency for the "capacities of the cognitive system to be shaped…to take advantage of the structure of the external environment". That is, the effectiveness of a given decision-making strategy is dependent on the decision-making environment it is used in, and each environment favors certain strategies. Applied to the discussion at hand, this illustrates the error in assuming that Maximization strategies are "optimal" across all domains—surely in some situations, it is not best to weigh each and every outcome in order to make a decision. Specifically, it is predictable that the use of maximizing strategies would be ill-advised when informational search costs or levels of

choice are high, or when the marginal benefit of improving to a better option is low. In the latter case, this could be embodied by low variability of potential-choice values (example; Choose from 5 apples with respective utility values of 100, 100, 100, 100, and 101), or when the importance of the decision is relatively low (example; It's not adaptive for someone to conduct three hours of online research to determine the right brand of vanilla extract to buy at the store; the cost of search far outweighs what they can expect to gain by choosing the best brand). Most of all, though, this illustrates that decision-making must be adaptable, as each decision-making environment will favor a different approach that maximizes the costs and benefits of informational search.

Decision-Making Satisfaction

Maximization strategies have an identifiable goal; to obtain the outcome that maximizes a player's outcome. Players' outcomes are measured by their individual preferences, which are determined by their unique utility valuations and are therefore inherently *subjective*. However, economics and game theory typically assume that in most cases this means maximizing monetary payouts, an *objective* measure.

Strategy states: "…we shall generally assume that players care only about their own monetary gains because, for most settings, this is a reasonable approximation" (Strategy, pg. 45). Such an assumption may make sense in most *business* settings, where profits reign supreme, but it is not necessarily supported in the social psychological literature. While levels of income and measures of personal happiness are positively correlated for income levels up to ~$75,000, the relationship between money and subjective happiness essentially disappears once individual income levels pass this

threshold (Kahneman & Deaton, 2010). Therefore, it seems that monetary gains may not be a "reasonable approximation" for subsequent subjective outcomes, after all[5].

Perhaps the parameter that people would most like to optimize in their decision-making is decision satisfaction. This is essentially the same assumption made by economists, in that decision-makers seek to maximize the subjective value of the choices they make. However, rational theories assume that weighing each potential option via expected value calculation (i.e., Maximization) is the best method for achieving this result. Perhaps a more adaptable strategy would preferable; one that can balance the costs and benefits of decision-making in a way that maximizes an individual's unique subjective demands. Furthermore, in line with ecological rationality, perhaps this strategy could be made adaptable to different informational environments, calling for varying levels of search depending on the choice environment.

* * * *

The present research concentrates on two competing decision-making strategies, Maximizing and "Satisficing". Satisficing entails finding a response that meets a given quality standard, and once that standard is met, search is discontinued. This quality standard can be of any level, and these competing strategies can be thought of as

[5] One may contend that Economics is concerned with quantifying *economic* decision-making, not human decision-making as a whole. If people act in line with self-interest in economic exchanges, then economic theories have done their job. However, as outlined in earlier sections (see section on the Ultimatum Game, page 18) the shortcomings of economic predictions of human behavior are not limited to the realm of personal decision-making. Furthermore, any homeowner will tell you that economic decisions are frequently made with a subjective aim.

comprising a continuum; a Maximizer is essentially a Satisficer whose minimum quality standard for discontinuing search equals the value of the very best option available.

Interestingly, there is evidence that Maximizers attain better *objective* outcomes (higher-quality decisions, higher levels of income and attainment, etc.), while Satisficers enjoy better *subjective* outcomes (happiness, decision satisfaction) (Iyengar et al., 2006). This finding highlights the pitfalls of excessive determination in the decision-making arena. In decision-making, the marginal returns to cognitive investment are decreasing, eventually reaching zero and becoming negative. That is, at some point in search, the benefits of another unit of search (such as choosing a slightly better option) are outweighed by their costs (cognitive exertion, forgone opportunities). Additionally, when decision makers invest large levels of informational search, and receive anything less than the optimal outcome, the decision-maker has "no one to blame but themselves" (Schwartz et al., 2002; Schwartz, 2004). This can be true even when the outcome achieved was of very high quality, and Maxmizing has been linked to heightened levels of self-blame and regret.

This research is geared towards determining which demographics are Maximizers, which are Satisficers, and where people may learn such strategies for decision-making. While the Maximizing/Satisficing literature has produced findings on the impacts of adopting such strategies, no study has attempted to measure where individuals may learn to adopt them. The methodology of this research is based on the hypothesis that the training offered within a college major can be a significant factor in shaping the decision-making of young adults. It is hypothesized that academic exposure to theories that endorse Maximizing-type decision making strategies, such as traditional rational economic theories, will be predictive of Maximizing behavior.

III. Method

Survey Materials

To assess the Maximizing behavior of college students, we utilized a survey designed by Schwartz et al. (2002), titled the Maximizing Scale (MS). The MS contains 17 questions, using 7-point Likert-type responses ranging from 'Completely Disagree' to 'Completely Agree'. Contained within these 17 questions are three subscales, titled High Standards, Alternative Search, and Decision Difficulty. Sample items include "I never settle for second best" (High Standards), "No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities (Alternative Search), and "I often find it difficult to shop for a gift for a friend" (Decision Difficulty). Factor analysis of this survey, as well as reliability coefficients and correlations with other psychometric surveys, are reported in Schwartz, et al. (2002). Overall, the survey is intended to measure "individual differences in the orientation to seek to maximize one's outcomes in choice situations" (Schwartz et al., pp. 1193).

The first wave of surveys was administered to 377 students at the undergraduate (n=345) and graduate (n=33) level. These students were enrolled at the Claremont Colleges, a consortium consisting of five undergraduate colleges (Pomona College, Claremont McKenna College, Harvey Mudd College, Scripps College, and Pitzer College), as well as two graduate schools (Claremont Graduate University, Keck Institute; not represented in survey data). Surveys were passed out via in-person administration in 18 separate courses. 17 of these courses were undergraduate (16 at Pomona College, one at Claremont McKenna College), and one was a Claremont Graduate University course. However, as students at the consortium are allowed to

register for courses at other campuses, some courses contained mixes of students from each campus. IRB approval was obtained from each institution's ethics boards before beginning survey collection.

In Nenkov et al., (2008) the authors conducted a meta-analytic review of the Maximization Scale's structure, which reported means and standard deviations of 15 separate samples of participants completing a 13-item version of the MS, which does not include the regret portion utilized in the 17-item version. The 13-item version differs from the 17-item scale, in that it lacks the 5-question regret construct, and also splits the question "No matter what I do, I have the highest standards for myself and never settle for second best" into two questions. In the current sample, we measured a Maximizing Scale pro-rated item mean of 4.34 (s.d. = .677) in the first wave of collection, and 4.37 in the second wave (s.d. = .678) on the 17-item scale. If the regret scale is dropped from this data, the resulting 12-item scale results in a mean of 4.26 (s.d. = .722) in the first wave and 4.36 (s.d. = .661) in the second wave. These outcomes compare well to those of the three American undergraduate populations reported in Nenkov et al., which returned means and standard deviations of 4.35 (s.d. = 0.85), n= 102; 4.57 (s.d. = 0.61), n=219; and 4.36 (s.d. = 0.78), n=99. These findings support that the collected data are generalizable to previous findings and is a representative student-aged sample.

In addition to the MS, first-wave surveys contained additional questions measuring other potentially-relevant information. This sheet provided variables for sex, campus affiliation, academic major, student interests, and varsity sport participation. The questionnaire also asked students to report their academic schedule. With this information, analyses could account for co-participation in multiple courses, which are just as likely to affect Maximizing behavior as the course in which students completed

their survey. Descriptive statistics for both T1 and T2 data collection are listed in Table 1, and survey materials appear in their entirety in the Appendix.

The second wave of data collection also contained the 13-item MS, but otherwise differed from the first-wave survey materials. This survey included a two-item Ultimatum Game task comparable to Carter and Irons' (1991) approach. This consisted of two questions, essentially asking 1) What amount would you offer as a Proposer in the Ultimatum Game? and 2) What is the smallest offer you would accept, as a UG Responder? The UG questions were included to test for the generalizability of this sample's results to those of previous studies, as well as to allow exploration of the possible connections between self-interested and maximizing behavior.

The resulting dataset contained data for 376 individuals. Of these individuals, 286 completed both T1 and T2 surveys (attrition rate = 23.9%). Upon investigation, it was revealed that the sample exhibited systematic attrition of males; while 68% of participants at T1 were male, only 53% of participants who completed both T1 and T2 surveys were male. Since these samples were not comparable (Two-sample t-test: $t= -2.38$, $p=.012$), the study was restricted to only those participants who completed both waves of surveys. Notably, this resulted in the deletion of data for an entire Claremont Graduate University-affiliated Game Theory course, as this course ended before T2 data was collected and was only surveyed once. This 30-student course was only 22% Female.

Next, variables were coded for individuals' change in the MS generated between the beginning and ending of semester. This was calculated by taking the pro-rated item

mean of the MS (which corrects the average for small amounts of missing data) from T2, and subtracting the same measure from T1. The resulting "ChangeMaxSat" variable is a measure of how the Maximizing decision-making tendencies of students were altered over the course of the semester, and a positive value indicates increases in MS score and increased Maximizing. It is hypothesized that those students exposed to rational self-interest theories over the course of the semester will see a positive "ChangeMaxSat" value.

IV. Results

i. Maximizing Scale (MS) Investigation

Selection Effects: Analysis of Cross-Sectional Data

In Carter and Irons (1991), a cross-sectional data collection was used to infer whether economists made decisions differently than non-economists, and why. These authors utilized a UG framework to understand the how self-interested decision-making of economists differed from those of other academic backgrounds. In this section, we attempt a similar approach, except using measures of Maximizing behavior, as measured by the Maximizing Scale (Nenkov et al., 2008).

First, gender effects were tested for in the T1 and T2 MS samples. T-tests revealed significant differences in men and women on Maximizing measures in each data wave (**T1**: $t=1.992$, $p<.05$; **T2**: $t=2.14$, $p<.05$). Across both samples, men displayed significantly higher Maximizing scores than women.

Next, effects of grade level were assessed. Previous findings indicated that levels of generosity and self-interest waned as students mature (Frank et al., 2003), suggesting a

similar finding may also emerge in a study of maximizing behavior. However, simple regressions of grade level on T1 and T2 MS scores did not produce significant coefficient estimates. However, the inclusion of both grade level and sex in a regression of T2 MS scores provided a marginally-significant coefficient estimate for grade level (β= -0.0596, t = -1.67, p=.096), while the sex variable still maintained significance at the p<.05 level. The direction of the grade level coefficient in this regression is consistent with previous literature; as students mature, they stray from the predictions of strict, self-interested rational theories. However, though an identical regression on T1 MS data also indicated a grade level coefficient of negative direction, this coefficient did not approach statistical significance (p=.479).

Next, potential effects of academic major were investigated. It was hypothesized that economics majors as a whole would exhibit higher MS values. Such a finding would lend support to the presence of a selection effect; that students who naturally have high Maximizing tendencies gravitate toward the field that endorses them; Economics.

However, this hypothesis was not supported. Economics Majors did not exhibit elevated scores on the MS compared to the rest of the sample in either time wave. The T1 and T2 MS data by academic major are presented in Table 1.

Table 1: T1 and T2 Maximizing Scores by Academic Major

	T1 MS			**T2 MS**		
	obs	Mean	s.d.	obs	Mean	s.d.
Economics	55	4.362	0.550	55	4.452	0.640
Mathematics	30	4.295	0.721	30	4.327	0.668
Engineering	6	4.038	0.415	6	4.510	0.476
Humanities	28	4.194	0.838	28	4.134	0.792
Natural Science	28	4.354	0.653	28	4.426	0.633
Social Science	6	4.440	0.666	6	4.196	0.532
Politics	38	4.383	0.679	38	4.410	0.690
Foreign Studies	7	4.429	0.857	7	4.134	0.962
Undecided	88	4.425	0.609	88	4.422	0.660

It was also hypothesized that the MS scores of economics majors would be larger in seniors than in freshmen, in support of a learning effect. A learning effect predicts that students exposed to rational economic theories will adapt their decision making to resemble the behavior predicted by these theories.

However, a learning effect was not identified in this sample, when comparing sample means. However, a more promising method for measuring learning effects is the comparison of changes in *individual* MS values, and this analysis is presented in the following section.

Learning Effects: Time-Series Data

By administering the Maxmimizing Scale (MS) to undergraduate students in the beginning and closing weeks of an academic semester, we were able to define a variable titled "MSChange", denoting the change in individual MS scores occurring over this time period. While high scores on the MS indicate Maximizing-type behavior, low scores indicate Satisficing. Similarly, high scores on MSChange indicate a shift towards Maximizing over the course of a semester, and low scores indicate shifts towards Satisficing.

Changes in Maximizing by Academic Major

The descriptive statistics for MSChange by academic major are listed in Table 2

Table 2: Mean MSChange by Academic Major

Major	Obs	Mean MSChange	Std Dev	Min	Max
Foreign Studies	7	-0.294	0.808	-1.353	0.762
Social Sciences	6	-0.244	0.393	-0.823	0.240
Humanities	28	-0.059	0.544	-0.707	1.174
Undecided	88	-0.004	0.389	-1.239	0.946
Politics	38	0.027	0.497	-0.942	1.415
Mathematics	30	0.033	0.502	-1.061	0.763
Natural Sciences	28	0.072	0.501	-1.058	1.062
Economics	55	0.091	0.458	-0.821	1.174
Engineering	6	0.471	0.474	-0.234	0.999

It was hypothesized that participants receiving exposure to economic coursework would see their MS scores shift towards Maximizing, as they internalize the Maximizing strategies taught in their courses. This hypothesis predicts a positive MSChange score among students who take economic courses. Supporting this hypothesis, economics majors observed an increase in Maximizing (mean MSChange = 0.0934, s.d. =.4979), while non-economists saw a decrease in Maximizing (mean MSChange = -0.0132, s.d. = .4614). A t-test comparing these means revealed a t-statistic of -1.793, indicating a marginally significant p-value of 0.074. This provided the first piece of evidence that economists learn to maximize, perhaps via exposure to economics and rational self-interest theories.

Economics majors were exposed to significantly more economics courses than non-economics majors. While the average econ major had one or two econ courses on

their schedule (mean = 1.57), the average non-economics major took either one or none (mean = .4293; t-statistic comparing econ enrollment by econ/non-econ majors = -12.08, $p<.001$). This may account for the observation that economics majors were more likely to experience increases in Maximizing behavior over the course of the semester. Since economics majors received significantly higher levels of exposure to economics courses, it could be assumed that they also received more exposure to rational economic theories.

Changes in Maximizing by Course

Survey data was collected in 19 separate courses. However, restricting the sample to only students completing both T1 and T2 data resulted in the deletion of data for an entire CGU Game Theory course, which was only surveyed at T1. This resulted in a sample population N=286.

Furthermore, multiple Intro to Sociology (Soc 51), Principles of Macroeconomics (Econ 51), and Microeconomic Theory (Econ 102) courses were surveyed (two courses surveyed, in each case). In each of these pairs, the MS responses of the classes did not statistically differ by separate course offerings of the same classes, so these three pairs of classes were conjoined. This resulted in 15 separate "Course" dummy variables, and the summary statistics for MSChange by course is listed in Table 3.

Table 3: MSChange by Survey Administration Course

	Obs	Mean MSChange	Std.Dev.	Min	Max
Econ 162: Advanced Microeconomic Theory	15	0.299	0.556	-0.471	1.121
Math 101: Intro to Analysis	13	0.186	0.324	-0.647	0.526
Mathematical Game Theory (CMC)	6	0.159	0.566	-0.647	0.825
Soc 51: Intro to Sociology	28	0.141	0.446	-0.823	1.172
Math 60: Linear Algebra	16	0.090	0.332	-0.471	0.826
Econ 102: Microeconomic Theory	59	0.071	0.451	-0.822	1.174
Econ 51: Principles of Macroeconomics	35	0.050	0.547	-1.055	1.415
Econ 101: Macroeconomic Theory	22	-0.014	0.485	-1.353	1.174
Econ 52: Principles of Microeconomics	11	-0.016	0.376	-0.939	0.356
Econ 154: Game Theory	15	-0.058	0.376	-0.706	0.369
Math 32: Calculus II	16	-0.089	0.454	-0.941	0.592
Art 108: Figurative Painting	16	-0.118	0.400	-0.648	0.468
Econ 190: Original Research	11	-0.207	0.534	-1.350	0.414
Art 10: Intro to Painting	15	-0.235	0.479	-1.239	0.887
Math 147: Topology	8	-0.292	0.670	-1.061	0.486

Since students are typically co-enrolled in courses of multiple majors, using only the survey administration course to measure economic exposure would leave important classroom exposure variables unobserved. That is, a student surveyed in Sociology 51 could feasibly be enrolled in three higher-level econ courses, and simply coding the student as a Sociology student would wrongly attribute variation to incorrect variables. Without controlling for the remainder of the student's schedule, the data may be incomplete or misleading. This is especially true in the current sample, as the Claremont Colleges are liberal arts institutions that encourage interdisciplinary studies via breadth of study requirements, which each student must fulfill in order to graduate.

The T1 survey included the question, "What other classes are you taking this semester?" The answers to this question were used to code the true exposure to economics over the course of this semester. Focusing on students' enrollment in

economics courses, the dummy variables "Econ", "EconLL", and "EconHL" were created. "Econ" indicated students enrolled in at least one economics course (these students will be referred to as "econ students"). "EconLL" and "Econ HL" indicated enrollment in at least one lower-level economics course or at least one higher-level economics course, respectively. Economics courses numbered 116 and above were counted as higher-level courses, as defined by the Pomona College course catalog, and all economics courses numbered below 116 were considered lower-level.

The distinction between higher-level and lower-level economics courses was made to capture relevant differences in the content of these courses. Though brief introductions to the study of rationality theories begins as early in the economics curriculum as Econ 52, the in-depth study of such theories usually does not begin until Economics 102. The courses most intensive in the study Rational Economic Theory are typically upper-level economics courses, especially those rooted in microeconomics and strategic decision-making. In support of this observation, of the seven courses experiencing increases in average MS scores over the semester, three of these courses were Microeconomics courses and another was a Game Theory course.

Of the participating courses in which surveys were administered, the courses expected to provide students with the most in-depth study of rational self-interest theories were: Game Theory (Econ 154), Mathematical Game Theory (a Claremont McKenna upper-level mathematics course), Advanced Microeconomics (Econ 162), and Microeconomic Theory (Econ 102). For this reason, it was hypothesized that students receiving upper-level economics training, as identified by the EconHL variable, would see greater increases in Maximizing than econ students enrolled in lower-level econ courses.

Average change in MS score for five separate groups of economics exposure is listed in Table 4. It should be noted that it is possible for students to be both a HL Econ student and a LL Econ student, if they enroll in at least one HL and one LL economics course. In this sample, 23 of 185 economics students (12.4%) fit this criterion.

Table 4. Average MSChange by Type of Economics Exposure (Lower-/Higher-Level)

Variable	Obs	Mean MSChange	Std. Dev.	Min	Max
Econ (All)	185	0.063	0.478	-1.353	1.415
Econ (LL)	152	0.076	0.469	-1.353	1.415
Econ (HL)	56	0.068	0.500	-1.350	1.121
Econ (HL + LL)	23	0.164	0.466	-0.587	1.121
No Econ	101	-0.052	0.465	-1.239	1.172

Statistics reported in Table 4 show that the largest increases in MS score among economics students are associated with students who receive concurrent training in both HL and LL economics courses. This finding was not supported by statistical significance in a t-test. However, the comparison of the average MSChange of economics students (n=185, mean = .063, S.D. = 0.477) to that of students not enrolled in an economics course (n=101, mean = -.052, S.D. = 0.465) revealed a t-statistic of 1.959, very near statistical significance at the 95% CI (p=.051). This finding provides evidence that participation one or more economics courses is predictive of significant increases in Maximizing behavior, in comparison to students' schedules that do not include the study of economics.

Which Econ Students Learn Maximization?

The previous section provides evidence that economics students exhibited a learning effect, in which their decision-making tendencies were nudged towards Maximizing. Next, we investigated factors that may contribute to this effect. The

investigation originally hypothesized that such a learning effect would occur, and that it would be explained by exposure to rational economic theories. The next step of our analysis focuses on economics students, and on identifying factors that may predict whether or not economics students will adopt the teachings of self-interested maximization theories in their personal decision-making.

RET-Intensive Courses

One potential factor driving economists towards maximizing is the specific exposure to rational economic theories. Earlier, we identified four classes that provide in-depth analysis of self-interested maximizing theories; Game Theory, Mathematical Game Theory, Microeconomic Theory, and Advanced Microeconomic Theory. Students appearing in these courses were assigned a value of one for a new dummy variable "RET" (RET stands for "rational economic theory"), while others were assigned a value of zero. A t-test of MSChange by values of RET revealed a t-statistic of -1.756 (p=.08), indicating a marginally significant connection between taking RET-intensive classes and shifts towards Maxmizing.

However, this connection is weaker than the connection between being in *any* economics course and MSChange, as presented above (t=-1.96, p=.051). Furthermore, in a simple regression of RET on MSChange, the resulting RET coefficient was not significant (t=0.86, p=.393), when the regression was restricted to only economics students. This indicated that taking one of these 4 courses did not have a significantly larger impact on Maximizing behavior than participation in economics courses in general, failing to lend support to our hypotheis. With this realization, no more analyses focused on the effects of these four classes, but instead focused on participation in any economics course.

Previous Econ Exposure

Another potential factor is prior exposure to economic theories. Students who have already learned economics should see less of an effect on MS scores, if courses in the past have already taught them to Maximize. In the data set, there were three variables measuring previous economic experience; "HS_Econ", "College_Econ", and "GT_Ever".

The variable "HS_Econ" is a dummy variable assessing whether or not the participant had completed a college-level economics course prior to the current semester. In previous literature, Kroncke and Mixon (1993) included measures of early-academic exposure to economics. In a regression of Ultimatum Game split behavior among 76 undergraduate students enrolled in a Principles of Macroeconomics class, the model included dummy variables indicating economics experience at the high school and junior high school levels. Kroncke and Mixon hypothesized that early exposure to economics would predict more self-interested behavior in the UG. However, neither of these early-exposure variables approached statistical significance in their model.

However, in the current sample, a comparison of MSChange among economics students that either had received (n=105, MSChange mean = .002, s.d. = .459) or had not received economic training in high school (n=79, MSChange mean = .145, s.d. = .495) revealed a t-statistic of 2.025, significant at the 95% CI (p=.04). That is, among students enrolled in economics courses, early exposure to economics in high school moderated the effects of studying economics over the course of a semester. For economics students who had been previously exposed to economics at the high school level, the average effects of taking econ classes on Maximizing were negligible. However, those who had not taken high school economics and enrolled in at least one economics course saw a statistically significant increase in Maxmizing behavior.

To check for robustness, a regression was constructed with MSChange as the dependent variable. Three independent variables were regressed on MSChange: econ (a dummy for economics student), HsEcon (a dummy for high school econ exposure), and Econ*HsEcon (an interaction variable that only takes a value of one if the individual is both enrolled in an econ class and was exposed to econ at the high school level). This regression is reported below:

MSChange = -0.0978 + 0.2432 ECON*** + 0.0983 HsECON - .2415 [ECON*HsECON] **
(.0641) (.0832) (.0940) (.1173)

***-p < .01 **-p<.05
R-Squared = 0.0316

The regression above revealed findings consistent with the previous t-tests, indicating robustness. Participation in an economics course was predictive of an increase of about 0.24 on the Maximizing Scale over the course of a semester, but this effect was essentially negated by the Econ*HsEcon interaction term when (Econ*HsEcon) = 1. That is, of those students enrolled in econ courses in the current semester, the increases in Maximizing behavior associated with participation in these classes is essentially absent for those who had already been exposed to economics at the high school level. Both of these coefficients were statistically significant at the 95% CI, and the Econ coefficient was significant at the 99% CI. While this provides evidence for a learning effect of studying economics, it also seems to indicate that the effects of studying economics are greatest when the participants have received little economic training. Alternatively, students who have access to, and take high school econ may also carry with them unobserved characteristics that protect them from changes in MS scores.

Identical tests for college econ exposure and Game Theory exposure did not reach significance, indicating that the HSEcon variable is unique in its ability to negate the effects of studying economics.

Discussion

This section identifies a learning effect for the study of economics, in which taking economics courses is predictive of positive changes in self-reported Maximizing tendencies. This provides support for the assertion that the study of rational economic theories can be influential in shaping the decision-making of young adults. Interestingly, this effect was moderated by exposure to high school economics; the MS scores of economics students who had received economics training at the high school level were not affected by studying economics. Therefore, the observed effects of studying economics is primarily driven econ students who did not receive economics training at the high school level.

ii. Ultimatum Game Behavioral Simulation

Surveys in the T2 data wave contained an Ultimatum Game design resembling that of Carter and Irons (1991). The tables below summarize the relative frequencies of each UG response, as a Responder and as a Proposer. These values are for the entire sample that participated in the UG game experiment (N=287). Using this data, we hope to replicate the findings of Carter & Irons, providing robustness to the literature. Techniques employed by critiques of Carter and Irons' research are also employed, to present a wide range of outcomes implied by the data.

In the T2 survey, UG_Offer and UG_Accept values were indicated by multiple choice selections, chosen between 13 progressively-increasing 50-cent intervals (see Survey

Materials, Appendix). UG_Offer indicated the amount the participant would offer as a UG Proposer, while UG_Accept indicated the smallest amount that the participant would be willing to accept as a UG Responder. The participant's offer and acceptance value were quantified as the average value of the interval the participant chose on each question; that is, an individual selecting the interval $2-$2.49 resulted in a value of $2.25 for that individual on the relevant question.

This approach was altered in one special case; those who chose the $5-$5.49 option were coded as offering/accepting $5. This decision was made in light of previous findings that a 50/50 split is the most commonly proposed UG offer (Henrich et al., 2001). This trend was also observed in our sample as 84 of the 287 participants chose the $5-$5.49 interval (next leading response n=36) . Furthermore, many participants made it expressly known that they desired to offer $5, by either writing $5 next to the response or circling only the '$5' portion of the '$5-$5.49' option. Upon this discovery, it was assumed that the overwhelming majority of students that indicated this interval were likely attempting to offer a 50/50 split, and that valuing such a selection at $5.25 would systematically overstate the levels of generosity for participants proposing egalitarian splits.

Finally, participants choosing the '>$6' option for either UG question were assigned a value of $6. These entries are perplexing, as such an offer is not typical of any previous sample of UG behavior. These entries indicate students who either misunderstood the game, or are intensely altruistic. On the survey, the question, "How well do you feel you understand this game?" followed the UG responses (variable name "UG_Understand"). We tested to see if students who chose extreme UG offers/acceptance rates reported lower levels of comprehension. Using a t-test of means comparing students choosing the >$6 option for the UG_Accept variable (total n=14, of which only 12 answered UG_Understand,

UGUnderstand mean=5.08, sd=1.38) to students choosing any of the other choices (obs=271, UGUnderstand mean=6.00, sd=1.39), produced a t-statistic of 2.22, significant at the $p<.05$ level. However, an identical t-test focusing on the UG_Offer variable was statistically insignificant (t=-0.10, p=.976), as students choosing the altruistic outcome did not differ from students choosing other UG offers. This provides evidence that students claiming to be willing to accept only UG offers of more than half the total endowment may have chosen this option in error, while this evidence is absent for students reporting similar answers for levels of UG acceptance.

Tables 5 and 6: UG_Accept and UG_Offer Values and Frequencies

UG_Accept	Frequency
0.25	102
0.75	11
1.25	27
1.75	4
2.25	23
2.75	11
3.25	27
3.75	8
4.25	16
4.75	15
5	28
5.75	1
6	14
Total	287

UG_Offer	Frequency
0.25	28
0.75	4
1.25	14
1.75	5
2.25	17
2.75	9
3.25	26
3.75	16
4.25	34
4.75	36
5	84
5.75	4
6	10
Total	287

* * * *

Calculating Expected Outcomes

From the information contained in tables 5 and 6 expected payouts can be calculated for each of the possible responses to the UG task. This involves the

calculation of participant's expected values as both a UG Proposer and a UG Responder, while the sum of these two expected values gives a measure of overall performance in the UG.

The calculation of these values depends on how many players will be willing to complete a successful transaction with the participant, as well as the payoff generated by each successful transaction. At any given value of UG_Offer, some fraction of the survey sample will be willing to accept that offer. Participants whose UG_Accept variable (the lowest amount that they are willing to accept from a DM1) is less than or equal to the value of a UG Proposer's offer will agree to the exchange, and a payoff will transpire. However, if the offer is less than the participant's lowest acceptable value, they will reject the offer and receive a payoff of zero.

Proposers

Therefore, the expected payoff of any UG Proposer's chosen offer is the percentage of participants in the sample willing to accept the offer, multiplied by the value that they "keep" in this offer, which is \$10 – (UG_Offer). So, a UG Proposer who offers \$0.75 will complete successful transactions with those who are willing to accept \$0.75 or less as UG Responders. In this sample, 113 of the 286 participants fit this criterion, resulting in an expected value for this UG Proposer of:

[(\$10 - \$0.75) x 113] / [286] = \$3.65.

Responders

As a responder, expected values are calculated by looking at each offer the player would successfully accept, and multiplying each of these accepted offers by the value of the offer. The value of each individual offer is given by the UG_Offer values of the other sample participants. So, if a participant is willing to accept UG offers only as low as

$4.75, they will only complete offers with UG Proposers that offer $4.75 or more. This participant's total payout, if they were to play the UG with the entire sample, would be calculated by multiplying the value of each acceptable UG offer by the number of participants extending such an offer, and then adding the resulting products together. That is, their total payout would equal:

[$4.75 x 36] + [$5 x 84] + [$5.25 x 4] + [$6 x 10] = $818.50.

Dividing this value by the number of participants in the sample (n=286) results in the expected payoff for the player's UG acceptance level. In this particular case, the participant could expect to gain an average of $2.86/trial playing as a UG Responder against this sample of their undergraduate peers.

Theoretical Predictions

In the Ultimatum Game, the minimum value that UG Responders will accept from their paired partners is taken as a measure of individual standards for fairness. Alternatively, this value can serve as a proxy for inequality aversion, or as a quantitative measure of the strength of an individual's "social preference for rejecting unfair offers" (Fehr & Camerer, 2007). The value that UG Proposers offer to their paired partners reflects a more complicated mental estimate. UG Proposers (if they are attempting to maximize individual payouts) would like to offer the smallest amount that will be still be accepted by their UG partners. By offering too little, the proposer is bound to miss out on potential opportunities, as they will frequently be rejected. However, if they offer too much, they may be overshooting their partner's willingness to pay. Therefore, the value that Proposers offer is likely to draw on their own opinions of fairness, as well as their estimates of the other player's concepts of fairness.

Rational economic theories predict that responders will be willing to accept any nonzero offer, and that "rational" proposers will offer as little as possible to their experimental partners. However, research cited earlier (JEP Correspondence, Ray Lattimore) illustrates that this is unlikely to be the "optimal strategy", in practice. In line with ecological rationality (Todd & Gizerenzer, 2003), the optimal decision-making strategy will be determined by the decision-making environment. That is, the UG decisions of the other players, and the extent to which an individual's strategies adaptively "fit" the decisions of others, will determine the individual's UG success.

Outcomes: UG Proposers

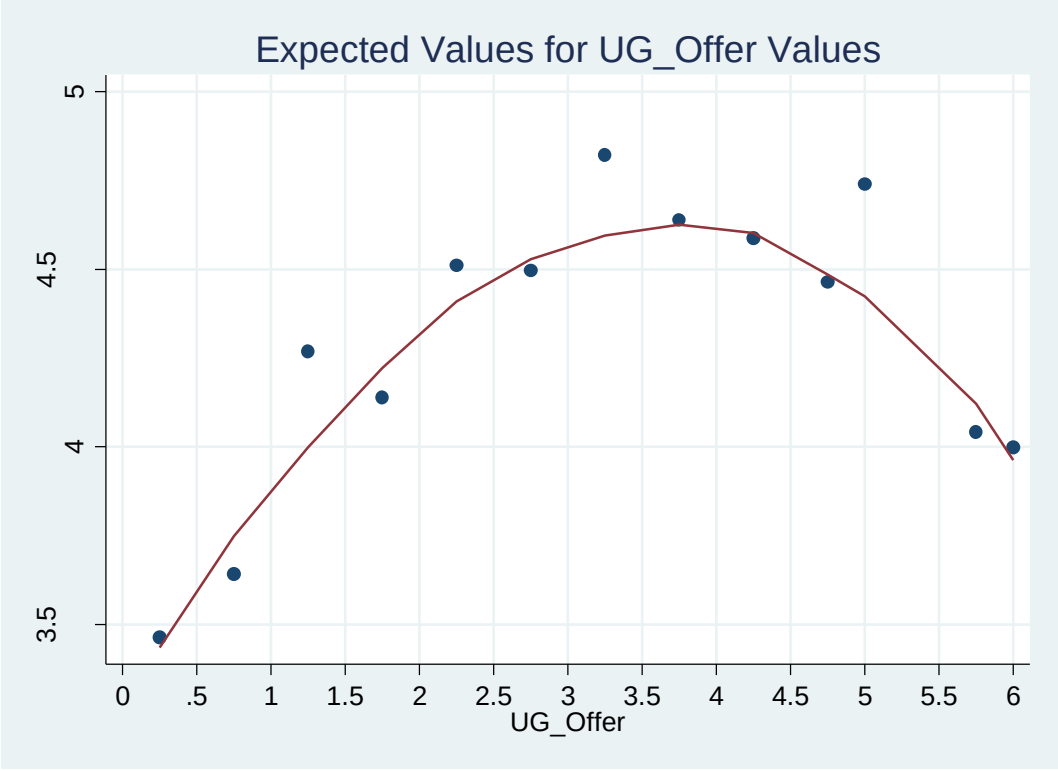
Calculating the payoffs that would hypothetically transpire if each player were to play everyone else in the sample, we compare the successes of each player and see which groups of players fared best in the game. The table below identifies UG outcomes, as determined by the distribution of offers within the sample.

In the current empirical sample, expected payoffs to UG Proposers were maximized at an offer of $3.25. At this offer, a total of 205 offers (of 287, 71%) were accepted, each generating $10 - $3.25 = $6.75. The expected payoff for such an offer, pitted against a randomly chosen participant from the sample, is $4.82. The expected values for each UG_Offer value are listed in the table below, and are represented graphically in Figure 2.

Table 7. Calculation of Expected Payoffs for Individual UG Offers.

	A	B	C	D
UG_Offer	# Participants with Identical UG_Accept	# Participants for which UG_Accept ≤ Offer	Acceptance Rate = (Column B / Sample Size)	Expected Payoff = (Column C x Offer)
0.25	102	102	0.36	3.47
0.75	11	113	0.39	3.65
1.25	27	140	0.49	4.27
1.75	4	144	0.50	4.14
2.25	23	167	0.58	4.51
2.75	11	178	0.62	4.50
3.25	27	205	0.71	4.82
3.75	8	213	0.74	4.64
4.25	16	229	0.80	4.59
4.75	15	244	0.85	4.46
5	28	272	0.95	4.74
5.75	1	273	0.95	4.04
6	14	287	1.00	4.00

Figure 2. Scatter Plot of Expected Values for Various UG Offers



Outcomes: UG Responders

Players' ability to accept offers as DM2s in the UG is just as essential to maximizing UG outcomes as making fair and reciprocated offers as DM1s. Feelings of pride or anger against an experimental partner may provide an incentive for punishing immoral or unjust behavior (Sanfey et al., 2003), but turning down nonzero offers is not a good strategy if monetary outcomes is the objective. To measure the earnings of players in the role of the UG Responder, an expected value based on individuals' lowest acceptable monetary split was also measured.

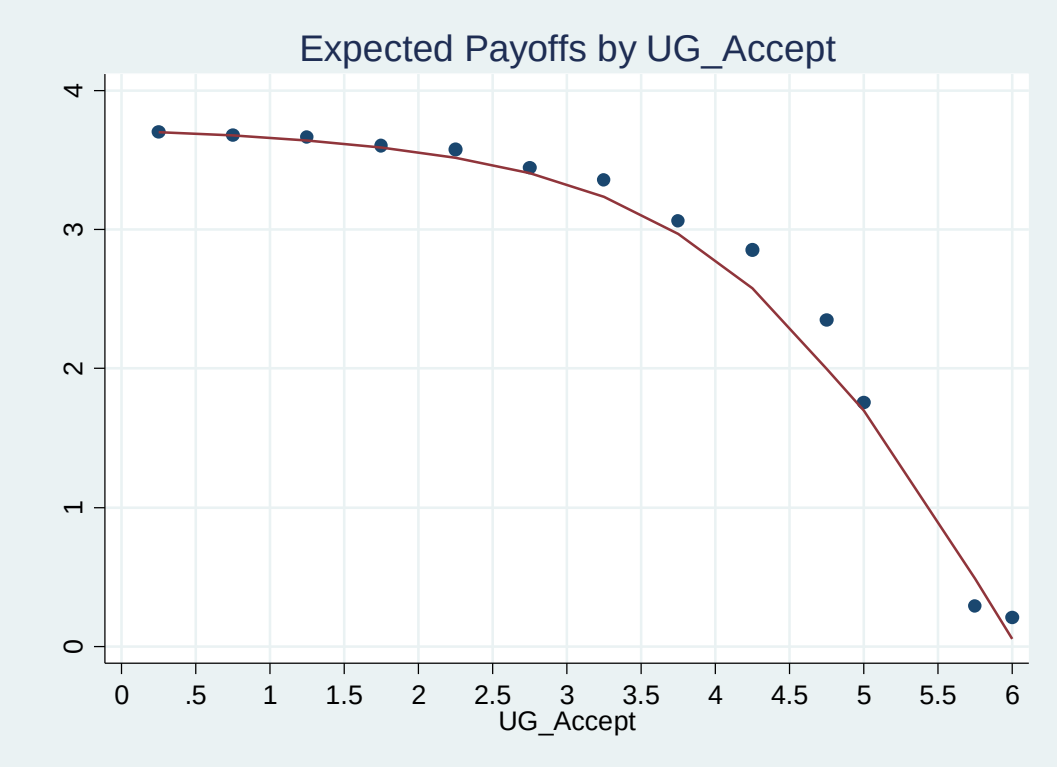
In this case, the optimal strategy is obvious; if one is willing to accept the lowest non-zero offer that can be given, they will maximize their opportunity to make money in the UG. Since this is one-shot anonymous game, there is no potential for bargaining, or for the formation of reputation effects. Since rejecting offers always result in a loss of potential income, profits are maximized by authorizing as many transactions as possible.

The table below outlines what a UG Responder in this sample could expect to earn playing the UG against the current sample, given their reported value for lowest acceptable UG offer. These data are summarized in the following scatter plot, which shows that as standards for fairness go up, increased rates of offer rejection renders expected payoffs smaller in size.

Table 8. Calculation of Expected Payoffs for Individual UG Acceptance Levels.

UG_Accept	# Participants with Identical UG_Offer	Total Earnings (as Responder)	Expected Payoff
0.25	28	1062.25	3.70
0.75	4	1055.25	3.68
1.25	14	1052.25	3.67
1.75	5	1034.75	3.61
2.25	17	1026.00	3.57
2.75	9	987.75	3.44
3.25	26	963.00	3.36
3.75	16	878.50	3.06
4.25	34	818.50	2.85
4.75	36	674.00	2.35
5	84	503.00	1.75
5.75	4	83.00	0.29
6	10	60.00	0.21

Figure 3. Scatter Plot of Expected Values for Various UG Offers



Comparing Majors

Descriptive statistics for UG Offers and Acceptance Levels were calculated, and are presented in Table 9.

As seen in Carter and Irons (1991), economists kept more and accepted less than non-economists in the UG (Average Econ Major accepted/kept = $1.93/$6.85, respectively; average Non-Economics Major accepted/kept = $2.41/$6.08, respectively). T-tests comparing the amount kept by economics majors to that kept by non-economists was significant at $p<.05$ ($t=2.16$), while an identical t-test of amount accepted by economic major in the UG approached significance ($t=1.93$, $p=.055$). These findings replicate Carter and Irons' 1991 findings, and indicate that economists do exhibit behavior consistent with the assumptions of rational self-interest theories, compared to their non-economist peers.

Next, UG expected values for each individual were generated in the original data set, and used to see which groups of players fared the best in the UG. The values from this analysis are presented in Table 10, and indicate that economists, who should be the most familiar with this experimental set up, do not outperform all other academic majors. This finding replicates Ralph Latimore's observation that economists are frequently "beat at their own game" (JEP Correspondence). However, the economists in this sample actually do slightly better than non-economists by measure of total expected UG payoff (Economists mean = $7.68, Non-Economists mean = $7.56; comparison of means not statistically significant).

Upon further analysis, while economists tie for the 3rd best among majors in expected success as UG Responders, they perform 7th best (2nd to last) in expected

success as UG Proposers. This seems to suggest that economists especially falter in their role as UG Proposers, which is a role that depends on the correct estimation of the actions of their experimental partners. Lattimore's assertion that economists falter due to their assumption that "other agents are as indifferent to equity as themselves" (JEP Correspondence, pg. 200) is supported, in that the UG offers of economists were significantly lower than those given by non-economists ($t = 2.16$, $p < .05$), leading to a poor showing in this aspect of the game. However, the economists' expected payoffs as UG Proposers, though poor, was not significantly distinct from those of non-economists.

Table 9. UG Offers and Acceptance Levels By Academic Major.

	n	Mean UG Offer	SD	Mean UG Accept	SD
ForeignStudMaj	7	3.11	2.212	2.75	2.432
EconMaj	95	3.46	1.804	1.93	1.847
HumanitiesMaj	32	3.77	1.790	2.16	2.164
Politics Maj	41	3.87	1.506	2.40	2.112
SocialSciMaj	10	4.13	1.350	1.70	1.802
MathMaj	37	4.20	1.412	2.32	1.796
EngineerMaj	6	4.25	1.378	1.83	1.357
NaturalScienceMaj	29	4.27	1.248	2.78	1.869

Table 10. Expected UG Payoffs By Academic Major.

	Expected Payoff as Proposer ($)	sd1	Expected Payoff as Responder ($)	sd2	Total Expected Payoff ($)	sd3
ForeignStudMaj	4.29	0.570	2.90	0.920	7.19	0.780
Politics Maj	4.54	0.302	2.98	1.057	7.51	0.989
NaturalScienceMaj	4.55	0.221	3.05	0.848	7.60	0.977
HumanitiesMaj	4.50	0.438	3.17	1.024	7.67	1.301
EconMaj	4.42	0.437	3.26	0.888	7.68	0.984
MathMaj	4.58	0.306	3.26	0.626	7.84	0.618
SocialSciMaj	4.57	0.261	3.46	0.350	8.03	0.374
EngineerMaj	4.62	0.138	3.55	0.156	8.17	0.263

Finally, a variable titled "Buffer" was created, modeled after the methodology of Jan Tullberg (1999). "Buffer" is defined as the sum of the amount kept as a Proposer and the amount demanded as a Responder. The resulting variable is an integrated measure of selfishness in the UG; the highest scores indicate low levels of generosity and high levels of self-entitlement. On the other end of the spectrum, low scores categorize participants as altruists; Tullberg labels those who have a buffer of less than 5 in this selfless category. It should be noted that this is not a measure of *self-interest*, but rather of *selfishness*. While self-interest seeks to maximize individual utility values *given a decision-making environment*, strict selfishness blindly seeks only the outcome that would provide the very highest payout possible *in any decision-making environment.*

Using exploratory analysis, variables that could be theoretically linked to levels of selfishness were tested for a sginificant effect on the variable. Frank et al., (1993) presented findings that measures of generosity increased as students matured. However, a simple regression of grade level on the Buffer variable did not provide a statistically significant coefficient estimate (t=1.17, p=.24). A t-test comparing men and women's Buffer scores also did not reach significance (t=1.17, p=.24).

Interestingly, a simple regression

A regression of all academic major dummy variables on "Buffer" reveals the selfish UG behavior exhibited by economic majors. The results of this regression are presented below (std. errors listed in parentheses). In this regression, EconMaj is the only statistically significant academic predictor of selfishness, as measured by Tullberg's "buffer" construct.

Buffer = 3.935 + 0.8754 ECONMAJ****** - 0.6103 MATHMAJ - .4556 ENGINEERMAJ
(.2725) *(.3764)* *(.5126)* *(1.1903)*

…+ 0.1373 HUMANITIESMAJ – 0.9278 NATURSCIMAJ – 0.6275 POLITMAJ
(.5511) *(.5830)* *(.5028)*

…+ .01207 FOREIGNSTUDMAJ
(1.1087)

**- Denotes statistical significance at the 95% CI

Finally, one other variable was identified as exhibiting a significant relationship with the "Buffer" variable. A t-test of Buffer score by varsity sport participation revealed a t-statistic of -2.962 ($p<.01$). Those participating in varsity sports had an average buffer score of 4.88 (sd = .346), while non-athletes averaged only 3.69 (sd = .193). However, further analyses revealed that econmajors shared a significant positive relationship, as indicated by a simple regression of Varssport on EconMaj. However, the coefficient of this relationship was fairly small in magnitude ($\beta=.17$), and when EconMaj and Varssport were entered in a regression on the Buffer measure, each variable retained significance at the $p<.05$ level. This suggests that economics majors and varsity sports players may exhibit similar decision-making strategies.

V. Discussion

This investigation was broken into two separate investigations. The first focused on the Maximizing Scale, and hypothesized that exposure to economic courses would systematically raise the Maximizing scores of students. In this sample, we observed a learning effect, in that students who enrolled in economic courses reported subsequent increases in Maximizing behavior. This finding is the first to show where individuals may learn Maximizing behavior.

The hypothesis that higher level econ courses, or courses offering intensive training in self-interest maximizing theories, would provide larger increases in MS

scores, was unsupported. Interestingly, the positive effect of economics exposure on MS scores was rendered negligible in cases where the student had already been exposed to economics in high school. The mechanisms producing such a finding can only be speculated to in this paper, and this topic would be an interesting topic of research for future studies.

Surely, there are many factors that shape the Maximizing/Satisficing behavior of individuals. However, this research shows that exposure to economics courses tends to raise the Maximizing tendencies of individuals.

The second investigation presented in this research utilized a single-wave Ultimatum Game behavioral simulation. In our simulation, the findings of Carter and Irons (1991) were replicated. Economists gave less, and kept more, in the UG. Our hypothesis that economists would fare worse in the behavioral simulation was not supported, however. Economists performed similarly to students of other majors, finishing near the "middle of the pack". However, by adopting methods from Tullberg (2002), significant connections to levels of selfishness were discovered for members of the economics major. Since these students consistently give less, and keep more in the UG, economics majors exhibit a statistically significant, positive regression coefficient in a regression on "Buffer" values (defined as the sum of amount kept and amount demanded). This measure is interpreted as a measure of selfishness, and economists were the only major to report a statistically significant coefficient.

However, the finding that varsity sports participation is also strongly linked to the "Buffer" measure may help to shine a different light on this connection. Athletes are notorious for their competitive spirit; their determination to succeed and drive to do their best. Furthermore, as an athlete, one cannot worry about the outcomes of others, but

instead are conditioned to focus on their objective of maximizing their performance in the competitive task. Though this behavior could be interpreted as selfish, this is the accepted (and encouraged) mentality of competitive sports.

Perhaps the Buffer variable could be better described as a measure of competitiveness, or high aspirations, instead of "selfishness". Since the UG is a zero-sum game, these two things are fundamentally the same; for each unit that DM1 increases their payoff, they take one unit from their experimental partner. However, this is not always the case, and there is a distinction between high aspirations and selfishness.

If the significance of the regression coefficient linking economics majors to the Buffer measure is taken as an indication of high aspirations, this explanation works well with the findings of the first investigation. The fact that econ students have high aspirations perfectly explains why they would exhibit larger shifts towards Maximizing. Maximizers are willing to invest large amounts of time and energy into making the *best possible* outcome occur. Seen through the lens of high aspirations, these outcomes seem to make much more sense.

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Appendix: Survey Materials, Survey 1

Consent Form

The intent of the following survey is to measure various decision-making tendencies of 5C students. It contains 20 questions, and should take no more than 10 minutes to complete. Your participation in this study is meant to be completely voluntary. There is no penalty for declining participation, and there will be no reward for completing the survey. If any of the questions make you feel uncomfortable in any way, please feel free to skip them. You have the ability to opt out of this study at any time. Your identity will be kept secure, and any and all documents linking your identity to the responses on this document will be stored under lock and key in strict confidentiality. This first sheet, the Consent Form, will be removed from the rest of your survey and only an

identification number will appear on all data forms. If you have any questions or concerns, please feel free to contact me at daniel.brown@pomona.edu.

Please sign below to indicate that you understand the statements above, and to give consent for participation in this survey.

Print Name: _____

Signature: _____

Maximizing Inventory: Survey #1

Please circle the most appropriate response, and answer the prompts below. Take your time, and please answer each question truthfully and accurately as possible.

Sex Male Female

Campus Affiliation PO CMC SCR HMC PZ

Grade FR SO JR SR

Major: _____

If undecided, list as many as three potential majors below. If you have a minor, list below and indicate with an 'M':

_____

_____

_____

Are you interested in… (circle all that apply)

Technology Finance/Banking Community Service Medicine

Shopping Nature Sports Business Religion Movies

What courses are you taking this semester? (List all)

Do you participate on a varsity sports team? If so, which sport(s)?

Please read the following questions carefully, and circle the most appropriate response.

1. Whenever I make a choice, I'm curious about what would have happened if I had chosen differently.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

2. Whenever I make a choice, I try to get information about how the other alternatives turned out.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

3. If I make a choice and it turns out well, I still feel like something of a failure if

I find out that another choice would have turned out better.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

4. When I think about how I'm doing in life, I often assess opportunities I have passed up.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

5. Once I make a decision, I don't look back.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

6. When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

7. When I am in the car listening to the radio, I often check other stations to see if something better is playing, even if I'm relatively satisfied with what I'm listening to.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

8. I treat relationships like clothing: I expect to try a lot on before I get the perfect fit.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

9. No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

10. I often fantasize about living in ways that are quite different from my actual life.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

11. I'm a big fan of lists that attempt to rank things (the best movies, the best singers, the best athletes, the best novels, etc.).

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

12. I often find it difficult to shop for a gift for a friend.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

13. When shopping, I have a hard time finding clothing that I really love.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly

1	2	3	4	5	6	7

14. Renting videos is really difficult. I'm always struggling to pick the best one.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

15. I find that writing is very difficult, even if it's just writing a letter to a friend, because it's so hard to word things just right. I often do several drafts of even simple things.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

16. No matter what I do, I have the highest standards for myself I never settle for second best.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

17. Whenever I'm faced with a choice, I try to imagine what all the other possibilities are, even ones that aren't present at the moment.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

Thank you for completing this survey, have a great semester!

Survey 2
ID #: _____ (from consent form, bottom-right corner)

THE ULTIMATUM GAME

You are playing an experimental economics game with a person you have never met before (the Stranger). In the game, **an experimenter gives the Stranger $10**, to be distributed between the Stranger and yourself. **The Stranger can offer you any amount from $0 to $10**, at their discretion. If you **accept** the offer, you **receive the amount of money the Stranger has offered you**, and the Stranger will keep what is left from the $10 endowment (that is, if the Stranger offers you $4, and you accept, the Stranger receives [$10-$4]= $6, and you receive $4). However, if you **decline** the offer, both you and the Stranger will **walk away empty handed**; you both receive $0. The game is only played once, and **you will never see or interact with the Stranger ever again**.

Q1: What is the lowest offer that you would accept from the Stranger? Circle the interval that contains the **minimum offer** you would **accept**: (If you decline this offer, you will receive $0.)

$0-$0.50
$0.50-$0.99
$1-$1.49
$1.50-$1.99
$2-$2.49
$2.50-$2.99
$3-$3.49
$3.50-$3.99
$4-$4.49
$4.50-$4.99
$5-$5.49
$5.50-$5.99
>$6

Q2: What if the roles are reversed? That is, **picture the same situation, except you are in the position of the "Stranger**", and you are asked to offer a person (whom you've never met before, and will never see again) a portion of a $10 endowment you've just received from an experimenter. **What portion of your $10 will you offer to the other player?**

Circle the interval that contains the **amount you would offer to the other player**: (If the other player declines your offer, you will both receive $0.)

$0-$0.50
$0.50-$0.99
$1-$1.49
$1.50-$1.99
$2-$2.49
$2.50-$2.99
$3-$3.49
$3.50-$3.99
$4-$4.49
$4.50-$4.99
$5-$5.49
$5.50-$5.99
>$6

How well do you feel you understand this game?

Don't Understand at all						Understand Completely
1	2	3	4	5	6	7

Please read the following questions carefully, and circle the most appropriate response.

1. Whenever I make a choice, I'm curious about what would have happened if I had chosen differently.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

2. Whenever I make a choice, I try to get information about how the other alternatives turned out.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

3. If I make a choice and it turns out well, I still feel like something of a failure if I find out that another choice would have turned out better.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

4. When I think about how I'm doing in life, I often assess opportunities I have passed up.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

5. Once I make a decision, I don't look back.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

6. When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

7. When I am in the car listening to the radio, I often check other stations to see if something better is playing, even if I'm relatively satisfied with what I'm listening to.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

8. I treat relationships like clothing: I expect to try a lot on before I get the perfect fit.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

9. No matter how satisfied I am with my job, it's only right for me to be on the lookout for better opportunities.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

10. I often fantasize about living in ways that are quite different from my actual life.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

11. I'm a big fan of lists that attempt to rank things (the best movies, the best singers, the best athletes, the best novels, etc.).

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

12. I often find it difficult to shop for a gift for a friend.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

13. When shopping, I have a hard time finding clothing that I really love.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

14. Renting videos is really difficult. I'm always struggling to pick the best one.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

15. I find that writing is very difficult, even if it's just writing a letter to a friend, because it's so hard to word things just right. I often do several drafts of even simple

things.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

16. No matter what I do, I have the highest standards for myself I never settle for second best.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
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17. Whenever I'm faced with a choice, I try to imagine what all the other possibilities are, even ones that aren't present at the moment.

Disagree Very Strongly	Disagree Strongly	Disagree	Undecided	Agree	Agree Strongly	Agree Very Strongly
1	2	3	4	5	6	7

18. Did you have exposure to economics at the high school level?

(circle) Yes No

19. Have you taken a college-level economics course before? (Before this semester)

(circle) Yes No

20. Have you ever had a Game Theory course?

(circle) Yes No

21. Did you play varsity sports in high school?

(circle) Yes No