Racial Differences in Bargaining Behavior:
An Ultimatum Game Analysis

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I use the ultimatum game in a survey to test whether respondents make different choices about whether to accept or reject offers from a fictional proposer when the proposer appears to be of a different race. Previous literature on the ultimatum game has not focused extensively on race. Using voter data to find "racially typical" names, I expand on the literature and test whether respondents' assumptions about names and race lead to different decisions when faced with proposers of different races. My results show that participants do not appear to take implied proposer race into account when making decisions in the ultimatum game. However, undergraduate students in my sample were more likely to accept offers than non-students.

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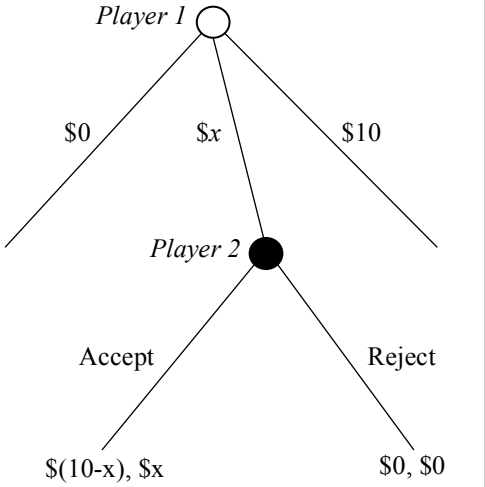
The Effects of Racial Differences on Bargaining Behavior: An Ultimatum Game Analysis

Introduction

Race relations have been a key point of tension in the history of the United States. From slavery and the treatment of Native Americans to the Civil Rights movement of the 1960s and more recent tensions centered on police violence, there have been many examples of racially focused conflicts with big implications for United States domestic policy. Looking at the history of the United States, as well as current events, there is reason to believe that people might characterize people of their own race differently than those of other races. If this sort of by-race selection is present, it could have effects on many different real-world economic outcomes. For instance, if white people have an in-group preference for other whites, they may give them higher salaries relative to people of other races. I test for this sort of racial in-group preference in an economic context with the ultimatum game.

The ultimatum game, first played experimentally by Guth, Schmittberger, and Schwarze in 1982[1], is a simple two-player bargaining game. The game as played for the purposes of my experiment is presented in Figure 1 to the right.

Figure 1: The Basic Ultimatum Game



The first mover is presented with \$10. She must make an offer to the second mover of any amount \$*x* between \$0 and \$10 inclusive. She would then keep \$(10-*x*) for herself. The second mover has two options in response. He can accept the offer of the first mover, in which case he receives \$*x* as a payoff and the first mover receives \$(10-*x*). However, he can also reject the offer, in which case both players receive \$0 as a payoff.

In the sub-game perfect Nash equilibrium, the first mover would offer \$0, or as close to it as possible (i.e., \$0.01), and the second mover would be indifferent between accepting and rejecting a zero offer and accept any nonzero offer. However, the literature has shown that, contrary to the standard model, second movers often find extremely low offers unfair, and reject them. One possibility is that these players are sacrificing their own payoff in

[1] **Guth, Werner, Rolf Schmittberger, and Bernd Schwarze.** 1982. "An Experimental Analysis of Ultimatum Bargaining" *Journal of Economic Behavior and Organization*, 3:4. 367-388

order to "teach a lesson" to the first mover. Pfister and Boehm (2012)[2], for instance, find that responders of unfair offers act to punish proposers out of anger about the low offer, instead of other possible reactions, such as envy. Essentially, players who act this way might be revealing an aversion to inequality by refusing a positive payoff in order to avoid an unfair result.

My research tests whether responders in the ultimatum game react differently to an offer when it is presented by someone of the same race than if it is given by someone of a different race. My theory is that responders are better able to relate to proposers of a similar racial background, and will therefore be more sympathetic towards proposers who give low offers, and less averse to inequality between themselves and the proposer. On the contrary, if a responder is unable to relate to the proposer, they may be more likely to reject an offer because they feel it is unfair. Unfortunately, the design used in this research cannot distinguish the motivation behind any effect that is found–it can only determine whether there seems to be an effect.

The rest of this paper proceeds as follows: a review of the literature, a summary of the experimental design, discussion of the data sample, a development of the models used in the analysis, a summary of the results, and finally some concluding thoughts.

Literature Review

There has been a great deal of economic research on the ultimatum game since its introduction to the literature more than thirty years ago. Guth, Schmittberger, and Schwarze played the first version of the game experimentally in 1982, intending to research bargaining behavior. They note that Player 1 tended to act with a relatively fair result in mind, frequently offering more than the standard model would predict, and that Player 2 was generally willing to forgo their own payoff to punish Player 1 for an unfair offer.

The results found by Guth et. al (1982) have been confirmed by several studies over the decades. Generally, players will reject offers if they are below a certain threshold. The idea is that players have not only their own payoff in mind, but also some measure of fairness, and are averse to unfair offers, even if the alternative is receiving nothing. This is contrary to the predictions of standard game theory, but has been confirmed repeatedly in experimental studies. Additionally, proposers frequently offer non-negligible amounts, which also contradicts the sub-game perfect Nash equilibrium.

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[2] **Pfister, Hans-Rudiger and Gisela Boehm.** 2012. "Responder Feelings in a Three-Player Three-Option Ultimatum Game: Affective Determinants of Rejection Behavior" *Games*, 3:1. 1-29

There have been few studies on how race affects decision-making in the ultimatum game. Fershtman and Gneezy (2001)[3] find that the ethnic background of the other participant affects decisions in the ultimatum game and similar games. Israeli proposers appear to take certain stereotypes about people with Eastern origin into account when they make their choices, offering them *more* than others. The authors theorize that this is due to a stereotype about this racial group–that these are people who value honor highly. Proposers offer more because they are worried about a low offer being rejected out of pride, and they want to ensure that they receive some payoff. This result also suggests that the identity of the other player can affect a person's decision-making in bargaining situations.

Francisco Gil-White (2003)[4] plays the ultimatum game with two different ethnic groups in Mongolia, the Kazakh and the Torguud. He uses a series of Polaroid photos to show the other player's race–i.e., he told participants they were playing against one of 10 people pictured, all of whom were of the same ethnic group. Though he theorizes that proposers will make higher offers to members of the same ethnic group, he surprisingly finds that the opposite is true. Proposers offered, on average, 42.5% of the stake to members of the other ethnic group, and only 35% to members of the same group (p-value 0.01). Additionally, only two proposers gave a higher offer to the in-group member. He finds no evidence of difference in respondent behavior by race of the proposer. To explain the surprising proposer behavior, he theorizes that proposers knew that members of their group would accept lower offers, but were unsure how members of the other group would react.

Finally, Griffin, Nickerson, and Wozniak (2012)[5] use an experimental design similar to mine to study whether race affects decisions by the second mover in an ultimatum game. Using voter data for three states, they identify racially typical names. Then, they play the ultimatum game with participants over the phone. Offers are made from a fictitious proposer, whose name is altered to be either typically black or typically white. This allows for the study of race effects in the responders' choices. Participants are sent their winnings, if any, in the mail. Overall, they find no significant differences in the responses of white persons to offers which appear to be made by black persons, with a statistically insignificant decrease of 2 percentage points in offer acceptance. They also find no significant difference in black responses to offers that appear to be made by white proposers.

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[3] **Fershtman, Chaim and Uri Gneezy.** 2001. "Discrimination in a Segmented Society: An Experimental Approach" *Quarterly Journal of Economics*, 116:1. 351-377

[4] **Gil-White, Francisco.** 2004. "Ultimatum Game with an Ethnicity Manipulation: Results from Khovdiin Bulgan Sum, Mongolia." In , ed. Joseph Henrich, 260-304: Oxford and New York:; Oxford University Press

[5] **Griffin, John, David Nickerson, and Abigail Wozniak.** 2012. "Racial Differences in Inequality Aversion: Evidence from Real World Respondents in the Ultimatum Game" *Journal of Economic Behavior and Organization*, 84:2. 600-617

Much of the analysis presented here stems from this earlier work by Griffin, Nickerson, and Wozniak. This research expands on their work mainly by recruiting participants in person rather than on the phone and including typically Middle Eastern names along with typically black and white names.

Experimental Design

Data was collected over two weeks in two different locations in Davidson, NC–the Davidson Farmers' Market and on campus at Davidson College. I was the primary researcher to collect data, but I recruited another researcher of a different race for some of the data collection to account for any possible effects the race of the experimenter might have on participants' responses.

Each participant played the role of second mover in the ultimatum game. The rules were explained, and a fictitious name was provided as the "first mover" in the game. This fictitious name was either typically white, typically black, or typically Middle Eastern, in order to vary the implied race of the proposer. The participant was next informed of the offer made by the first mover, which was predetermined randomly by the experimenters. The name of the first mover was both spoken aloud and printed on a sheet of paper with the offer amount. Once participants had indicated their choice on the sheet, they were asked to complete a short survey on their demographic information, including their gender and ethnic background. Everyone was given a small, non-monetary reward for participating, in the form of a piece of candy. Additionally, participants who accepted the fictitious offer received that dollar amount in cash.

I varied the implied race of the proposer by using names that were typically white, typically black, and typically Middle Eastern. I follow the lead of Griffin et. al (2012) and of Bertrand and Mullainathan (2004), both of whom use databases of first names and calculate the "racial polarization" of a name. I used voter registration data from Mecklenburg County, NC for name selection. To obtain a racial polarization figure for a certain name, I calculated the probability that that name was given to someone of a particular race, and divide it by the probability that it was given to anyone from any other race. If this ratio was above 10, I concluded that a name was sufficiently polarized as to be a signal for that race. Only male names were used in order to avoid possible gender effects, such as those detailed in Eckel and Grossman (2001)[6]. The names chosen are given in Figure 2, along with racial polarization statistics and the percentage of people in the voter registration data sample that had each name.

[6] **Eckel, Catherine C. and Philip J. Grossman.** 2001. "Chivalry and Solidarity in Ultimatum Games" *Economic inquiry*, 39:2. 171-188

Figure 2: Selected Statistics for Chosen Names		
Black	*Racial Polarization*	*Percent with Name*
Derrick	16.44	0.14%
Andre	20.73	0.14%
Darryl	12.28	0.19%
Willie	48.36	0.32%
White	*Racial Polarization*	*Percent with Name*
Scott	12.53	0.63%
Kurt	14.37	0.06%
Dustin	12.92	0.07%
Brett	10.07	0.13%
Middle Eastern	*Racial Polarization*	*Percent with Name*
Mohamed	14.75	0.04%
Ahmed	19.2	0.02%
Ibrahim	12.54	0.01%
Mahmoud	11.84	0.01%

Offers made to participants were varied randomly across $1, $2, $3, and $4, out of the total stake of $10. The literature suggests that nearly all offers of $0 will be rejected and nearly all offers of $5 will be accepted, regardless of the proposer's identity. Since I am interested in differences in acceptance rates, I used a $1 to $4 range.

Sample

Descriptive statistics for the 105 observations in the main data sample are provided in Figure 3.

Davidson is a relatively homogenous community, both on the college campus and off. As such, 85.7% of respondents are white, with the other 14.3% distributed fairly evenly across the Black, Asian, and "Other" categories. Just over half (50.5%) were recruited at the Davidson Farmers' Market, with the remainder recruited on campus at Davidson College. Due to the high percentage of participants that were recruited on a college campus, 59% of respondents are in the 18-24 year-old age range.

On the whole, 74.3% of offers were accepted. However, there is a noticeable difference in the responses of students and non-students who participated. Those who were not Davidson College students faced an average offer of $2.13 and accepted 60.4% of offers, while students were offered $2.21 on average, accepting 86% of offers. Figure 4 is a breakdown of acceptance rates by offer amount. While acceptance rates increase overall as offers increase, students are more likely than non-students to accept any given offer. In contrast, Figure 5 shows the same information for responders playing with responders of the same implied race or a different implied race. There does not seem to be a clear difference between the two in terms of acceptance rates.

Figure 3: Data Summary

Variable	Mean	Standard Deviation	Minimum	Maximum
Offer Characteristics				
Offer Accepted	0.74	0.44	0	1
Offer Amount	$2.17	$0.97	$1.00	$4.00
Implied Proposer Race				
Black	0.34	0.48	0	1
Middle Eastern Origin	0.35	0.48	0	1
White	0.30	0.46	0	1
Same Race as Responder	0.29	0.45	0	1
Responder Characteristics				
Student	0.54	0.50	0	1
Farmers' Market	0.50	0.50	0	1
Female	0.53	0.50	0	1
Responder Age				
18-24	0.59	0.49	0	1
25-34	0.09	0.28	0	1
35-44	0.07	0.25	0	1
45-54	0.15	0.36	0	1
55-64	0.08	0.27	0	1
65+	0.03	0.17	0	1
Responder Race and Ethnicity				
White	0.86	0.35	0	1
Asian	0.03	0.17	0	1
Black	0.07	0.25	0	1
Other	0.05	0.21	0	1
Hispanic	0.10	0.29	0	1

N = 105. Data collected at two locations in Davidson, NC in March and April 2015. Offer Amount is the amount offered to responders in dollar. All other variables = 1 if that characteristic is true, and 0 if that characteristic is false.

Figure 4: Acceptance Rates for Students by Offer Amount

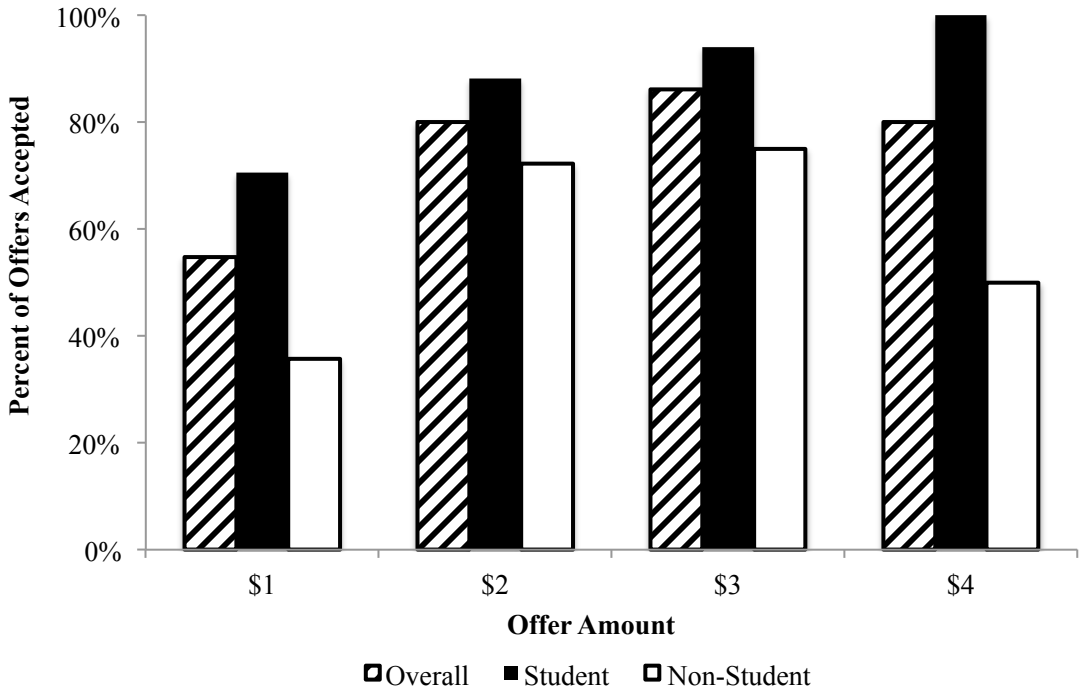
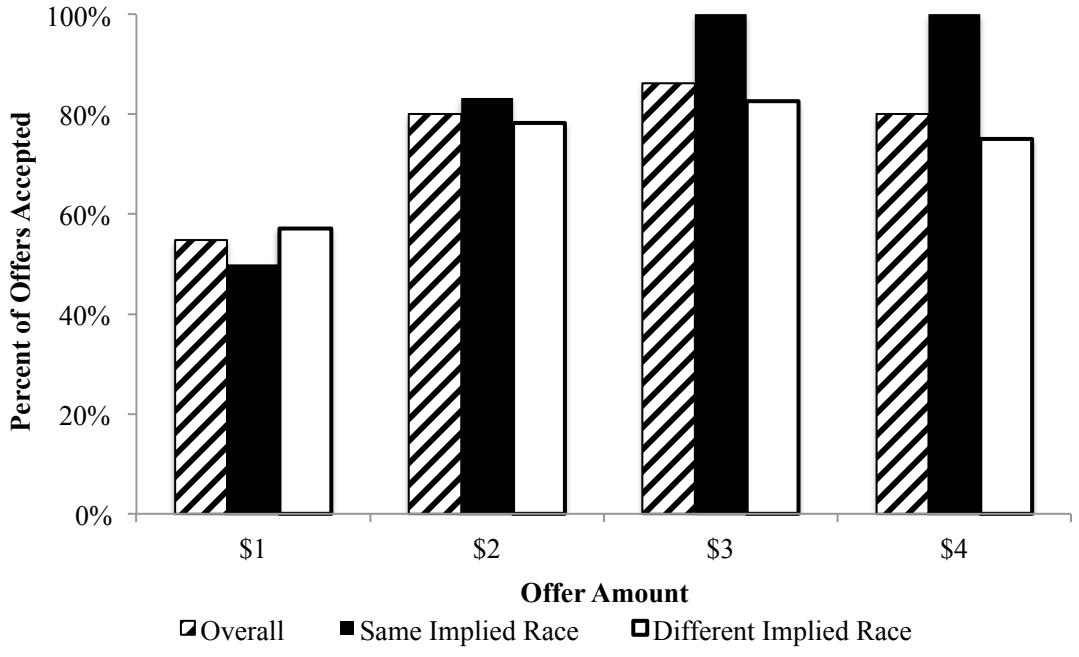


Figure 5: Acceptance Rates for Same and Different Implied Proposer Race by Offer Amount



Model Development

I use both logit and linear probability models in order to estimate the effect of proposer race on the probability that an offer is accepted. My basic model relies only on offer size, whether the respondent is a college student, and on the proposer's implied race. It is given as equation (1) below.

$$\text{Accept} = \beta_0 + \beta_1 \text{Offer} + \beta_2 \text{Student} + \beta_3 \text{ProposerRace} + \varepsilon_i \quad (1)$$

The coefficient on "proposer race," β_3, is the main focus of my research. This variable will take a value of 1 if the name given to the responder is representative of the same race as the responder, and 0 if the name is representative of a different race. My hypothesis is that β_3 will be positive. This would mean that responders are more likely to accept offers coming from a proposer who they believe is from the same racial background as they are. My theory is that responders will be better able to sympathize with a proposer with the same implied race than a proposer with a different implied race.

Other models include controls for gender, researcher race, and responder race. I originally planned to have location and date controls as well, but severe multicollinearity between these variables and the student dummy prevented me from doing so. I elected to use only the student dummy variable, since I believe that is more likely the driver of any effect found than the location where someone was recruited or the date on which they participated. Additionally, I perform analyses with the data stratified by offer size, using the basic model seen in equation (1) with no offer term, to check if any effect differs by the size of the offer. Finally, I use only the white respondents and model an equation that includes specific terms for each proposer race, in order to see if any effect present differs by proposer race. I hypothesize that the coefficient on proposer race will be positive across all of the models described above.

Results

My main results are reported in Figure 6. All three models are estimated both with linear probability and logit techniques. Linear probability models are all corrected for heteroscedasticity with the weighted least squares (WLS) method; the Breusch-Pagan-Godfrey statistics of the uncorrected models are reported.

The main interest in this study *a priori* is the effect of proposer race on decisions to accept or reject an offer. Figure 6 shows that the coefficient enters the model with a positive sign in all three models, which implies that a responder playing with a proposer of the same race is more likely to accept the offer. However, the coefficient on proposer race is statistically insignificant in all three models, with p-values in the 0.4 to 0.7 range. Additionally, the

Figure 6: Basic Model Results

	Model (1)		Model (2)		Model (3)	
	Lin. Prob.	*Logit*	*Lin. Prob.*	*Logit*	*Lin. Prob.*	*Logit*
Intercept	0.313 (0.109)***	-1.121 (0.680)***	0.264 (0.122)**	-1.065 (0.745)	0.321 (0.130)**	-1.409 (0.796)*
Offer	0.131 (0.048)***	0.694 (0.283)**	0.134 (0.050)***	0.715 (0.286)**	0.112 (0.042)***	0.817 (0.314)***
Student	0.251 (0.091)***	1.451 (0.502)***	0.222 (0.098)**	1.311 (0.527)**	0.262 (0.090)***	1.665 (0.603)***
Proposer Race	0.034 (0.100)	0.387 (0.546)	0.032 (0.101)	0.354 (0.551)	0.065 (0.092)	0.442 (0.585)
Female	-	-	0.078 (0.090)	-0.145 (0.503)	-0.002 (0.085)	-0.195 (0.536)
Researcher	-	-	0.158 (0.197)	0.761 (1.160)	0.063 (0.152)	0.479 (1.273)
Race Controls	No	No	No	No	Yes	Yes
N	105	105	105	105	105	105
Adj. R^2	0.111	0.141	0.103	0.148	0.119	0.216
Model F	5.36***	-	3.38***	-	2.56**	-
BPG	16.45**	-	16.89**	-	29.03**	-
Model Chi-Square	-	12.87***	-	13.12**	-	14.06

, ** and * denote statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are in parentheses. All tests for significance are one-sided. R^2 measures for logit regressions are approximations, and should only be compared to other logit regressions. All linear probability models are weighted by the inverse of predicted values squared.*

magnitude of this coefficient is somewhat small–for example, in Model (1), a 3.4 percentage point increase in the likelihood of acceptance if the proposer is of the same race as the responder, on average, ceteris paribus. Compared to a 13.1 percentage point on-average increase in acceptance probability for every dollar the offer increases, the magnitude of the proposer race coefficient is low. The same holds true across the other two models. For this initial analysis, the conclusion is that proposer race has no significant or meaningful economic effect on responders' decisions in the ultimatum game.

Perhaps more interesting is the coefficient on the student dummy variable. Across all three models, these coefficients are positive, statistically significant, and very large in magnitude. For instance, in Model (1), a respondent who is a student is 25.1 percentage points more likely to accept an offer, on average, with all else held constant. This is equivalent to increasing the offer size by almost $2, a sizeable increase when the entire stake is only $10.

Figure 7 shows results for individual regressions on each offer size. This allows us to see whether any effect from proposer race or of being a student or differs by the amount offered. To combat this, the models estimated are limited to only an intercept, the dummy variable for student, and the dummy variable for proposer race. In these results, the coefficient on proposer race remains statistically insignificant and economically insignificant across all three of the regressions with individual offer size. The only exception is the $3 model. Only 13.8% of $3 offers were rejected, and there are no examples in the data sample of a respondent playing against a proposer with the same implied race and rejecting a $3 offer. This skews the regression severely. In general, these results suggest that no strong effect exists based on implied proposer race.

In contrast, the coefficient on the student dummy variable remains positive and large in magnitude across all three models, though not statistically significant. This is most notable in the $1 model, where the student dummy coefficient means that on average and ceteris paribus, a student would be 35.6 percentage points more likely to accept a given $1 offer than a non-student. This is nearly double the size of the intercept, meaning that for offers of $1, a particular respondent being a student increases the predicted probability that they will accept the offer almost twofold (on average and holding all else constant). The results of this regression suggest that responses to $1 offers could be the main driver of large student effects seen in the basic models.

Finally, Figure 8 shows a modified regression with only white respondents included. This allows us to break apart any larger effect from proposer race into specific effects for both typically black and typically Middle

Figure 7: Regressions Stratified by Offer Amount

	$1 Offers		$2 Offers		$3 Offers	
	Lin. Prob.	*Logit*	*Lin. Prob.*	*Logit*	*Lin. Prob.*	*Logit*
Intercept	0.385 (0.141)**	-0.464 (0.600)	0.696 (0.112)***	0.790 (0.620)	0.684 (0.102)***	0.693 (0.707)
Student	0.356 (0.177)*	1.510 (0.783)*	0.166 (0.138)	1.107 (0.927)	0.224 (0.140)	1.872 (2.222)
Proposer Race	-0.098 (0.188)	-0.456 (0.833)	0.068 (0.146)	0.455 (0.949)	0.225 (0.197)	11.568 (247.100)
N	31	31	35	35	29	29
Adj. R^2	0.068	0.125	-0.013	0.046	0.060	0.147
Model F	2.09	-	0.78	-	1.90	-
BPG	0.10	-	2.39	-	4.07**	-
Model Chi-Square	-	3.78	-	1.54	-	2.22

, ** and * denote statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are in parentheses. All tests for significance are one-sided. R^2 measures for logit regressions are approximations, and should only be compared to other logit regressions. The $3 linear probability model is weighted by the inverse of predicted values.*

Figure 8: White Respondents

	Lin. Prob.	*Logit*
Intercept	0.265 (0.132)**	-1.193 (0.791)
Offer	0.145 (0.053)***	0.816 (0.319)**
Student	0.305 (0.106)***	1.814 (0.599)***
Black Proposer	-0.075 (0.115)	-0.448 (0.653)
Middle Eastern Proposer	0.087 (0.125)	0.174 (0.679)
N	90	90
Adj. R^2	0.151	0.190
Model F	4.96***	-
BPG	20.43**	-
Model Chi-Square	-	13.78***

, ** and * denote statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are in parentheses. All tests for significance are one-sided. R^2 measures for logit regressions are approximations, and should only be compared to other logit regressions.*

Eastern proposer names. The negative coefficient for typically black proposer names implies that, on average, holding all else constant, whites were less likely to accept offers associated with these names than offers associated with white names. In contrast, the positive coefficient for typically Middle Eastern names means that whites were more likely to accept these offers than offers associated with white names. However, neither coefficient is economically significant compared to the offer or student terms, and both are statistically insignificant in the model.

Discussion

The analysis performed here shows that implied proposer race has no significant effects on a responder's decision to accept or reject an offer in the ultimatum game. This result confirms the findings of Griffin et. al (2012). Further research can explore this topic further, with a larger sample size and more varied participant backgrounds.

More unexpected were the large student effects found in the analysis above. The results presented in Figures 6, 7, and 8 report that, on average, holding all else constant, someone who is an undergraduate student is around 20-25 percentage points more likely to accept a given offer. This is generally almost twice the effect of increasing the offer size by $1, certainly a meaningful increase. Much of the literature on the ultimatum game is based on studies of undergraduate or graduate students, and the results found here are not commonly found in earlier work. The original paper on the topic, written by Guth, Schmittberger and Schwarze in 1982, used graduate students and found that second players would reject low offers. They theorized that these rejections were meant to punish the first players. More relevantly, Eckel and Grossman (2001) used mainly undergraduate students. They report a rejection rate of 83.3% for offers equal to one-tenth the total stake. The rejection rate in my dataset, among students and for the same relative offer amount, is only 29.4%.

There are a few possible reasons for this result. Perhaps, since undergraduate students tend not to earn their own income, they are less sensitive to offers of fairness and are more concerned with earning whatever they can from the game. However, if this was true of all students, earlier research should have picked up the effect. There might be something different about Davidson College students from other undergraduates–for instance, they are of a higher socioeconomic class than other students surveyed, or they are more economically rational for some reason. It's also possible that the experimental design I used makes students less likely to accept offers, although there would have to be a reason that design wouldn't affect non-students as well. Future research can look at how students respond to ultimatum game offers more carefully, and use experiments designed specifically to test for any effects present.

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