UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
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PSYCHOPATHY AND THE ULTIMATUM GAME:
EXPERIMENTALLY ASSESSING THE FAIRNESS HYPOTHESIS

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Trabalho de Conclusão de Curso apresentado ao Instituto de Economia da Universidade Federal do Rio de Janeiro como exigência para obtenção do grau de Bacharelado em Ciências Econômicas.

Orientador: Professor Dr. Pedro James Frias Hemsley

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Rio de Janeiro, 01/03/2023.

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RESUMO

Uma explicação proeminente para os resultados do Jogo do Ultimato em humanos, em que o principal é distribuído muito mais equitativamente do que o Equilíbrio de Nash, é a de que os participantes têm um senso de justiça — a justeza da distribuição é relevante para sua tomada de decisão. Esta tese testa tal hipótese para ofertantes psicopatas. Uma vez que a psicopatia está intimamente ligada a um desprezo pelos outros, esperaria-se que as ofertas fossem iguais, ou ao menos muito mais próximas do, Equilíbrio de Nash. O experimento desta tese mostrou o contrário: à medida que cresciam os escores para psicopatia, também o faziam as ofertas. Possíveis explicações para tais resultados e de que maneira elas se integram à literatura atual são discutidas.

Palavras-chave: jogo do ultimato, psicopatia, economia experimental.

ABSTRACT

A prominent explanation for the Ultimatum Game experimental results in humans, where the principal is much more equally distributed than the Nash Equilibrium, is that the participants have a sense of fairness — the justness of the distribution is relevant to their decision-making. This thesis tests this hypothesis for psychopathic offerors. Since psychopathy is intimately tied to a disregard of others, their offers should be expected to match, or at least be closer to, the Nash Equilibrium when compared to non-psychopathic agents. This thesis' experiment showed the opposite: as psychopathy scores grew, so did the offers. Possible explanations for such results and how they integrate with current literature are discussed.

Keywords: ultimatum game, psychopathy, experimental economics.

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SUMÁRIO

1 INTRODUCTION

This thesis has the objective of exploring the effects of psychopathy on Ultimatum Game offers. The classic Ultimatum Game contains two players. The first to move (henceforth *offeror*) receives a principal x and decides on a distribution $(y,\ 1-y)$ between her and the other player (henceforth *receptor*). The latter accepts or rejects the offer; upon accepting, the distribution is made effective, otherwise, both players go home with zero pay-off (GÜTH, KOCHER; 2014). At the Nash Equilibrium, the offeror maximizes y. An ultimatum u is defined as $u = \frac{1-y}{y}$.

Experimental data shows that the distributions are made effective at $u \in [0.4,\ 0.5]$ (GÜTH, KOCHER; 2014), i.e., ultimata are considerably higher than expected. An important hypothesis regarding these results is that the players have a sense of fairness (ABBINK et al., 2010): distributions that are considered unjust, where the offeror retains a large portion of x, are commonly rejected.

One immediately ponders if such motivation can be extended to the offerors. The answer is not obvious: if an offeror proposes a just ultimatum, she could be doing so either because of her own sense of justice, or because of reinforcement learning (ABBINK et al., 2010), that is to say, she is aware that unjust distributions are commonly rejected – in both situations, regardless of her motivation, her behavior is the same.

In this context, psychopathy inserts itself as a type of great relevance. According to Ohira and Osumi (2010), "Individuals with psychopathy often exhibit antisocial behaviors with no regard for social norms or relationships with other people [...] The hallmark of psychopathy is considered to be affective impairment."

In fact, this thesis is based on Ohira and Osumi (2010), where participants with psychopathic tendencies play as receptors – and the finding is that these participants are willing to accept unjust distributions much more than their control counterparts: "the affective deficit of psychopathy might be associated with insensitivity to unfairness [...]".

Therefore, given the behavior exhibited by psychopaths within the Game, it is possible to test directly the aforementioned hypotheses. Here, the participants with psychopathic tendencies will play as offerors.

2 EXPERIMENTAL DESIGN

The experiment is divided into two parts: a test for psychopathy and an Ultimatum Game simulation. The former is the Levenson Self-Report Psychopathy Scale or LSRP (FITZPATRICK, KIEHL, LEVENSON; 1995), the same one used in Ohira and Osumi (2010); it has 26 items with 4 options each, and ample usage in the literature. The higher the total score, the higher the participant's psychopathic tendencies. It is available on the Annex section.

Before playing the game, the participants are presented with two questions in order to guarantee adequate understanding of its rules. Then, the participants are informed they are playing as an offeror with another person. For the sake of simplicity, they only send an ultimatum that is randomly accepted or rejected.

The test and simulation were available on Qualtrics, a platform specialized in business and research surveys and data collection. The participant pool was sourced from MTurk, an Amazon tool in which users are rewarded to perform tasks. We offered US$0.20 for task completion alone and a principal of US$1.00. The experiment had 315 participants and was performed on 29/09/21.

For the classification of participants between the low and high psychopathic tendencies categories, two models were used:

1. Osumi and Ohira's (2010), in which the participant whose score exceeds the sample mean plus one standard deviation is classified as high-tendency (*High*), otherwise, as low-tendency (*Low*);
2. K-means clustering.

Data and scripts available at https://github.com/youk-kai/TCC.

3 RESULTS

3.1 OSUMI AND OHIRA'S METHOD

3.1.1 Initial score analysis

Descriptive statistics for the scores are provided below.

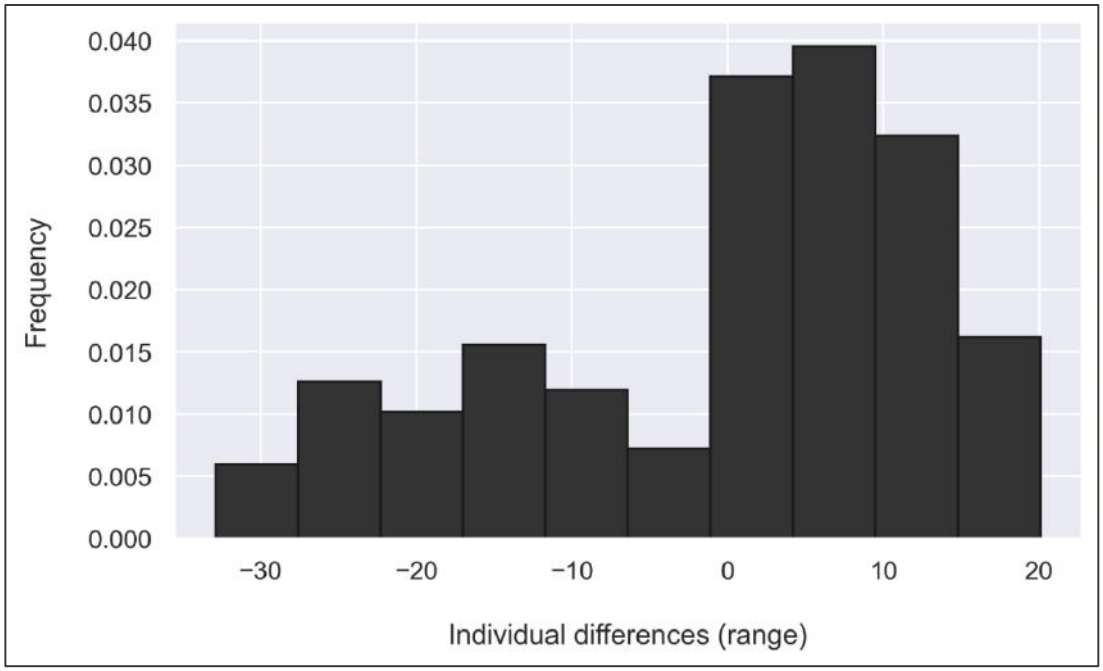
TABLE 1 — Score statistics

Classification	Mean	SD	Kurtosis
Low	21.95	8.62	(1.03)
Neutral	43.62	3.86	(1.13)
High	53.05	2.12	(0.55)
All	36.90	13.16	(0.61)

Source: own work.

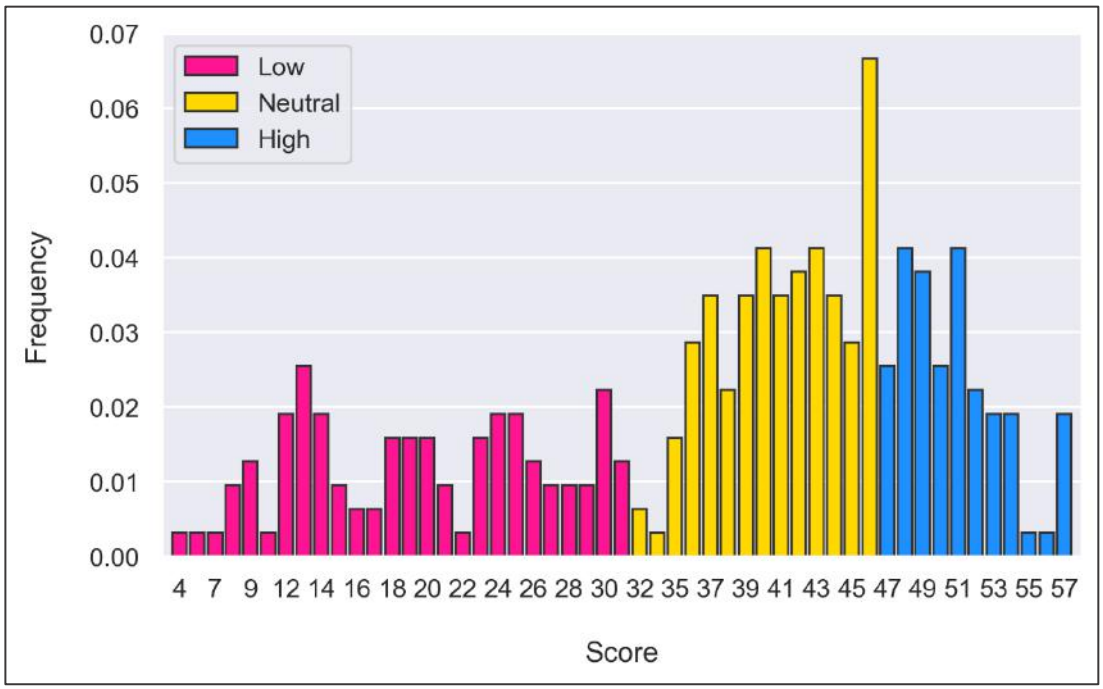
It should be noted that the difference between Osumi and Ohira's sample mean and the current sample mean is statistically significant (*t-score* = -4.52, *p-value* = 0.0) if one simulates the former sample. Let us visualize the table.

FIGURE 1 — Frequency of individual score differences



Source: own work.

FIGURE 2 — Distribution of scores by group

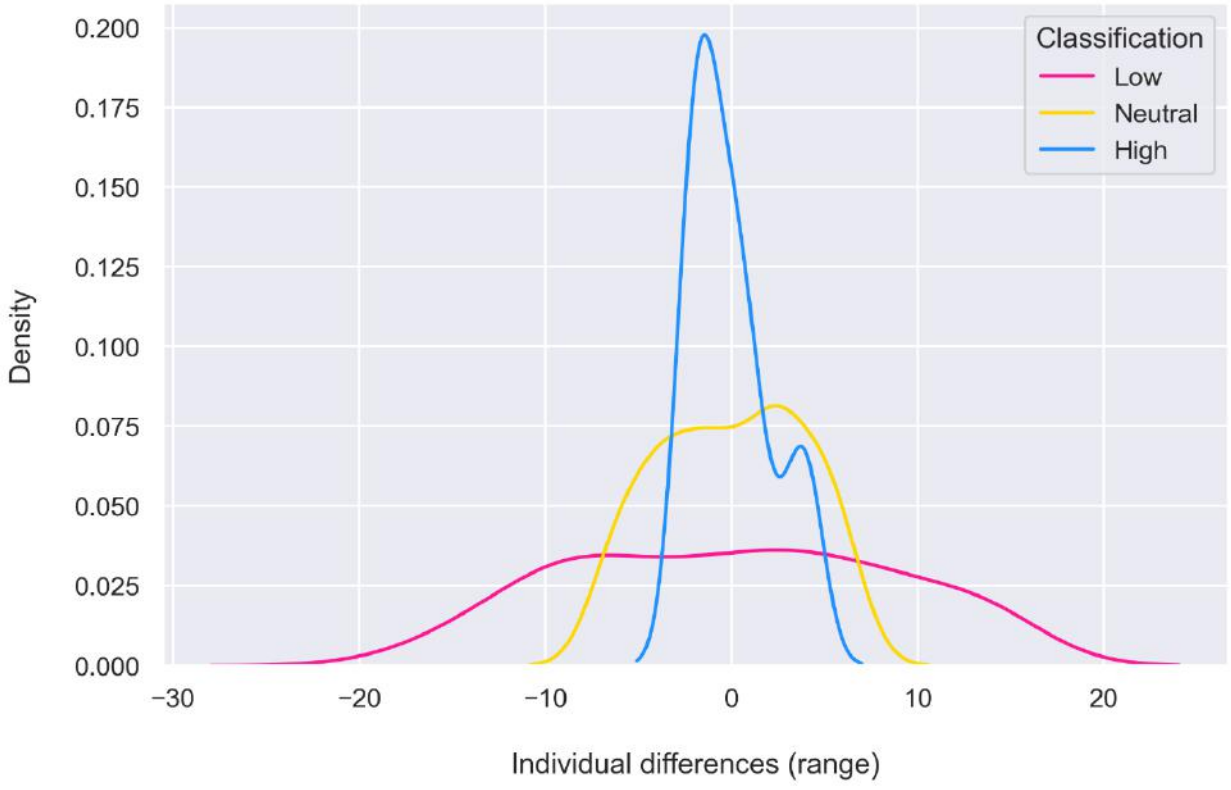


Source: own work.

From these graphs, two main divisions emerge: negative individual differences, those pertaining to the *Low* group, who have a wide range and high variability; and positive individual differences, those pertaining to the *Neutral* and *High* group, who have a stricter range, but considerably less variability. The latter is also much more frequent: participants were more likely to deviate away from the mean score positively rather than negatively.

The asymmetry with regards to variability can be assessed more explicitly with the following graph, which plots the within-group differences.

FIGURE 3 — Density of individual score differences by group



Source: own work.

As it was seen before, the left-skewness of the individual score differences are mainly due to the influence of the *Neutral* and *High* groups. Increases in score are translated into decreases of variability: the individual differences of the *Low* group will span approximately (-17.95, 14.05) units away from the group's mean with reasonable uniformity, while the *High* group enjoys much more predictability, spanning only (-2.05, 3.95) units.

3.1.2 Initial offer analysis

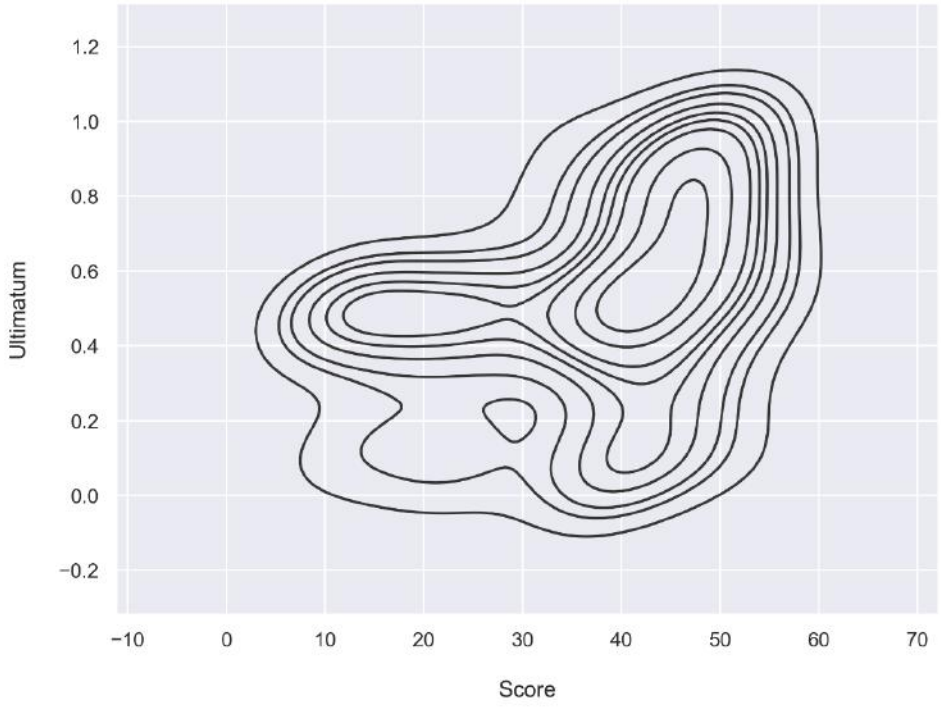
TABLE 2 — Ultimata statistics

Classification	Mean	SD	Kurtosis
Low	0.42	0.25	7e-4
Neutral	0.54	0.28	(0.86)
High	0.64	0.27	(0.18)
All	0.51	0.28	(0.75)

Source: own work.

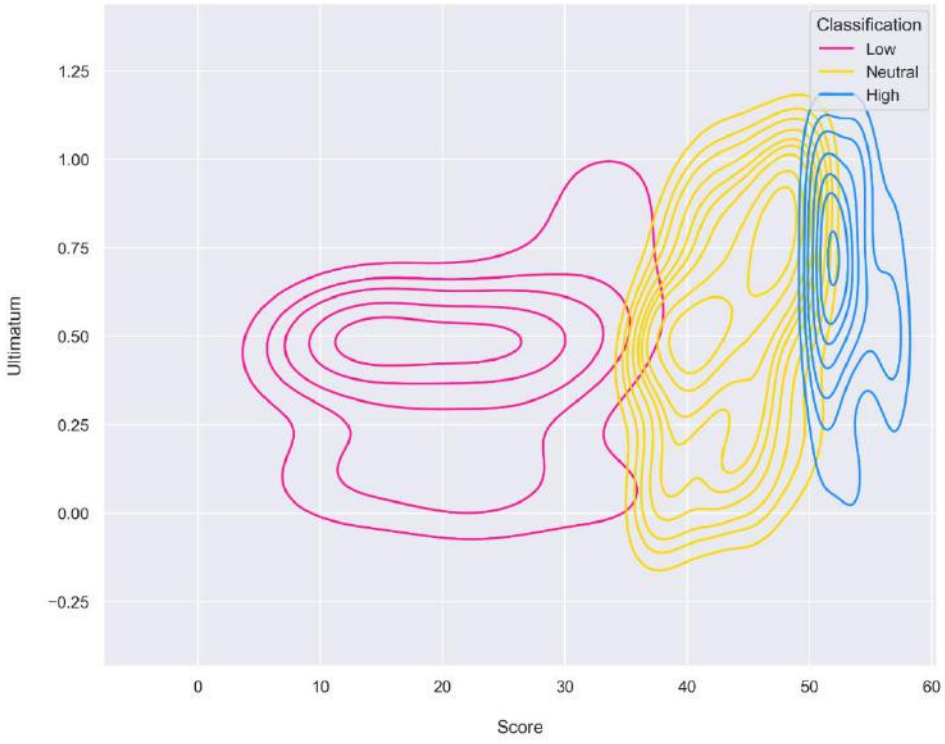
As expected, the mean for the entire sample is aligned with the notion of just ultimata. However, we already start seeing a perplexing picture: the ultimata seem to be positively correlated with the scores. The following graphs will begin to illustrate this correlation.

FIGURE 4 — Sample density of scores vs. ultimata



Source: own work.

FIGURE 5 — Density of scores vs. ultimata by group



Source: own work.

Contrary to scores, ultimata are much more predictable for the *Low* and *Neutral* groups than they are for the *High* group, although all groups' offers spanned from the minimum to the maximum available offers.

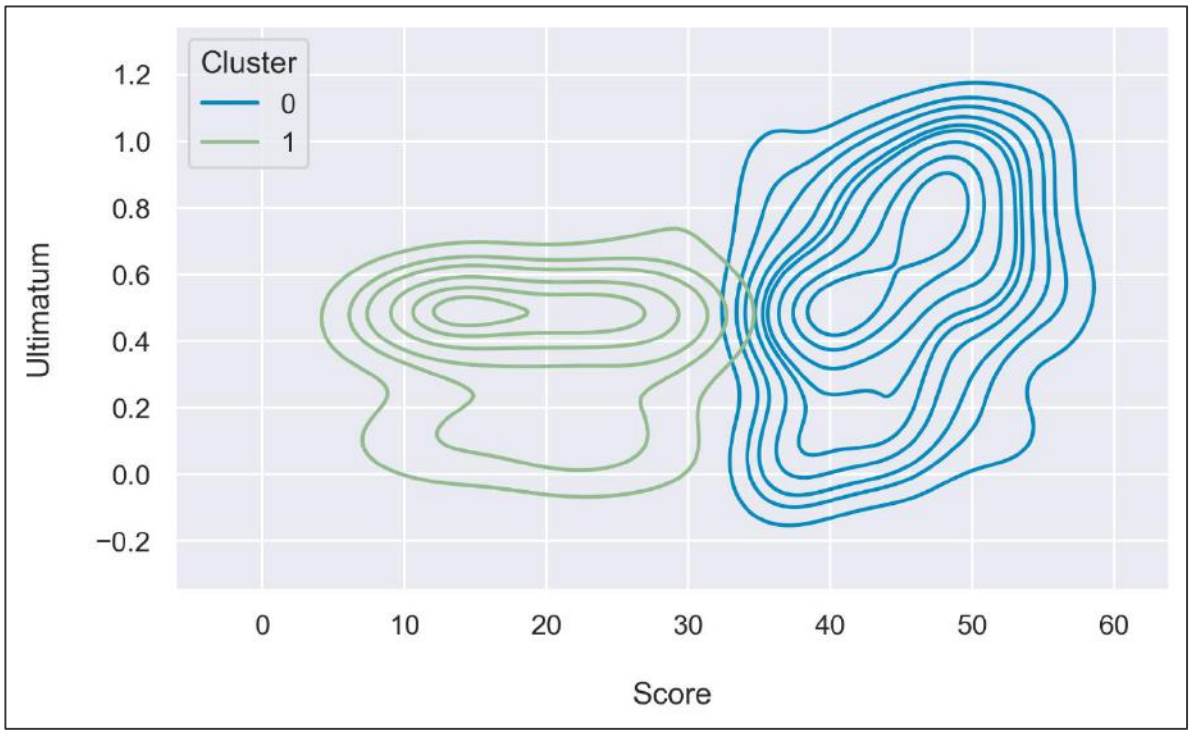
3.2 K-MEANS CLUSTERING

An important question is whether the group splitting was arbitrary at the threshold of one deviation away from the mean. To assess this concern, a K-means clustering algorithm was used against the data: starting with k random seeds ($k = 2$ in this context), the algorithm selects the data points within minimum Euclidean distance from the seeds and groups them into k clusters. The seeds are updated to the centroid of each cluster until they converge i.e. the seeds get updated to the same position. The results can be visualized below.

FIGURE 6 — Scores vs ultimata by cluster

Source: own work.

FIGURE 7 — Density of scores vs. ultimata by cluster



Source: own work.

The *K*-means algorithm seems to have split the data into low- and high- scores. Since this division is roughly equivalent to the split of *Low* and *Neutral/High* groups—and behaves accordingly, as illustrated in the second graph—, it seems that the group splitting is a relevant partition of the data.

3.3 REGRESSION ANALYSIS

The previously speculated hypotheses will be tested in this section with ordinary linear regressions. The first one will regress the scores against the ultimata; the second one will regress the scores against the ultimata, mean discounted; the third one will regress the scores against the absolute values of the ultimata, mean discounted:

I. $ULTIMATUM = \beta_{(1,0)}\, SCORE + \beta_{(0,0)}$

II. $ULTIMATUM - \overline{ULTIMATUM} = \beta_{(1,1)}\, SCORE + \beta_{(0,1)}$

III. $|\, ULTIMATUM - \overline{ULTIMATUM}\, | = \beta_{(1,2)}\, SCORE + \beta_{(0,2)}$

All standard errors are robust, specifically of the HC3 type, where the covariance matrix of the residuals is estimated by

$$diag\left[\frac{e_i^2}{(1-h_{ii})^2}\right]$$

For $i = 1{:}N$ observations and where $h_{ii} = x_i(X'X)^{-1}x_i'$. The denominator acts as to reduce the bias of e_i^2 and the "'over-influence' of observations with large variances" (ERVIN, LONG; 2000).

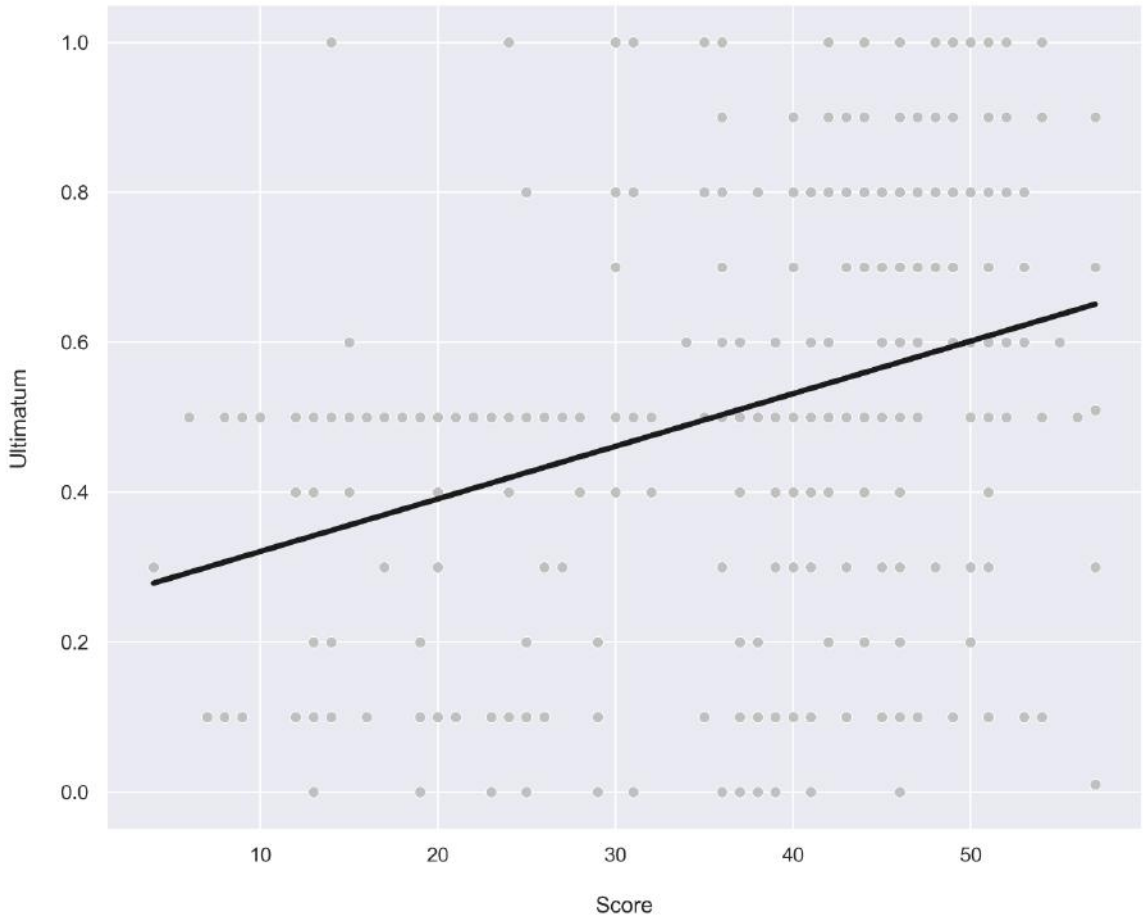
Results are summarized in the following tables and graphs.

TABLE 3 — Regression (I) summary

Coefficients	Value	SD	P-value	R-squared	Adj. R-squared
$\beta_{(0,0)}$	0.007	0.001	>0.001	0.111	0.108
$\beta_{(1,0)}$	0.250	0.038	>0.001		

Source: own work.

FIGURE 8 — Regression (I): scores vs ultimata



Source: own work.

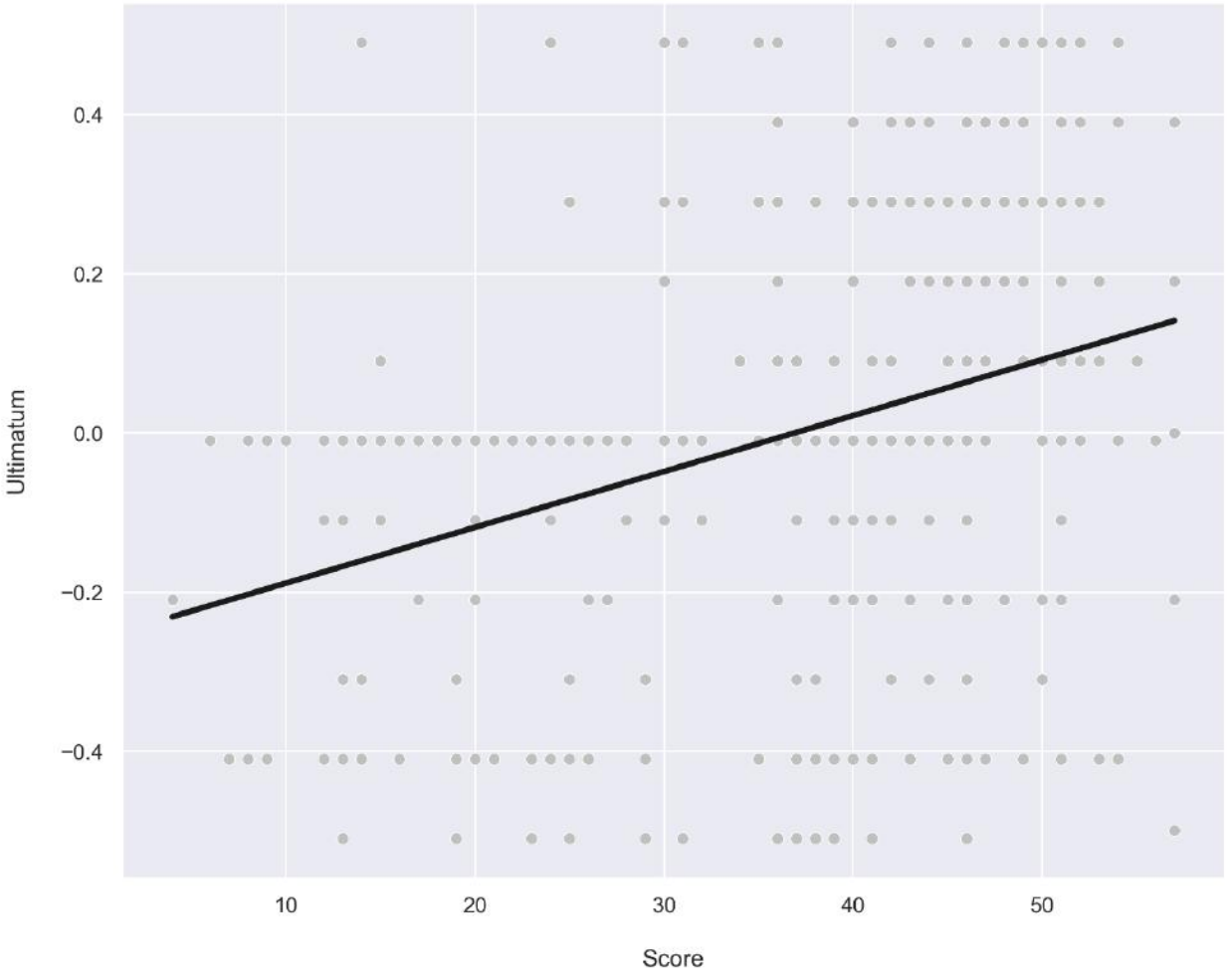
As expected, the scores and the ultimata are positively correlated. We can also investigate the scores' impact on the deviation from the mean:

TABLE 4 – Regression (II, III) summary

Coefficients	Value	SD	P-value	R-squared	Adj. R-squared
$\beta_{(0,1)}$	(0.259)	0.038	>0.001	0.111	0.108
$\beta_{(1,1)}$	0.007	0.001	>0.001		
$\beta_{(0,2)}$	0.114	0.031	>0.001	0.041	0.038
$\beta_{(1,2)}$	0.003	0.001	>0.001		

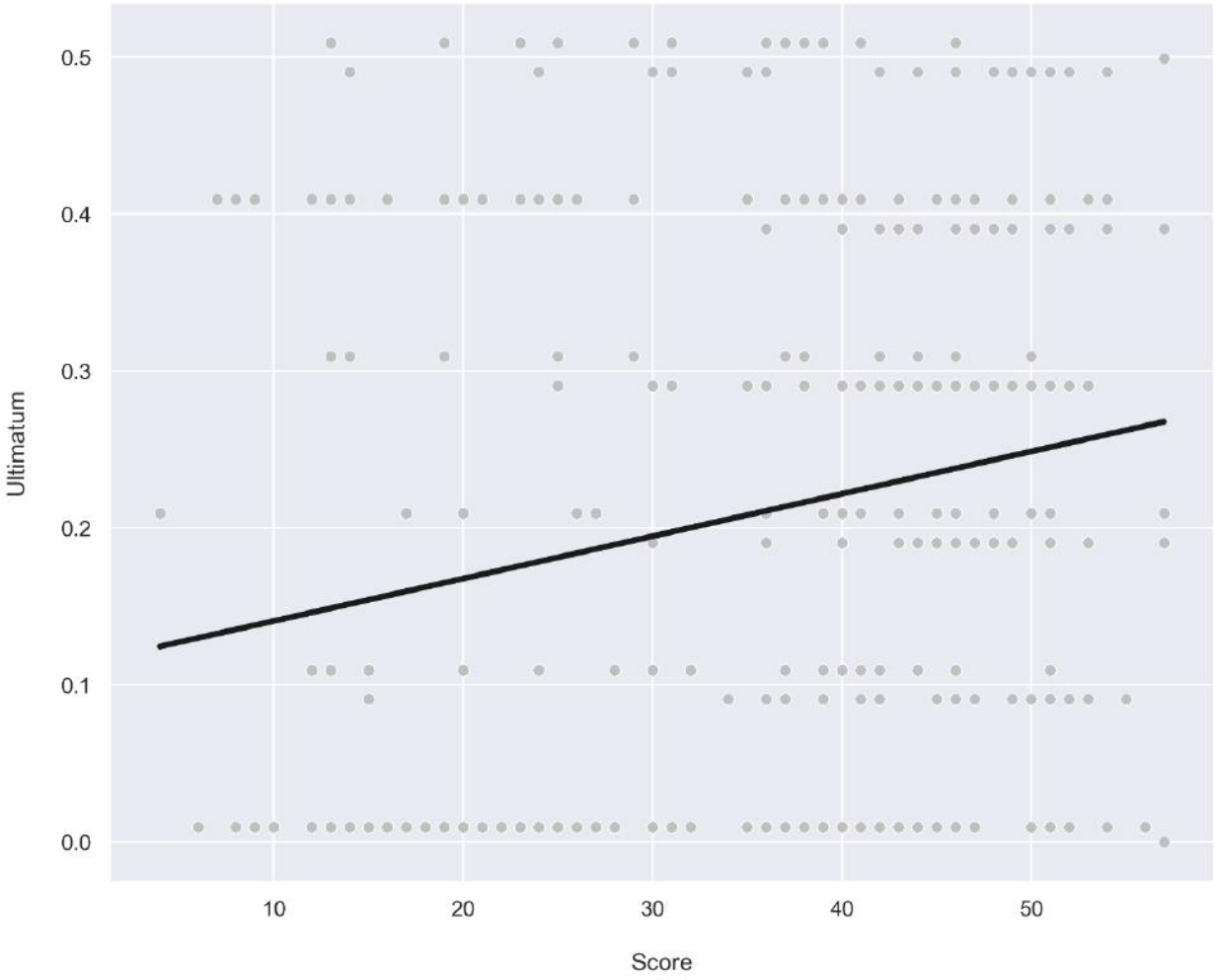
Source: own work.

FIGURE 9 — OLS (II): scores vs ultimata (mean discounted)



Source: own work.

FIGURE 10 — OLS (III): scores vs ultimata (absolute value with mean discounted)



Source: own work.

In line with the previous observations, groups account for a significant part of the individual score differences.

4 DISCUSSION

As it was observed, the higher a participant's score, the higher we can expect their ultimatum to be. In fact, only the *Neutral* and *High* groups had an average ultimatum whose value was equal or above that of an equitable distribution ($u = .5$). Essentially, this suggests that fairness does not seem to guide the decision-making of the offeror in the Ultimatum Game: rather than proposing fair ultimata based on morality, the player does so only because they know unfair distributions will leave them worse-off.

This is not a neglectable result: the current explanations for the experimental results observed for the Ultimatum Game are largely anchored on the premise that fairness motivates this specific pro-social behavior. A corollary is that players who lacked such sense of fairness would fail to offer just ultimata. The opposite was found in this thesis: it is evidence that offerors do not evoke justice, at least not primarily, in their strategies for the Ultimatum Game.

But this result should be addressed with caution. For example, sample defects might be present: the *High* group may have a higher income compared to the *Low* group; but since the *Neutral* group also had an average ultimatum substantially higher than that of the *Low* group, it should be verified if there exists a continuous, decreasing mapping of income and LSRP results.

That being said, the results are still consistent with Ohima and Osumi's (2010) finding that individuals with high psychopathic tendencies are less sensible to unjust distributions. In the context of the present thesis, not only are they less sensible as receptors, but also as offerors.

5 CONCLUSION

It is generally agreed upon that experimentally observed ultimata, which diverge from the Nash Equilibrium so as to generate equitable distributions, owe their existence to the players' sense of fairness.

Although certainly not definitive, this thesis' results go against the extension of this hypothesis to offerors, since high psychopathic tendency individuals, understood to be lacking in such sense, were precisely the ones to carry out the highest ultimata.

It is suggested that future research should control for missing variables, such as income and wealth, in an attempt to falsify the current results. Experiments with validated patients, particularly those diagnosed with Narcissistic and/or Antisocial Personality Disorders, have the potential to bring more precision to the assessment of the role of fairness on the Ultimatum Game.

6 APPENDIX

Below is the LSRP test, as sourced from Fitzpatrick, C. M.; Kiehl, K. A.; Levenson, M. R. (1995).

	Strongly disagree	Slightly disagree	Slightly agree	Strongly agree
Success is based on survival of the fittest; I am not concerned about the losers.				
I find myself in the same kinds of trouble, time after time.				
For me, what's right is whatever I can get away with.				
I am often bored.				
In today's world, I feel justified in doing anything I can get away with to succeed.				
I find that I am able to pursue one goal for a long time.				
My main purpose in life is getting as many goodies as I can.				
I don't plan anything very far in advance.				
Making a lot of money is my most important goal.				

I quickly lose interest in tasks I start.				
I let others worry about higher values; my main concern is with the bottom line.				
Most of my problems are due to the fact that other people just don't understand me.				
People who are stupid enough to get ripped off usually deserve it.				
Before I do anything, I carefully consider the possible consequences.				
Looking out for myself is my top priority.				
I have been in a lot of shouting matches with other people.				
I tell other people what they want to hear so that they will do what I want them to do.				
When I get frustrated, I often "let off steam" by blowing my top.				
I would be upset if my success came at someone else's expense.				
Love is overrated.				

I often admire a really clever scam.				
I make a point of trying not to hurt others in pursuit of my goals.				
I enjoy manipulating other people's feelings.				
I feel bad if my words or actions cause someone else to feel emotional pain.				
Even if I were trying very hard to sell something, I wouldn't lie about it.				
Cheating is not justified because it is unfair to others.				

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