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NORMS OF EGALITY AND THE GAP BETWEEN ATTITUDES AND BEHAVIOUR AMONGST POLISH STUDENTS: AN EXPERIMENTAL STUDY

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ABSTRACT. Social norms and ideals play an important role in determining the attitudes and behaviour of individuals. However, in many scenarios adhering to such norms or ideals leads to an individual incurring costs. In such a case, a gap may appear between the attitudes (intentions) and the behaviour of an individual. This article considers the gap between declared and observed readiness to punish an individual seen to act unfairly on the basis an experimental version of the Ultimatum Game. The authors highlight the difficulties of analysing such a gap. This experimental game was played by a sample of 1540 Polish students of state universities in each of the 16 Polish regions. These participants also filled out a questionnaire regarding their social capital, as well as attitudes and beliefs related to inequality and reciprocation. An analysis of the behaviour of individuals is presented, together with a mathematical model describing the gap between behaviour and stated intentions.

JEL Classification: C70, C72

Keywords: Experimental game theory, egality, intention-behaviour gap, social capital, Ultimatum Game, Poland.

Introduction

This article considers social norms regarding egality among Polish students on the basis of declarative statements and behaviour in an experimental game, the Ultimatum Game (Güth *et al.*, 1982). In this game, a pool of money is to be split between two players. The first player, the initiator, proposes how the money should be split. The second player, the respondent, either agrees to the split, in which case the two players receive the appropriate monetary payoffs, or disagrees, in which case neither player receives any money. This game was designed to illustrate norms regarding egality and negative reciprocation, i.e. punishment of behaviour that is seen to be unfair. Such norms are components of so called social capital, which is a multi-dimensional concept covering formal and informal norms, together with individuals' social relations. Social capital affects (and is affected by) how society and economic systems function.

One of the goals of this paper is to investigate how students' social capital is associated with declared and observed behaviour in the Ultimatum Game. The authors present novel models of the gap between the declared willingness to punish somebody seen to be

acting unfairly and the actual willingness to punish such actions when the act of punishment is costly.

Behaviour in the Ultimatum Game has been studied experimentally in many countries. For example, Roth *et al.* (1991) present results from an international study. However, this is the first such major study to be carried out in Poland. The behaviour exhibited by Polish students is similar to the behaviour exhibited by their peers in other Western countries. The declarations and behaviour indicate a strong social norm that promotes egality. The majority of initiators respect this norm by proposing an equal or (near equal) split. However, as respondents, Polish students punish an initiator who is seen to be unfair much less often than would result from their declarations. As far as the authors know, this is the first attempt to model this gap between declared and observed behaviour in the Ultimatum Game. It is assumed that the probability of accepting an offer as a respondent is a function of the offer's value relative to the minimal acceptable offer. Comparing the distribution of the declarations with the frequency of offers and the frequency at which various offers are rejected, the results of this study seem to support Kahneman's (2011) concept of fast and slow thinking. Those stating that they would only accept an equal share often give this response instinctively and then reconsider this decision when faced with a real offer. On the other hand, those stating that they would accept a lower offer are more likely to act according to this declaration. The fact that these two mechanisms are used means that a more complex approach must be used to model the intention-behaviour gap.

The layout of article is as follows: Section 1 gives a literature review. The study procedure is described in Section 2 and the Ultimatum Game in Section 3. Section 4 describes the methodology used to analyse the data. The declared intentions and behaviour observed are presented in Section 5. Section 6 presents a novel approach to modelling the gap between intentions and behaviour. This is followed by a short conclusion.

1. Literature Review

Bourdieu and Wacquant (1992) define social capital as "the sum of the resources, actual or virtual, that accrue to an individual or group by virtue of possessing a durable network of more or less institutionalised relationships of mutual acquaintance and recognition". Growiec (2011) considers social capital at the level of individuals in terms of individuals' networks of friends and relations. Such capital can be categorized as bonding or bridging. Bonding capital tends to be composed of relations with relatives and close friends. Such capital provides security and financial support, but can counteract an individual's personal freedom and development. Bridging capital tends to comprise relations with acquaintances and co-workers. Such capital can play a useful role in career development and innovation. Putnam *et al.* (1994) consider social capital in terms of membership of formal and informal organisations. Membership in such groups promotes cooperation and trust (see also Markowska-Przybyła and Ramsey, 2017).

The amounts offered by the initiators and the reactions of the recipients reflect social norms of egality and negative reciprocation. The norm of egality states that each player should receive a fair share. Here, this is assumed to be an equal share, since the roles of the player are chosen at random (Güth *et al.*, 2001). From the point of view of a respondent, there may be a gap between intention and behaviour (Kaiser *et al.*, 2010). A respondent might state that he/she would only accept an offer of at least k% as a purely declarative statement, but when he/she has to face a real decision, it is very possible that he/she would accept a lower offer. This is due to the fact that declarations to punish are not costly, whereas in the Ultimatum Game punishment is costly. From the point of view of an initiator, adherence to such a norm may be internalised, i.e. an initiator offers an even split as this is fair, or

externalised, i.e. an initiator offers an even split as otherwise he/she might be punished (Gintis, 2003). In many ways, adhering to such an externalised norm can be thought of as an intention-behaviour gap. However, in this case both adhering and not adhering to the norm of egality are associated with costs (in the first case due to accepting a lower payoff, in the second case due to the increased likelihood of rejection).

The study was carried out in the spring of 2014 amongst a large group of Polish students. These students are a very particular cohort, due to the fact that they are the first set of students to have grown up entirely after the fall of the communist bloc in Central and Eastern Europe. Wrzesień (2016) states that this generation is characterised by the rise of consumerism, the technological revolution and globalisation. The banking crisis of 2008, which did not hit Poland as hard as other European countries, is only part of the background to this generation, rather than a defining point. They do not have a grounding in the past and do not feel confident about their future: Dąbrowska and Skowron (2015) note that students, particularly of the humanities, feel that their future career is more dependent on the situation of the employment market than on themselves and that the job market is now saturated, unlike 10 or 20 years ago.

Social norms evolve relatively slowly, even after radical change in formal institutions, (Platje, 2004) and so the communist past will still have an imprint on the attitudes of today's graduates (although indirect and often unconscious). The research is aimed at elucidating the attitudes of Polish students to inequality, whose effects, both national and global, have been of great interest in recent times, both practically and in terms of research (e.g. Deaton, 2013; Piketty, 2014). High levels of inequality, both between and within countries, lead to social tension. As Woźniak (2016) states, Poland is catching up economically with Western European countries, but still clearly lags behind. According to official statistics, the Gini index of inequality in Poland increased from 0.230 in 1990, to 0.345 in 2005. It declined to 0.324 in 2011, but is still above the mean level of inequality in the EU nations. We analyse the intention-behaviour gap with regards to reacting to inequality, which reflects the degree of frustration resulting from inequality.

2. A Description of the Study

The research took place between 16/4/2014 and 12/6/2014 at public universities[1] in all of the 16 Polish regions by a team from "EU-CONSULT" Ltd., together with Dr. Urszula Markowska-Przybyła and Ewa Starczewska from the Faculty of Economics, Management and Tourism of Wrocław University of Economics. In total, 1540 students (volunteers from a wide range of faculties) took part, with between 88 and 100 students at each university, split into two to four consecutive sessions, each lasting about an hour. Each participant obtained a financial payoff based on the results of the games (mean 45PLN, approx. €11). The questionnaires and decisions were written on forms coded to identify players and their "opponents". Session members were split randomly into two groups (not knowing which group other students were in). They first made their decision in the Public Goods Game and the decision of the initiator in the appropriate game for their group (the Ultimatum Game or the Trust Game). Each student then received instructions for the game they had not played yet, together with the decision of their randomly chosen "opponent". This procedure was designed so that participants treated the games independently (when taking a decision, they possessed no information about the results of other games). Before making each decision, the participants had time to read the instructions and ask questions. They then completed the questionnaire (required to obtain their payoff), while the payoffs were being calculated, which

[1] These were all „uniwersytety", which give courses in a wide range of subjects, including the humanities, social sciences and sciences.

lasted about 20 minutes.

The variables considered in this paper are described below (see Markowska-Przybyła and Ramsey, 2015a for a full description of the questionnaire):

a) The size of a student's home town was categorised (by the student) using a four point scale (1: up to 5 thousand inhabitants, 2: from 5 to 20 thousand inhabitants, 3: from 20 to 100 thousand inhabitants, 4: above 100 thousand inhabitants). The location of the student's local tax office (the income from the study had to be declared) based on its northern and eastern coordinates was used as a proxy of their home town's location. The population of the city they studied in was taken from the Central Statistical Office (Główny Urząd Statystyczny, 2015).

b) The participants were asked "What is the frequency of your social contacts with the three following groups: relatives, close friends and acquaintances?" Social contact is measured on a seven-point scale, 1: never, 2: less than once a month, 3: once a month, 4: two/three times a month, 5: once a week, 6: several times a week, 7: daily. Organisation membership was assessed based on the following question with a binary (yes/no) answer: "Are you an active member of an organisation?" Members of organisations were asked which of the following types of organisations they belonged to: charity, sport/recreational, artistic/musical, political, religious, local interest or "another type" (yes/no answer in each case). When a student belonged to "another type" of organisation, they were asked to specifically state what type of organisation. Based on these answers, the class of "student/academic" organisations was added.

c) General values (relative importance of ethical and legal norms, reciprocation, aversion to inequality) were assessed as follows: The relative importance of ethical and legal norms was assessed by the question "In situations of conflict between legal and moral norms, which are the most important to you?" on a three point scale, 1: legal norms, 2: ethical norms, when the punishment for breaking legal norms is not too harsh, 3: ethical norms. Readiness to exhibit negative reciprocation in public affairs was assessed by the question "How often do you react when you see someone damaging public property? (e.g. call the police)" on a four-point scale, 1: never, 2: very rarely, 3: sometimes, 4: usually. Readiness to exhibit negative reciprocation to personal injury was assessed by the question "If somebody acts unfairly to you, how do you react?" on a four-point scale, 1: I do not react, 2: I react if it does not cost me anything, 3: I react only if there is a small cost, 4: I react, even if it involves changing plans and significant costs. A student's aversion to inequality was assessed by the question "What do you think about wage differences in society?" on a three-point scale, 1: inequality results from the free market and is thus just, 2: inequality is inevitable and, to some degree, good, but should be controlled by the government, 3: the government should minimize inequality.

d) The type of strategy seen as most likely to bring success and students' willingness to follow such a strategy. The first question was "Which of the following types of strategy gives the greatest probability of success?" There were four possible answers, given by the combinations of the legal dimension: a) acting in line with the law, b) acting on the edge of the law, and the social dimension: a) individual effort, b) cooperation. The willingness to follow such a strategy was assessed by the question "Do you intend to follow the type of strategy given above?" on a five-point scale: 1 – no, 2 – rather not, 3 – I do not know, 4 – rather, 5 – yes. These answers result from the interaction between a student's own views and their view of the world, particularly others' behaviour (Markowska-Przybyła and Ramsey, 2015b).

3. The Ultimatum Game

First, the initiator (referred to as she) proposes how 20PLN (about €5) should be split between two players. The amount she offers to the respondent (referred to as he) is denoted by *x*. This proposal must be a multiple of 1PLN. In other words, the initiator demands 20-*x*. The respondent then decides whether to accept this proposal. If he accepts it, then each player obtains the amount of money corresponding to the agreed split, i.e. the payoff vector is (20-*x*, *x*). If he rejects it, then neither player receives anything.

This game illustrates norms of negative reciprocation and egality. Under the assumption of economic rationality, i.e. that players maximize their expected payoff, the respondent should accept any positive amount. Hence, the initiator should not offer more than 1PLN. Roth *et al.* (1991) observed in an international study that most offers were between 40% and 50% of the available sum. Offers of below 20% were often rejected. However, when respondents think that offers are generated by a computer, then they behave according to economic rationality (Falk and Fischbacher, 2006). Hence, when the initiator is a human, the respondent can display negative reciprocation if the offer is small, i.e. punish someone for an unfair action. Henrich (2000) notes that an initiator often instinctively suggests an equal split, as she feels this is fair, or after some time, since she recognizes the possibility of reciprocation. This is confirmed by Markowska-Przybyła and Ramsey (2015b), who note that initiators stating that the strategy most likely to bring success involves cooperation and/or observing the law offer more on average than players stating that the strategy most likely to bring success involves both acting on the borders of the law and being individualistic. It is hypothesised that an equal split is seen as being fair and initiators offering an equal split act either by personal choice, i.e. an internalized norm (Gintis, 2003), or conform to a socially recognized norm.

In the questionnaire (answered after the games were played), the initiators were asked "Imagine you are playing the role of the respondent. What would be the minimum offer acceptable to you?" This value will be called an individual's threshold. Since our sample is large, we may assume that the distribution of these declarations is a reasonable estimator of the distribution of declarations in the student population as a whole. One obvious weak point of this approach is that we cannot directly link such a declaration to observed behaviour, since the initiators never played the role of respondent. However, in the context of our experiment, asking the respondents the analogous question is highly problematic. If this question is asked before the decision, then it is likely that simply stating the answer to such a question will affect their behaviour. Similarly, if the question is asked after the decision, then the answer will be a rationalisation of the observed behaviour (Kahneman, 2011). One advantage of the approach used here is that we can analyse the relation between the initiator's behaviour and this statement of intent. Putting oneself in the position of the respondent seems natural when playing the role of initiator and the problem of rationalisation is at least much reduced, since the link between behaviour and the statement of intent is indirect. This approach also allows us to highlight initiators who make a proposition that they would not accept themselves. Such behaviour will be called risky, although it is unclear how conscious such behaviour is.

4. Statistical Analysis

The main goal of this paper is to analyse the gap between intention and behaviour. This was analysed using novel regression procedures involving maximum likelihood estimation. Since these procedures are new, they are described fully in Chapter 5. These procedures were implemented by programs written in the R package and are available from the corresponding author on request.

The secondary goal of this paper is to analyse how the decisions of players and their thresholds are associated with other declarations and demographic variables. This is done with the aid of regression models (Field, 2013). Linear regression models are used to model how both the offers made by initiators and their stated thresholds are associated with the variables from the survey. Logistic regression is used to model both whether or not an initiator exhibits risky behaviour and how the probability of accepting an offer depends on both the amount of money offered and the variables from the survey. Since a relatively large number of variables were observed, we used a two-stage selection procedure. In the first stage, we found the variables that are significantly associated with the dependent variable according to the appropriate univariate test or test of correlation. To analyse the associations of offers and thresholds with ordinal or numerical variables, Spearman's test of correlation was used. To analyse the associations of offers and thresholds with nominal variables, the appropriate non-parametric test was used (Mann-Whitney when the categorical variable was binary, otherwise Kruskal-Wallis analysis of variance was used). To analyse the association of the decision of the respondent and the occurrence of risky behaviour by the initiator with ordinal or numerical variables, the Mann-Whitney test was used. To analyse the association of the decision of the respondent and occurrence of risky behaviour by the initiator with a nominal variable, Fisher's exact test of association was applied. In the second stage, stepwise elimination was employed to derive a regression model. The initial model included all the variables found to be significant at the first stage. The least significant variable in the current regression model was eliminated until all the explanatory variables remaining in the model were significant at the 5% level. This analysis was carried out using the SPSS package (Version 24).

5. Analysis of the Behaviour Observed and Declared Intentions

Table 1 presents the frequencies of the offers made and corresponding acceptance rates, together with the distribution of the stated thresholds. This is the subject of the following section. It should be noted that given the number of initiators (770), at the 95% confidence level, frequencies are estimated to within $\pm 3.7\%$.

If the stated threshold (intention) corresponds to actual behaviour, the probability of an offer being accepted would be equal to the cumulative frequency of the threshold. Under this assumption, the expected reward from an offer may be calculated by multiplying the amount demanded (twenty minus the offer) by the corresponding cumulative frequency. Note that given the distribution of thresholds, offering an even split maximizes the expected reward of the initiator. This is due to the fact that although virtually none of the initiators stated that they would reject an even split as a respondent, almost half of them stated that they would reject any split where they obtained less than the initiator.

It should also be noted that if the distribution of the threshold actually used in the Ultimatum Game was as given in *Table 1*, then the rejection rate would be clearly higher. This is due to the gap between declared intentions, which are not associated with any cost, and behaviour.

On the other hand, several similarities exist between the distribution of offers and the distribution of thresholds. This is unsurprising, since the initiator naturally tries to predict what the respondent would do and this may be done by imagining oneself in the role of the respondent. This threshold can be interpreted as an expression of aversion to inequality (the closer the threshold is to 10, the less accepting an individual is of inequality). For example, over 40% of the respondents stated that they would only accept an offer of at least half of the pool, while close to two thirds of the offers made suggested an even split. This indicates that there is a strong social norm for equality. Also, two local maxima in the distributions of the offer and of the threshold coincided. The first came at a 12:8 split and the second at a

15:5 split. One might interpret these splits as defining the boundaries between low and moderate inequality and between moderate and high inequality. The second border seems to be in agreement with the general observation that in Western countries the rejection rate increases sharply when the offer is less than 25% of the pool (Falk and Fischbacher, 2006).

A small number of initiators offered the respondent more than half of the money. It is likely that these students either misread the instructions (e.g. thought that they were demanding an amount of money, rather than offering it) or did not realize that the initiator has more bargaining power in the game. The distribution of the stated threshold shows a similar, though weaker, pattern. The models considered in the following section assume that the players make mistakes with some small probability.

There is a positive correlation between the stated threshold and the offer actually made ($r=0.310$, $p<0.001$, Spearman's test). Hence, those who stated that they would reject uneven splits were more likely to offer even splits. We should not infer that those offering even splits and stating that they would reject uneven splits have necessarily internalised a social norm promoting equality (they might try to take advantage of their bargaining position if they felt that were possible). However, it seems clear that such individuals have either internalised such a norm or feel that the respondent may well reject an offer seen to be unfair. This is concordant with the interviews carried out by Henrich (2000) with those who offered even splits.

Table 1. Distribution of offers, minimal acceptable offers and acceptance rates in the Ultimatum Game among the 770 initiators (one initiator did not answer the question regarding the minimum acceptable offer – the threshold)

Offer	Frequency of threshold	Cumulative frequency of threshold	Frequency of offer	Number of times accepted (Acceptance rate – as a percentage of the frequency of the offer)	Expected reward from offer given thresholds
0	16 (2.08%)	16 (2.08%)	22 (2.86%)	10 (45.45%)	0.416
1	64 (8.32%)	80 (10.40%)	1 (0.13%)	1 (100%)	1.977
2	8 (1.04%)	88 (11.44%)	2 (0.26%)	0 (0%)	2.060
3	6 (0.78%)	94 (12.22%)	5 (0.65%)	4 (80%)	2.078
4	12 (1.56%)	106 (13.78%)	10 (1.30%)	9 (90%)	2.205
5	167 (21.72%)	273 (35.50%)	62 (8.05%)	57 (91.94%)	5.325
6	15 (1.95%)	288 (37.45%)	10 (1.30%)	8 (80%)	5.243
7	31 (4.03%)	319 (41.49%)	25 (3.25%)	25 (100%)	5.393
8	78 (10.14%)	397 (51.63%)	74 (9.61%)	73 (98.65%)	6.195
9	27 (3.51%)	424 (55.14%)	25 (3.25%)	22 (88%)	6.065
10	329 (42.78%)	753 (97.92%)	493 (64.03%)	486 (98.58%)	9.792
11	3 (0.39%)	756 (98.31%)	9 (1.17%)	9 (100%)	8.848
12	3 (0.39%)	759 (98.70%)	7 (0.91%)	7 (100%)	7.896
13	1 (0.13%)	760 (98.83%)	2 (0.26%)	2 (100%)	6.918
14	0	760 (98.83%)	1 (0.13%)	1 (100%)	5.930
15	3 (0.39%)	763 (99.22%)	12 (1.56%)	12 (100%)	4.961
16	0	763 (99.22%)	0	-	3.969
17	0	763 (99.22%)	0	-	2.977
18	0	763 (99.22%)	0	-	1.984
19	0	763 (99.22%)	1 (0.13%)	1 (100%)	0.992
20	6 (0.78%)	769 (100%)	9 (1.17%)	9 (100%)	0
Total	769		770	736 (95.58%)	

Source: authors' experimental data.

There is one clear difference between the distribution of offers and the distribution of thresholds. The distribution of the threshold has a clear local maximum at 1 (64 of 769 individuals). This corresponds to the economically rational response. Although it is possible that some of these individuals had previously encountered the Ultimatum Game, this stated threshold was not associated with being either an economics student or a mathematics student. On the other hand, it is clear that these individuals did not expect the respondent to be economically rational. This may be inferred from the fact that on average the mean offer made by such players was relatively high (8.25) compared to others stating that their threshold was also low. Hence, while many of these "economically rational" players seem to understand the advantageous bargaining position of the initiator and tried to take some advantage of that position, they understood the risks of demanding too large a share.

Regression models were used to illustrate which factors were associated with the offers made and the stated threshold. It should be noted that categorical variables were recoded using binary variables corresponding to each category (the first category was treated as the baseline). The model describing the mean offer Y_1 is given by

$$Y_1 = 8.52 + 0.638X_1 - 1.238X_2 + 0.634X_3 + 0.606X_4 - 0.001X_5, \quad (1)$$

where $X_1 = 1$ if an individual states that the strategy most likely to bring success involves observing the law, otherwise $X_1 = 0$, $X_2 = 1$ if an individual belongs to a sports or recreation club, otherwise $X_2 = 0$, $X_3 = 1$ if an individual states that the government should ensure that inequality does not rise, otherwise $X_3 = 0$, $X_4 = 1$ if an individual states that the government should act to reduce inequality, otherwise $X_4 = 0$, X_5 is the population (in thousands) of the city that a student studies in. According to this model, those who state that the strategy most likely to bring success involves observing the law offer on average 0.638 more than those stating that such a strategy involves acting on the boundary of the law. This is unsurprising, since the first group is more likely to observe social norms. Those who are members of a sports or recreational club offer on average 1.238 less than those who are not members of such clubs. This is probably due to sports players framing the Ultimatum Game in terms of winning and losing. Hence, sports players are likely to gain utility simply by obtaining a larger payoff than the other player (Markowska-Przybyła and Ramsey, 2017). The terms involving X_3 and X_4 indicate that those who state that inequality is the fair result of the action of the free market offer on average about 0.6 less than those stating that the government should act to either control or reduce inequality (these two groups do not differ significantly from each other). Finally, the larger the city in which a student studies, the smaller on average the offers. This may be due to more ambitious, individualistic students being attracted to the universities with the best reputation and offering the best job prospects, which lie in the largest cities (notably Warsaw and Cracow).

Table 2. Mean offers proposed according to threshold

Threshold	Mean Offer	Frequency
1	*2*	*3*
0	7.31	16
1	8.25	64
2	7.63	8
3	7.83	6
4	6.67	12
5	8.50	167
6	8.07	15
7	8.65	31

1	*2*	*3*
8	9.36	78
9	9.74	27
≥ 10	9.60	345

Source: Authors' own research.

The model describing the mean threshold, Y_2 , is given by

$$Y_2 = 7.627 - 1.909X_1 - 1.758X_2 - 1.285X_3 - 0.607X_4 + 0.772X_5, \qquad (2)$$

where $X_1 = 1$ if an individual is a member of a religious organisation, otherwise $X_1 = 0$, $X_2 = 1$ if an individual belongs to a local interest organisation, otherwise $X_2 = 0$, $X_3 = 1$ if an individual belongs to a student organisation, otherwise $X_3 = 0$, $X_4 = 1$ if an individual states simply that ethical norms are more important than legal norms, otherwise $X_4 = 0$, $X_5 = 1$ if an individual states that the government should act to reduce inequality, otherwise $X_5 = 0$. It follows that members of religious, local interest and student organisations on average have lower thresholds. This is in line with the observation that organisation members state that they would react more strongly when public property is damaged than non-members, but members state that they would react less strongly to personal injury (Markowska-Przybyła and Ramsey, 2017). This is particularly clear in the case of members of religious organisations. Those who strongly stress ethical norms compared to legal norms also indicate a lower readiness to punish. On the other hand, those who feel that the government should act to reduce inequality indicate a high readiness to punish individuals who are seen to act unfairly (thus members of this group both actively act to implement egalitarian solutions when in the role of initiator, as well as expressing demands for equality when in the role of respondent).

One interesting group are individuals who as initiators offer less than they would accept as a respondent (72 of the 769 stating their threshold). Such behaviour might be interpreted as risky, but the motivation behind such behaviour might be unclear: are such players trying to dominate (be "alpha individuals") or are they unable to place themselves in the role of the other player? We carried out logistic regression to model the probability of individuals exhibiting such risky behaviour according to the variables observed in the questionnaire. Since there were several ordinal variables with a relatively large number of categories associated with such behaviour, for simplicity, these ordinal variables were treated as standard numerical variables. The model obtained is given by

$$p_1 = \frac{e^{Y_3}}{1+e^{Y_3}}, \text{where } Y_3 = -2.617 - 0.260X_1 - 0.252X_2 + 0.137X_3, \qquad (3)$$

where p_1 is the probability of a student offering less than he/she would accept, X_1 is the level of contact with close friends, X_2 is the level of intention of following the strategy stated to be the most likely to bring success and X_3 states how many degrees east the home town of a student lies. This equation states that such risky behaviour is more likely: a) the less regularly an individual interacts with close friends, b) the weaker the expressed intention to follow the strategy stated to be most likely to bring success, and c) the further east a student comes from. One may argue that these three factors are associated with a feeling of dissonance or isolation within society. For example, those who express a low level of intention to follow the strategy seen to be the most likely to bring success may well feel cognitive dissonance between the way they feel they should act and the way that they see people achieving success (Markowska-Przybyła and Ramsey, 2015b). The positive results of the economic transformation that Poland has undergone are more visible in the urban areas of Poland,

which has led to a feeling of injustice in rural areas, especially in the rural east (Malinowska, 2015).

Finally, we look at the factors influencing the likelihood of an offer being accepted. Using logistic regression based on stepwise elimination, we obtained the following model:

$$p_2 = \frac{e^{Y_4}}{1+e^{Y_4}}, \text{where } Y_4 = -2.577 + 0.569X_1 + 0.805X_2 - 0.553X_3 + 1.139X_4, \quad (4)$$

where p_2 is the probability of accepting an offer, X_1 is the offer made, X_2 is the category of the size of a student's home town, X_3 describes the regularity of contact with acquaintances and X_4 describes the level of reaction when public property is being damaged. This equation indicates that the probability of accepting an offer increases as: a) the offer increases, b) the size of the student's hometown increases, and c) the strength of reaction when public property is being damaged increases. On the other hand, the probability of accepting the offer decreases as the level of contact with acquaintances increases. The relation of the probability of acceptance with the strength of reaction when public property is damaged may be related to the association between strong reaction to damage to public property and weak reaction to personal injury among certain groups of individuals (particularly organization members, see Markowska-Przybyła and Ramsey, 2017). However, the role of the size of home town and level of contact with acquaintances seem less intuitive. For example, both high level of contact with acquaintances and coming from a large town are indicators of a high level of bridging capital compared to bonding capital (Growiec, 2011). On the other hand, according to our model, these factors have opposite effects on the probability of accepting an offer.

6. Analysis of the Gap between Stated Intentions and Behaviour

As described above, analysis of the gap between stated thresholds and actual behaviour by respondents in the ultimatum game is complicated by the context of our experiment. Hence, we are forced to use a statistical approach, arguing that since the sample size is large, the distribution of the stated thresholds is a good estimate of the distribution of the thresholds of the respondents. According to this approach, it is assumed that the probability of accepting an offer is a function of the relative value of the offer compared to the threshold. This relative value is denoted by r, i.e. $r = k/t$, where k denotes the value of the offer and t the stated threshold. Let $q_i(r)$ denote the probability of accepting an offer of relative value r, where the index i denotes the model used, $2 \leq i \leq 7$ (see the descriptions below). Note that when $t = 0$, it is assumed that $r = 1$ (also, according to the models described below, the probability of acceptance is constant for $r \geq 1$, i.e. the probability of accepting any offer which is at least as great as the threshold is constant). The models obtained in this way are compared with a standard logistic regression model, where the probability of accepting an offer depends purely on the absolute value of the offer.

We consider seven different models, as described below. Due to constraints on the length of the article, a brief mathematical description of only the second model is given (the first model is classical, the remaining models are analogous to the second). The forms of some of these models are illustrated in *Figure 1*.

Model 1. The probability of accepting an offer only depends on the absolute value of the offer itself, according to a logistic function.

Model 2. The probability of accepting an offer is a continuous function of r, which increases linearly in r between 0 and 1 and is constant for $r \geq 1$. For $0 \leq r \leq 1$, $q_2(r) = a + br$ and for $r > 1$, $q_2(r) = a + b$, where a and b are unknown parameters that should be estimated. The probability ε of rejecting an offer that meets or exceeds the stated threshold, $\varepsilon = 1 - a - b$, may be interpreted as the probability of making a mistake in such a situation.

Since Model 2 clearly overestimates the probability of accepting the demand that the initiator obtains all the money (see the results given below), we consider Model 3, which takes into account the possible psychological reactions of the respondent when a) he was not offered any money or b) he was offered an amount of money which was smaller than his threshold. For example, based on such a psychological effect, we would expect a relatively sharp fall in the probability of acceptance when the offer is 4 rather than 5, or 9 rather than 10, since many players state that their threshold is either 5 or 10.

Model 3. The probability of accepting an offer is as described in Model 2, except that the probability of accepting an offer is discontinuous at both $r = 0$ and $r = 1$ (i.e. the probability of accepting an offer increases suddenly when the threshold is met or the initiator does not demand all the money, by a and γ, respectively). This model is given by $q_3(0) = d$, $q_3(r) = d + a + br$ for $0 < r < 1$, and $q_3(r) = d + a + b + \gamma$ for $r \geq 1$, where $0 \leq a, b, d, \gamma, d + a + b + \gamma \leq 1$.

This model indicated that there was no sudden fall in the probability of accepting offers just below the stated threshold (the value of the parameter γ, which represents the height of the jump in the probability of acceptance when the threshold is met, is very close to zero and removing this parameter from the model left the likelihood of the data given the model almost unchanged). Inspection of the data supports this conclusion, since the vast majority of offers of 8 or 9 are accepted. Hence, we do not present results for Model 3 and simplified this model to the following one, Model 4.

Model 4. The probability of accepting an offer is as described in Model 2, except for the possibility of the probability of accepting an offer of 0 (when the stated threshold is greater than 0) being smaller (by a) than the probability resulting from the linear function. This model is given by $q_4(0) = d$, $q_4(r) = d + a + br$ for $0 < r \leq 1$, and $q_4(r) = d + a + b$ for $r \geq 1$, where the parameters satisfy $0 \leq a, b, d, d + a + b \leq 1$.

Models 5-7. These models are analogous to Models 2-4, respectively, except for the fact that the probability of acceptance is a logistic function of r when $0 < r < 1$. These models are defined by the following equations:

Model 5: $$q_5(r) = \frac{e^{(a+br)}}{1+e^{(a+br)}},\ 0 \leq r \leq 1 \text{ and } q_5(r) = \frac{e^{(a+b)}}{1+e^{(a+b)}},\ r > 1 \quad (5)$$

Model 6: $$q_6(0) = d, q_6(r) = d + \frac{(1-d-\gamma)e^{(a+br)}}{1+e^{(a+br)}},\quad 0 < r < 1 \text{ and}$$
$$q_6(r) = d + \gamma + \frac{(1-d-\gamma)e^{(a+b)}}{1+e^{(a+b)}},\qquad r \geq 1 \quad (6)$$

Model 7: $$q_6(0) = d, q_6(r) = d + \frac{(1-d)e^{(a+br)}}{1+e^{(a+br)}}, 0 < r \leq 1 \text{ and } q_6(r) = d + \frac{(1-d)e^{(a+b)}}{1+e^{(a+b)}} \quad (7)$$

These models are qualitatively very similar to Models 2-4 apart from the fact that when an offer is below the threshold, the probability of accepting an offer is a curvilinear function of r (follows a logistic function), rather than a linear function (see *Figure 1*). Models 5-7 can be interpreted as adaptations of the Rasch model (Bond and Fox, 2001), where the probability of exhibiting a behaviour is a logistic function of an individual's intention and the cost of exhibiting that behaviour. Again, Model 6 indicated there was no sudden fall in the probability of accepting offers just below the stated threshold and removing the parameter γ from the model left the log-likelihood almost unchanged. Hence, we do not present results for this model.

Based on any of the above models, we can estimate the probability that an offer of absolute value k is accepted. Let the estimate of this probability according to the i-th model be $p_i(k)$, for $0 \leq k \leq 20$. The likelihood of the data based on model i, denoted L_i , is thus given by

$$L_i = \prod_{k=0}^{20} [p_i(k)]^{a(k)} [1 - p_i(k)]^{r(k)}, \quad (8)$$

where $a(k)$ and $r(k)$ denote the number of times an offer of k is accepted and rejected, respectively. Since the values of these likelihoods are close to zero, we calculate the logarithm of this expression. When comparing models with the same number of parameters, the model which gives the greatest likelihood is preferred. When comparing models with differing numbers of parameters, the model with a larger number of parameters is only preferred when the addition of extra parameters leads to a significantly better fit according to the appropriate chi-square goodness of fit test.

The first model considered is a standard logistic regression model, where the probability of acceptance, $p_1(k)$, simply depends on the absolute value of the offer, k. The form of the model was derived using the SPSS package and is given by

$$p_1(k) = \frac{e^{Y_1(k)}}{1+e^{Y_1(k)}}, \text{ where } Y_1(k) = -0.0868+0.4351k. \quad (9)$$

According to this model, the probability of the respondent accepting that the initiator takes all the money is 0.4783. As the offer increases the probability of acceptance rises swiftly (an offer of 5 is accepted with a probability of approximately 0.8898 and an offer of 10 is accepted with a probability of approximately 0.9861. The log-likelihood of the data given this model is -103.4708.

According to the second model, the probability of accepting an offer of value r relative to the threshold is given by $q_2(r) = a + br$ for $r < 1$ and $q_2(r) = a + b$ for $r \geq 1$, where a and b are parameters to be estimated. Since we do not know the value of the threshold, we assume that it comes from the distribution of stated thresholds and calculate the probability of accepting a particular offer under this assumption. Let T be the random variable describing the stated thresholds and t denote a realization of this random variable. It follows that given an offer of absolute value k satisfies $k \geq t$ ($r = k/t \geq 1$), then the probability of such an offer being accepted is $a + b$. When $k < t$, then then this probability is $a + bk/t$. Using the law of total probability, the probability of accepting an offer of absolute value k is given by

$$p_2(k) = \sum_{t=0}^{k}(a+b)P(T=t) + \sum_{t=k+1}^{20}\left(a+\frac{bk}{t}\right)P(T=t). \quad (10)$$

It should be noted that each of these probabilities are of the form $p_2(k) = a + c_k b$, where $0 < c_k \leq 1$. The likelihood function given by Equation (8) can be maximized using the expectation maximization (EM) algorithm (Dempster *et al.*, 1977). This procedure was implemented using a program written in the R package by the authors. Using this iterative algorithm, the natural constraints on the parameters ($0 \leq a, b, a+ b \leq 1$) always hold at each stage. Also, the value of the likelihood function increases at each iteration. The model estimated using this procedure is given by

$$q_2(r) = 0.5729 + 0.4172r, \;\; 0 \leq r \leq 1 \;\; \text{and } q_2(r) = 0.9900, \; r > 1. \quad (11)$$

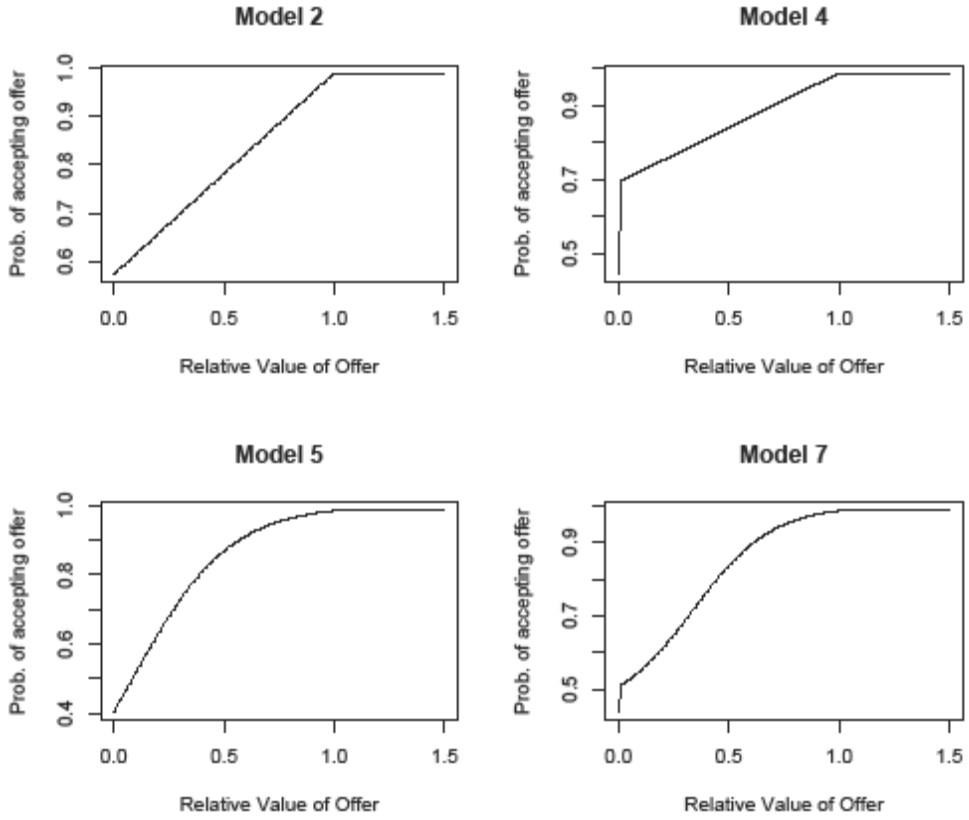

Figure 1. Illustration of the models describing the probability of accepting an offer based on the relative value of an offer compared to the threshold. Note that according to Models 4 and 7 there is a discontinuity when the relative value of the offer is 0. The probability of accepting such an offer is given by the value at the bottom.
Source: The authors.

According to this model, the estimated probability of a respondent accepting a demand from the initiator to take all the money is 0.5729, which is rather higher than indicated by the data. The probability that an individual rejects an offer which meets his threshold, i.e. makes an error in such situations, is approximately 0.01. The log-likelihood of the data under this model is -105.6190. Since both this model and the logistic regression model require the estimation of 2 parameters, we prefer the logistic regression model which gives a better fit to the data (a greater log-likelihood).

Model 4 was estimated in a similar way. The estimated probability of accepting an offer of relative value r is given by $q_4(r)$, where

$$q_4(0) = 0.4432, q_4(r) = 0.6927 + 0.2956r \text{ for } 0 < r \leq 1 \text{ and } q_4(r) = 0.9883, r > 1. \quad (12)$$

Hence, the estimated probability of a respondent accepting a demand from the initiator to take all the money is 0.4432, which agrees well with the data. There is a jump in the probability of accepting an offer at r = 0 of size 0.2495 and then the probability of acceptance increases linearly until the threshold is met, when the probability of rejection is estimated to be 0.0117. The log-likelihood for this model is -104.1769, which indicates that this model does not fit the data as well as the logistic regression model (and contains more parameters). Hence, the original model is still preferred.

Under Model 5, the expressions describing the probability of accepting an offer of absolute value k - which can be derived by using an equation analogous to Equation (10) – are relatively complex non-linear expressions of the parameters a and b, which means that it is impractical to implement the EM algorithm in this case. However, the values of a and b are not constrained. The Hooke-Jeeves algorithm for global optimisation was applied by writing a program in the R package which called the appropriate optimisation procedure (Kelley, 1999 gives a description of this procedure). The model obtained is of the following form:

$$q_5(r) = \frac{e^{-0.3909+4.5494r}}{1+e^{-0.3909+4.5494r}}, 0 \le r \le 1, \quad q_5(r) = 0.9846, \ r > 1. \tag{13}$$

According to this model, the estimated probability of a respondent accepting a demand from the initiator to take all the money is 0.4035 and the probability of rejecting an offer which meets the threshold is estimated to be 0.0154. The log-likelihood of the data under this model is -103.8724. This is a slightly worse fit to the data than the logistic regression model (using the same number of parameters).

Under Model 7, the parameter d is constrained to be in the interval [0, 1] and for this reason the COBYLA algorithm for constrained optimisation (Powell, 1998) was implemented using a program written in the R package. The model obtained using this procedure is given by

$$q_7(0) = 0.4363, \ q_7(r) = 0.4363 + 0.5637\frac{e^{-1.9404+5.6557r}}{1+e^{-1.9404+5.6557r}}, \ 0 < r \le 1,$$
$$q_7(r) = 0.9866, \qquad r > 1. \tag{14}$$

According to this model, the estimated probability of a respondent accepting a demand from the initiator to take all the money is 0.4363 and the probability of rejecting an offer which meets the threshold is estimated to be 0.0134. The jump in the probability of accepting an offer at $r = 0$ is estimated to be 0.0810. The log-likelihood of the data under this model is -103.6703, which indicates that out of all the models considered the logistic regression model is the model which best fits the data.

Hence, it may be stated that these models based on the distribution of the thresholds do not give us significant information about the behaviour of respondents in the Ultimatum Game. In particular, there is no evidence that the rejection rate suddenly increases when an offer is slightly below an individual's threshold rather than meeting that threshold. On the other hand, there does seem to be some evidence that there is a significant difference between offering 1PLN and not offering anything (which is in accord with classical game theory). Admittedly, the best fitting model (the logistic regression model) does not take into account the possibility of a discontinuity of the function describing the probability of acceptance at this point. However, the slope of the logistic curve describing this relationship is very steep around zero. Some of the reasons for the lack of explanatory power of the models proposed and possible future directions for research are considered in the conclusion.

7. Discussion and Conclusion

This article has firstly investigated how the intentions and behaviour of individuals in the Ultimatum Game depend on demographic variables and declarations regarding their social behaviour and their declared attitude to e.g. inequality and readiness to reciprocate. In addition, the authors have proposed statistical models which illustrate the intention-behaviour gap in the Ultimatum Game.

Initiators who propose even splits actively seek egality in such situations, regardless of whether a player has internalised the norm for egality or observes a socially accepted norm. This seems to be reflected in the model describing the offers made by initiators. Those stating that the government should play a role in either controlling or reducing the level of inequality in society and those stating that the strategies most likely to bring success involve acting in line with the law offer even splits more often than others. Ambitious and/or competitive individuals (e.g. those studying in the most renowned universities and sports players) demand more.

The level of intention declared by initiators to punish unfair offers if they were playing the role of the respondent is negatively associated with membership of an organisation (particularly religious organisations). This is in accordance with the observation that membership in organisations promotes socially orientated behaviour and is associated with lower levels of negative reciprocation to personal injury, but higher levels of reaction when public property (Markowska-Przybyła and Ramsey, 2017).

Since an initiator is likely to imagine what she (or others) would do when playing the role of the respondent, there are a number of similarities between the distributions of offers and thresholds. The positions of the peaks in the distributions coincide to a large degree (the largest peak corresponds to an even split in both cases). In addition, if the thresholds actually used corresponded exactly to the stated thresholds, then offering an equal split maximises the expected payoff of the initiator. On the other hand, nearly 10% of initiators offered less than they would find acceptable according to their stated threshold. Such behaviour may be considered as risky and is associated with a low level of both contact with friends and intention to follow the strategy stated to be most likely to bring success, as well as with coming from the east of Poland. These traits may be seen as indicators of a feeling of isolation.

Comparing the stated thresholds and the decisions made by the respondents, it is clear that there is a large intention-behaviour gap. This is due to the very clear costs of rejecting an offer, particularly of offers that are not much smaller than 10. In this article, we have proposed a model which assumes that the probability of accepting an offer is a function of the value of an offer relative to the threshold. None of these models give a better fit to the data than a logistic regression model in which the probability of acceptance is simply a function of the absolute value of the offer. One obvious problem with the model presented here is that it assumes that the cognitive process leading to stating a particular threshold does not depend on the person asked. For example, "I would only accept a split where I receive at least 50%" is often an instinctive answer. On the other hand, those who declare lower thresholds might instinctively feel that an even split is fair, but make a deeper cognitive analysis of how comfortable they would feel about receiving an offer of less than 50% (Kahneman, 2011). One would thus expect that the declared threshold is a function of both an individual's readiness to punish and the cognitive effort made before this declaration is made. After receiving an initial offer, if it is below the stated threshold, then the respondent would make a reappraisal of whether to accept or reject the offer. This reappraisal would depend on how much cognitive effort was utilized before the declaration, i.e. the function describing the probability of accepting an offer should explicitly depend on the declared threshold. Unfortunately, this would lead to a significant increase in the number of parameters needed to describe such a model, even if the declared thresholds were categorized according to the proximity to peaks in the distribution of these thresholds. On the other hand, the results presented here are clearly in agreement with the observation that offers of 20% or below are rejected fairly commonly, while those of above 20% are very rarely rejected. The declared thresholds seem to indicate that a 75%: 25% split is seen in some way to be a boundary between relatively large, but acceptable inequality and unacceptable inequality.

The declared thresholds indicate that there is a strong social norm for egality among Polish students, whilst the behaviour of respondents indicates that with respect to readiness to punish unfair actions there is a large gap between declarations and actual behaviour. One may ask whether students interpret the question requiring them to declare their hypothetical threshold as relating to a game played with a general member of society, rather than another student. It is possible that the resulting intention-behaviour gap might be smaller if the study group were more representative of the population as a whole (individuals might be less likely to punish a member of their own in group). How the behaviour of initiators depends on whether they are playing with a member of an in group or with a randomly chosen individual may well depend on the balance between the following two factors: a) an initiator could be naturally more inclined to behave fairly to a member of her own group, but on the other hand, b) there might be a greater probability of avoiding punishment when a large demand is made. These issues might be promising areas for future research.

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