

# Cultural Differences in Ultimatum Game Experiments: Evidence from a Meta-Analysis

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## **Abstract**

This paper reports the findings of a meta-analysis of 37 papers with 75 results from ultimatum game experiments. We find that on average the proposer offers 40% of the pie to the responder. This share is smaller for larger pie sizes and larger when a strategy method is used or when subjects are inexperienced. On average 16% of the offers is rejected. The rejection rate is lower for larger pie sizes and for larger shares offered. Responders are less willing to accept an offer when the strategy method is employed. As the results come from different countries, meta-analysis provides an alternative way to investigate whether bargaining behavior in ultimatum games differs across countries. We find differences in behavior of responders (and not of proposers) across geographical regions. With one exception, these differences cannot be attributed to various cultural traits on which for instance the cultural classifications of Hofstede (1991) and Inglehart (2000) are based.

**Keywords:** ultimatum game, meta-analysis, cultural differences

**JEL Classification:** C78, C91, Z10

## **1. Introduction**

A key insight from over two decades of experimental economics research is that people typically do not behave as selfish as traditional economics assume them to do. An experimental game that produced very convincing evidence in this regard is the ultimatum game. In this game player 1 proposes to player 2 the division of a sum of money. Player 2 either accepts the proposal in which case the players reap revenues according to the proposal, or player 2 rejects in which case both players receive nothing. Backward induction predicts that player 2 accepts every positive amount. Player 1 anticipates this and offers player 2 the smallest amount possible. This is, however, not how subjects in the laboratory typically play this game. Proposers usually offer substantially more than the smallest possible amount and responders often reject amounts larger than this. For instance, in the first ultimatum game experiment by Güth et al. (1982), proposers offer their opponent on average 36.7% of the pie (ranging in size between 4 and 10 DM), while one offer of 30% (1.20 DM out of 4 DM) was rejected. A common interpretation is that responders' behavior expresses that they would rather forgo some money than be treated unfair. Proposers' behavior is understood as

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combining two motives; some taste for fairness and the anticipation that small offers may be turned down (cf. Thaler, 1988, p. 197).

The experimental studies of the ultimatum game have in common that results deviate from the backwards induction point predictions. The variation of average offers and rejection rates across studies is, however, substantial. Henrich (2000), for instance, reports an average offer equal to 26% among 21 participants in Peru who each had to divide USD 160 with their opponent. In contrast, Buchan et al. (1999) find among 11 participants in Japan an average offer of 51% when the total pie equals USD 50. It has been investigated whether differences in offers are caused by differences in the amount of money that is at stake. Results tend to reject this as an explanation. Studies in which raising the stakes in ultimatum games was the explicit focus typically find no significant differences in the shares offered, while the rejection rate decreases as the stakes are increased (Cameron, 1999; Hoffman et al., 1996; Munier and Zaharia, 1998; Slonim and Roth, 1998).

Another explanation for variation in average offers and rejection rates across studies points to cultural differences. This explanation finds support in a number of studies. In their well-known paper Roth et al. (1991) compare behavior of subjects in four different countries in two environments. In a market environment, they find that subjects in Jerusalem, Tokyo, Ljubljana and Pittsburgh behave similarly. For the ultimatum game (resembling a bargaining environment) on the other hand, substantial differences were observed across countries. In the US and Yugoslavia the offers are higher than in Japan, where in turn the offers are higher than in Israel. Because no differences were found for the market environment, Roth et al. conclude that the cross-country differences in the ultimatum games are not due to differences in languages, currencies, or experimenters. Other researchers have replicated this study. Henrich (2000) reports differences between 18–30 olds Machiguenga men of the Peruvian Amazon and students at UCLA, with the former offering smaller amounts than the latter. Buchan et al. (1999) report differences between subjects recruited from comparable student populations in Pennsylvania and Tokyo, with the former offering less than the latter. Henrich et al. (2001) find substantial differences in the outcomes of the ultimatum game between subjects in 15 different societies. In contrast, Okada and Riedl (1999) find no differences in offers or rejection rates between subject groups in Vienna and Kyoto.<sup>1</sup>

The approach adopted in the cross-country/cross-culture studies has two potential drawbacks. First, these studies typically contain data from *only one* city of each country included in the analysis. Nothing guarantees that the differences between (say) Pittsburgh and Jerusalem are larger than the differences that would have been observed between Pittsburgh and (say) New York, or between Jerusalem and (say) Tel Aviv. When the within country differences are of the same magnitude as the between country differences, it obviously becomes less sensible to attribute differences between subject pools to cultural differences. But since New York and Tel Aviv are not included in the experimental design, there are no data to test this. The inconsistency of the findings of Roth et al. (1991) and Buchan et al. (1999) regarding differences in offered shares between the US and Japan—with the first study finding higher offers in the US than in Japan and the second study finding the reverse —, illustrates this problem. A second drawback of the usual cross-country/cross-culture studies is that cross-country differences are attributed to cultural differences without specifying the cultural traits that underlie differences in subjects' behavior.

This paper reports about a meta-analysis of 37 papers with results from ultimatum game experiments. A meta-analysis combines and integrates the results of several studies that share a common aspect so as to be “combinable” in a statistical manner (see Egger and Smith, 1997; Hunter and Smith, 1990). The 37 papers give results for 25 different countries and we use this feature to examine the issues just mentioned. We first clustered results by the countries or regions in which the experiments were conducted. Preferably clustering is at the level of separate countries but when the number of observations for a country was too small, we clustered by geographic region. We use this clustering to examine whether there are systematic differences in subjects’ behavior across countries/regions. Next, we supplemented the information from the ultimatum game studies with information on countries’ cultural traits. These traits are extracted from the work of leading scholars in the field of cultural differences, in particular the work of Hofstede (1991) who studied national cultural differences and of Inglehart (2000) who studied cross-cultural variation. For each trait we formulate explicit predictions about how subjects’ behavior in ultimatum games vary with these traits. Subsequently we put these predictions to the test. More exploratory we also relate subjects’ behavior to country level information about trust and competitiveness, two variables which seem to have immediate relevance for subjects’ behavior in ultimatum games, and to GDP per capita and income inequality.

The remainder of this paper is organized as follows. Section 2 elaborates on the process of the collection of studies. While the primary interest of this paper is the variation in behavior across countries, the available data also allows us to present descriptive statistics on average offers and rejection rates, and to investigate their relation to study characteristics such as the pie size and the composition of the subject pool. As these are of interest in their own right, Section 3 presents these results. Section 4 reports about geographic differences and about the effects of cultural traits. Section 5 summarizes and concludes.

## **2. Data collection**

According to Mullen and Miller (1991) the legwork of actually obtaining copies of studies for a meta-analysis can be tedious and time-consuming, and requires the combined skills of a psycholinguist, archeologist, and private detective (p. 432). Of great help for our first steps into these three professions were the websites of Alvin Roth of Harvard University and of Charles Holt of the University of Virginia.<sup>2</sup> Both provide extensive bibliographies of experimental economics papers and served as our points of departure. Subsequently we have checked the reference lists of the papers which were included in these bibliographies and which had something to do with ultimatum games. We also used the available search machines on the Internet and contacted researchers in several countries sending them a list of the studies we already detected from the respective countries and asking them whether they were aware of any additional studies, possibly in another language than English.

This procedure resulted in a long list of studies. For reasons of comparability we have chosen to restrict the analysis to results of the standard ultimatum game. In experimental studies this game comes in two forms. The most common form is the game described in the introduction. In the second form responders have to specify in advance (that is, before proposer’s offer is known) which offers to accept and which to reject. This is the

so-called *strategy method*, as it extracts from the responder his complete strategy rather than his strategy conditional upon the proposer's offer (which is just one action).<sup>3</sup> We include results from both types of experimental setups in our dataset and check whether there are indeed systematic differences.

Restricting our database to studies that fit the above descriptions excludes a large number of studies in which subjects play some variation of the ultimatum game. Examples of such excluded variations are:

- Studies in which there is no real money at stake so that the results refer to subjects' behavior in a hypothetical situation rather than when cash payments are at stake. Results from the studies of Bethwaite and Tompkinson (1996), Boyes (1996), Ortona (1991) and Tompkinson and Bethwaite (1995) are therefore excluded from our meta-analysis.
- In some studies proposers do not have a (almost) continuous offer space, but are restricted to choose between a small number of distributions. In Abbink et al. (1999) the choice is restricted to a 5-5 and an 8-2 division; in Meyer (1992) the choice is between an 8-2 and a 7-3 division.
- Several papers report about experiments in which there is one-sided uncertainty. The responder gets to know the probability distribution of offers rather than the exact offer or, as in the strategy design, no offer at all. Examples are Abbink et al. (2001), Mitzkewitz and Nagel (1993), Rapoport and Sundali (1996) and Rapoport et al. (1996).
- Furthermore experiments in which decisions were made by groups rather than by individuals did not qualify for inclusion in our database (Robert and Carnevale, 1997; Messick et al., 1997).
- Nor did we include the three-person ultimatum game with one proposer and two responders as studied by Güth and Van Damme (1998).
- We also excluded a study in which subjects were aware of the name of the person with whom (s)he was matched (Ferstman and Gneezy, 2001b).

Despite the exclusion of these deviating studies, there remains variation in the precise designs of the experiments. This variation is related to the following aspects:

- As already mentioned, both studies in which responders have to specify a complete strategy and studies in which only responses to actual offers are required, are included. According to Güth and Tietz (1990) the strategy method strengthens fairness considerations, which might thus lead to some systematic differences between the two types of studies.
- There are huge variations across studies in the total amounts of money that are up for division. In some cases the stakes are extremely high (especially in terms of local purchasing power), while in others the amounts are very modest. Studies that focus on the effects of larger stakes tend to find that this does not affect the share offered, but does reduce the rejection rate.
- In some studies subjects play the game only once while in others they play the game a couple of times (against different unknown others). Playing the game repeatedly teaches subjects how to play the game, which may affect behavior. Roth and Erev (1995) and Slonim and Roth (1998) present evidence showing that proposers give their opponent a smaller share when they have gained experience.

- For different studies subjects have been recruited from different pools. In most cases subjects are recruited from the student population of the department with which the researchers are affiliated. In that case subjects typically have a background in economics or business. In a few studies, however, subjects have a background in another field (sociology or psychology), or have no academic background at all. The evidence on differences between behavior of economists and non-economists is mixed. Kahneman et al. (1986a, 1986b) and Carter and Irons (1991) find that economists behave differently, while Kagel et al. (1996) observe no such differences in the context of ultimatum game experiments.

The search procedure together with the selection criteria resulted in 37 papers. Most of these papers extend the standard ultimatum game in one way or another, for instance by varying the information conditions or by including a third party. But while they extend the standard ultimatum game, a common feature of these papers is that they also report results on the standard ultimatum game. In most cases these results serve as a benchmark for the results of the extended versions. Together the 37 papers provide us with 75 results of standard ultimatum game experiments. Several papers include more than one result as they present outcomes from more than one city or from more than one independent group of subjects. In the list of references, we marked with an asterisk the studies from which we extracted information for our meta-analysis.

From each paper we took—if available—the following information: the mean fraction of the available amount offered to the responder, the rejection rate, year of publication, year in which the experiment was held, country in which the experiment was organized, a dummy equal to one when results refer to the first (single) time that subjects played an ultimatum game,<sup>4</sup> the size of the pie, the number of observations (where a combination of an offer and response constitute one observation), a dummy variable indicating whether the experimenters used the strategy method, and a dummy variable indicating whether the subject pool predominantly consisted of students with an economics background or not.<sup>5</sup> To make pie sizes comparable across countries we divided by the country's GDP per capita.

Notice that our dataset is based on information available from the papers, we did not approach the researchers involved to get any additional information, nor did we attempt to obtain the original raw data. As a result, for some studies there are missing variables. More importantly perhaps is that it also implies that we have no information on the dispersion of the offered amounts within a study because this is usually not reported. For the meta-analysis we therefore constructed a dataset in which one experiment in one city or location represents only one data point. In a purist's view this is the desirable mapping of subjects' actions into observations since otherwise inferences are drawn on the basis of observations that are not independent. It must be noted though that averages are a crude summary of ultimatum game data, and we would have liked to have information on the variance of the actual distribution of offers within a study.

### 3. Descriptive statistics and the effects of study characteristics

Table 1 presents descriptive statistics of the 75 results.<sup>6</sup> The year of publication covers the range from 1982 to 2003. The paper by Güth et al. (1982) marks the beginning of this line

*Table 1.* Descriptive statistics.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Year of publication	75	1998.0 <i>1998.4</i>	3.66 <i>3.60</i>	1982	2001
Year of experiment	28	1993.9 <i>1994.7</i>	3.37 <i>3.13</i>	1988	1998
Pie size in USD	57	37.12 <i>44.08</i>	86.05 <i>100.95</i>	.33	400
100 * pie size in USD/GDP per capita	57	0.6527 <i>0.9258</i>	2.534 <i>3.296</i>	0.0034	17.62
Number of observations	74	31.57 <i>48.09</i>	22.99 <i>29.10</i>	3	112
Offered percentage of pie	75	40.41 <i>40.54</i>	5.85 <i>4.94</i>	26	58
Rejection rate	66	16.20 <i>15.75</i>	10.74 <i>10.18</i>	0	40
Dummy first/single round	75	0.75 <i>0.74</i>	0.44 <i>0.44</i>	0	1
Dummy strategy method	75	0.16 <i>0.21</i>	0.37 <i>0.41</i>	0	1
Dummy economics students	75	0.64 <i>0.65</i>	0.48 <i>0.48</i>	0	1

*Note.* In normal font are unweighted descriptive statistics; descriptive statistics in italics are weighted by number of observations of studies.

of research. For the older papers the year of publication refers to publication in a journal, more recent papers were often only available in the form of a working paper. In surprisingly many cases authors do not report the year in which the experiment was conducted; this is true for almost two-thirds of the results. The mean pie size equals about 37 USD. This statistic is strongly affected by studies that focus on the effect of high stakes. This results in a very skew distribution; the median equals 10 USD. Expressed as a percentage of GDP per capita, the average pie size equals 0.65%, and ranges between 0.0034% and 17.6%. The average of the means of the offered shares of each result equals 40.4%. The average rejection rate equals 16.2%.

Notice that there is much more variation in the rejection rate than in the offered shares. For a study in which responders were required either to accept or reject a specific proposal, the rejection rate is just the fraction of offers that is turned down. In studies based on the strategy method this statistic is not readily available; such studies typically report the mean of the lowest acceptable offers. Only when separate offers were in one way or another matched with these lowest acceptable offers, or where the information in the paper allowed us to do so, it was possible to retrieve a rejection rate for studies that use the strategy method. This explains why for nine results there is a missing value for the rejection rate. 75% of the results pertain to a first or single round, and 16% of the results come from experiments that

Table 2. Descriptive statistics by country.

Country	N (1)	Mean offer (2)	Mean reject (3)	IDV (4)	PDI (5)	AUTH (6)	TRUST (7)	COMP (8)	GDP pc (9)	GINI index (10)
Austria	1	39.21	16.10	55	11	-0.05	0.32	6.78	12955	23.1
Bolivia	1	37.00	0.00						1721	42.0
Chile	1	34.00	6.70	23	63	1.10	0.23	5.94	4890	56.5
Ecuador	2	34.50	7.50	8	78				2830	46.6
France	3	40.24	30.78	71	68	-0.15	0.23	5.97	13918	32.7
Germany	1	36.70	9.52	67	35	-1.30	0.38	6.75	11666	30.0
Honduras	1	45.70	23.05						1385	53.7
Indonesia	4	46.63	14.63	14	78				2102	36.5
Israel	5	41.71	17.73	54	13				9843	35.5
Japan	3	44.73	19.27	46	54	-1.58	0.42	5.52	15105	24.9
Yugoslavia	1	44.33	26.67	27	76	-0.65	0.30	7.07	4548	31.9
Kenya	1	44.00	4.00	27	64				914	57.5
Mongolia	2	35.50	5.00						1842	33.2
Netherlands	2	42.25	9.24	80	38	-0.55	0.56	5.60	13281	31.5
Papua New-Guinea	2	40.50	33.50						1606	50.9
Paraguay	1	51.00	0.00						2178	59.1
Peru	1	26.00	4.80	16	64	1.75	0.05	6.54	2092	46.2
Romania	2	36.95	23.50				0.16	7.32	2043	28.2
Slovakia	3	43.17	12.67			-0.55	0.23	6.97	4095	19.5
Spain	1	26.66	29.17	51	57	0.60	0.34	5.70	9802	38.5
Sweden	1	35.23	18.18	71	31	-1.35	0.66	6.78	13986	25.0
Tanzania	4	37.50	19.25	27	64				534	38.2
UK	2	34.33	23.38	89	35	0.10	0.44	6.19	12724	32.6
US East	22	40.54	17.15	91	40	1.11	0.50	6.70	17945	40.1
US West	6	42.64	9.41	91	40	1.11	0.50	6.70	17945	40.1
Zimbabwe	2	43.00	8.50						1162	56.8

Note. IDV is country's score on Hofstede's (1991) individualism index; PDI is country's score on Hofstede's power distance index; AUTH is country's score on Inglehart's traditional/secular-rational dimension (higher values signify more respect for authority); TRUST is percentage in country's population saying that most people can be trusted (World Values Survey); COMP is country's score on 1-10 scale on statement that competition is good (World Values Survey). GDP per capita closest to 1990 (World Bank); Gini index is for income of households per capita for all areas and all populations closest year to 1990 (UNDP World income inequality data base).

use the strategy method. 64% of the results come from studies in which the subject pool predominantly consisted of students in economics or business.

Table 2 lists the countries where the results come from. Ultimatum game experiments have been conducted much more often in the US than in any other country; 28 out of the

75 results come from the US (we distinguished between eastern and the western states). For the other countries the numbers of results are fairly small. Columns (2) and (3) in Table 2 give the averages of the offered shares and rejection rates by country.<sup>7</sup> This information reveals substantial differences in subjects' behavior across countries. Before we turn to the analysis of these differences, we first discuss results from regression equations in which the study outcomes (offered share and rejection rate) serve as the dependent variables and where the study characteristics are the explanatory variables. Column (1) in Table 3 presents results for offered shares and column (1) in Table 4 presents results for rejection rates.<sup>8</sup> The other columns in these tables are discussed in the next section.

Column (1) of Table 3 shows that the mean of offered shares of a study is significantly lower for larger pie sizes (divided by per capita GDP), and is significantly larger when the study employs the strategy method and when the subjects are inexperienced. (The results in columns (2) to (6) indicate that these relations are almost unaffected by the inclusion of country and culture variables.) While the effect of pie size on offered share is significant, this effect is fairly small. Moving from the lowest observed pie size (0.0035% of GDP per capita) to the largest observed pie size (17.6% of GDP per capita) decreases the offered share by less than 6 percentage points. This finding concurs with results reported by others, who also find at most modest effects of increased stakes on proposers' behavior (cf. Cameron, 1999; Munier and Zaharia, 1998; Hoffman et al., 1996; Slonim and Roth, 1998). The significantly positive coefficient for playing the game in the first round or only once is consistent with the result of Roth and Erev (1995) and Slonim and Roth (1998). The significantly positive coefficient of the strategy method dummy corresponds with Güth and Tietz' (1990) idea that the strategy method strengthens fairness considerations. Finally, the insignificant coefficient for the origin of the subject pool is at odds with the results from Kahneman et al. (1986a, 1986b) and Carter and Irons (1991) but concurs with Kagel et al. (1996).

Column (1) in Table 4 regresses the rejection rate on the same explanatory variables as well as on the offered share. This latter variable is included in this equation because the rejection decision will in general be dependent on the amount offered. Again results reveal some systematic relations. Both the size of the pie and the share offered to the responder has a negative effect on the average rejection rate. This says that responders find it harder to reject an offer the more money is at stake. Further analysis of the effects of these two components reveals an interesting asymmetry in responders' behavior. An increase of the pie size with 48% (from 0.65% to 0.96% of per capita GDP) has the same effect as an increase of the offered share with 1 percentage point. The change in the amount of money offered to the responder is larger in the first case than in the second case. The fact that both changes have the same impact on the rejection rate indicates that responders care (a lot) about the relative amount they receive. There is a large difference in average rejection rates between studies that use the strategy method and studies that ask the responder only to accept or reject a given offer. For the strategy method the average rejection rate is about 13 percentage points higher. This again confirms Güth and Tietz' suggestion that the strategy method strengthens fairness considerations. There appears to be no systematic relation between other study characteristics and the average rejection rate. Neither the year of publication nor subjects' experience nor their field of study play a role.



Table 3. Determinants of offered shares.

	(1)	(2)	(3)	(4)	(5)	(6)
Year	-0.153 (0.158)	-0.146 (0.162)	-0.167 (0.154)	-0.114 (0.168)	-0.169 (0.159)	-0.252 (0.175)
100 * Pie/GDP per capita	-0.329** (0.161)	-0.484** (0.216)	-0.326** (0.164)	-0.303** (0.142)	-0.292** (0.144)	-0.434** (0.195)
Strategy method	2.289* (1.232)	3.144** (1.518)	2.029 (1.312)	2.837** (1.191)	2.325* (1.307)	2.676* (1.367)
First/single round	2.872* (1.478)	3.487** (1.493)	2.930* (1.535)	3.735** (1.411)	2.688 (2.042)	2.505 (1.631)
Economics students	-0.464 (1.346)	1.147 (1.699)	-0.213 (1.583)	-0.592 (1.259)	-0.576 (1.368)	1.447 (1.373)
Europe East		3.435 (2.637)				
Europe West		-0.105 (1.875)				
Israel		0.999 (2.833)				
Asia		2.898 (1.834)				
South America		1.950 (3.143)				
Africa		3.866 (2.433)				
US West		2.365 (1.661)				
US East		reference				
IDV			0.006 (0.031)			
PDI			0.034 (0.040)			
AUTH				-1.562** (0.743)		
TRUST					1.504 (8.151)	
COMP					0.474 (1.248)	
GDP per capita/100						-0.015 (0.010)
Gini index						0.093 (0.088)
Constant	40.958** (3.164)	37.851** (3.596)	39.055** (4.380)	40.389** (3.170)	39.148** (5.522)	39.512** (3.931)
R-squared	0.1423	0.2089	0.1479	0.1827	0.1442	0.1815
# studies	75	75	75	75	75	75

Note. Mean values (see Tables 1 and 2) were imputed for missing values of explanatory variables. Studies are weighted with number of pairs. Robust standard deviations in parentheses; \*\*/\* indicates significance at the 5/10% level.

Table 4. Determinants of rejection rates.

	(1)	(2)	(3)	(4)	(5)	(6)
Year	-0.507 (0.373)	-0.327 (0.403)	-0.377 (0.387)	-0.473 (0.370)	-0.551 (0.424)	-0.489 (0.372)
100 * Pie/GDP per capita	-1.019** (0.239)	-1.009** (0.208)	-1.022** (0.238)	-1.003** (0.233)	-0.973** (0.216)	-1.194** (0.276)
Strategy method	12.611**	13.724**	11.727**	12.800**	12.970**	12.512**
First/single round	3.422 (2.498)	3.684 (3.552)	3.504 (2.645)	3.498 (2.735)	3.760 (3.385)	3.707 (3.072)
Economics students	1.345 (3.036)	7.797 (7.419)	4.826 (4.861)	1.361 (3.059)	0.943 (3.777)	5.541 (4.941)
Offered share	-0.491** (0.228)	-0.541** (0.188)	-0.484** (0.224)	-0.512** (0.237)	-0.495** (0.236)	-0.547** (0.220)
Europe East		0.938 (4.671)				
Europe West		-0.462 (3.223)				
Israel		3.293 (6.892)				
Asia		12.981* (7.487)				
South America		0.156 (8.465)				
Africa		5.939 (7.812)				
US West		-7.042** (2.767)				
US East		Reference				
IDV			-0.058 (0.079)			
PDI			0.060 (0.087)			
AUTH				-0.827 (1.396)		
TRUST					3.696 (13.842)	
COMP					0.449 (1.945)	
GDP per capita/100						-0.033 (0.025)
Gini index						0.026 (0.151)
Constant	44.070** (13.802)	35.731** (15.735)	40.140** (14.044)	44.286** (14.256)	42.401** (14.321)	44.945** (13.806)
R-squared	0.3411	0.4826	0.3644	0.3437	0.3421	0.3603
# studies	66	66	66	66	66	66

Note. Mean values (see Tables 1 and 2) were imputed for missing values of explanatory variables. Studies are weighted with number of pairs. Robust standard deviations in parentheses; \*\*/\* indicates significance at the 5/10% level.

#### 4. Cultural differences

This section deals with our two concerns regarding the cross-country/cross-culture experimental studies. We first investigate whether subjects' behavior in the ultimatum games is systematically related to the countries in which the experiment was conducted. We subsequently relate subjects' behavior to specific cultural traits.

To investigate the role of country effects for subjects' behavior we could add country dummies to the regression equations of Tables 3 and 4. This is, however, problematic since the number of studies per individual country is often fairly small (cf. Table 2). To deal with this, we group countries by geographic regions (continents). For the continents for which we have sufficient observations (Europe and US) we distinguish between the eastern and western parts of these continents. Israel is treated separately; it is located on the cross-point of three continents and there are sufficient observations for this country. This gives the following groups:

- Africa: Kenya, Tanzania, Zimbabwe;
- Asia: Indonesia, Japan, Mongolia, Papua New Guinea;
- Europe East: Romania, Slovakia, Yugoslavia;
- Europe West: Austria, France, Germany, Netherlands, Spain, Sweden, United Kingdom;
- Israel;
- South America: Bolivia, Chile, Ecuador, Honduras, Paraguay, Peru;
- US East;
- US West.

Of course, we would have preferred a more refined grouping but this is not feasible with the available studies. As a result the analysis examines differences in subjects' behavior across regions rather than across countries.

Column (2) in Table 3 shows that there are no significant differences in offered shares between regions. But as the result in column (2) of Table 4 show, there are regional differences in responders' behavior. Conditional on other study characteristics, Asian responders have significantly higher rejection rates than responders in the US; and responders in the western part of the US have lower rejection rates than responders in the eastern part of the US. While perhaps interesting for their own sake, these differences (and similarities) between regions say little about cultural differences (or similarities). It is namely unclear to which cultural traits the differences in responders' behavior between Asia and the US should be attributed.

To relate differences in subjects' behavior in ultimatum games to cultural traits, we augmented the information from the ultimatum game studies with information on countries' cultural traits. These traits are extracted from the work of Hofstede and Inglehart, who are leading scholars in the field of cultural differences and cross-cultural variation.

Hofstede (1991) studied national culture differences in their relation to organizational practices. He clusters countries into groups on the basis of similarity along two dimensions. The first dimension is *power distance* that is defined as "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is

distributed unequally” (Hofstede, 1991, p. 28). The second dimension measures the degree of *individualism* in society, where individualism “pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family” (Hofstede, 1991, p. 51).

Hofstede uses data from survey questions among employees of IBM in 50 different countries and 3 regions, to construct country-level scores. For instance, the power distance index is based on the responses to three questions. The first question asks non-managerial employees how frequently the problem occurs that employees are afraid to express disagreement with their managers. The second question asks about the subordinates’ perception of their boss’s actual decision-making style, while the last question asks about the subordinates’ preferences for their boss’s decision-making style (p. 25). The individualism index is based on 14 survey questions about work goals. Respondents were asked to state the importance of 14 items. Subsequent analysis of the responses reflected two underlying dimensions, one of which is the degree of individualism (the other is the degree of femininity) (p. 51). Combining the power distance and individualism dimensions, Hofstede identifies 6 groups of countries.

One way to utilize this information is by using Hofstede’s country classification and use this in the regression analysis as an alternative to the geographic classification. Instead of this, we include the countries’ scores on the power distance and individualism scales as regressors. This has the advantage that any differences between countries can immediately be related to these underlying dimensions. 17 of the 25 countries present in our data are included in Hofstede’s analysis. Countries’ scores on the individualism and power distance index are given in columns (4) and (5) of Table 2. The individualism index has lower values for poor countries than for rich countries, while the power distance index tends to have higher values for poor countries than for rich countries. Within our sample of countries the correlation coefficient between the countries’ scores on the two scales equals  $-0.67$ .

Based on the definitions of power distance and individualism, we formulate two hypotheses:

*H1.* The degree of individualism has a negative effect on proposers’ offers.

*H2.* The power distance index has a negative effect on responders’ rejection rates.

Results in columns (3) of Tables 3 and 4 lend no support for these predictions. Neither the individualism index nor the power distance index has a significant effect on offered shares or on rejection rates.<sup>9</sup>

Inglehart (2000) locates 65 countries on two dimensions of cross-cultural variation (see also Huntington, 1996). One dimension expresses survival versus self-expressions values, the other traditional versus secular-rational orientations. Societies with high survival values emphasize economic and physical security, while societies with high self-expressions values put more emphasis on self-expression, subjective well-being and quality of life (p. 84). The traditional/secular-rational dimension reflects the differences between societies in which religion is very important and those in which it is not. This dimension is also related to the importance of family ties and deference to authority (p. 83). The second dimension can be translated into two further hypotheses:

*H3.* More respect for authority has a negative impact on proposers' offers.

*H4.* More respect for authority has a negative effect on responders' rejection rates.

Information about countries' deference to authority comes from the so-called World Values Survey. Information is available for 13 of our 25 countries. Column (6) of Table 2 gives countries' scores, where higher values signify more respect for authority. While Hofstede's power distance index and Inglehart's deference to authority scale seem to proxy a similar underlying dimension, the correlation between the two scores for the 12 countries in our sample that have no missing values on both, is rather low (0.25). Column (4) of Table 3 provides support for hypothesis H3. Column (4) of Table 4 gives no support for the related hypothesis that responders have lower rejection rates in countries with more respect for authority; the estimate has the correct negative sign but lacks significance. Apparently, in countries in which authority is respected more, proposers anticipate this and offer less, but conditional on the offered shares responders in these countries are not less likely to reject.

The World Values Survey from which the authority scale is extracted, contains two other questions that seem worthwhile to explore in relation to subjects' behavior in ultimatum games. The first measures the percentage in a country's population saying that most people can be trusted. We refer to this scale as "trust". The second is the average score of a country's respondents on a 1–10 scale on the statement that competition is good. We refer to this scale as "competition".<sup>10</sup> The country values for these two variables are shown in columns (7) and (8) of Table 2. Trust-scores are lower in countries in Latin America and in Eastern Europe. The country-level trust score is highly correlated with the individualism scale (0.72), and the power distance index (0.56) and authority scale (0.57). Competition scores reveal no clear pattern and the correlation with other scales is also quite low. Columns (5) in Tables 3 and 4 reveal that countries' trust and competition scores are not systematically related to subjects' behavior in ultimatum games. While one might have expected higher trust levels and lower competition scores to be associated with higher offered shares and with lower rejection rates, this is not supported by the results.

The final columns in Tables 3 and 4 report the results from regressions that include GDP per capita and the Gini index of income inequality as explanatory variables. Descriptive statistics of these variables are given in the last two columns of Table 2. Clearly, neither per capita income nor income inequality explains subjects' behavior in ultimatum games.

## 5. Conclusion

Ultimatum game experiments have been run to detect cross-country differences in behavior. When such differences are observed they are usually interpreted as cultural differences. The usual method is to run the exact same experiment in different countries and to test for differences in results. Researchers who use this method have restricted the collection of data to one city per country. Therefore, skeptics can easily argue that differences in outcomes are not related to differences across countries or cultures but just reflect differences between

different locations. This view is supported by the contradicting findings of Roth et al. (1991) and Buchan et al. (1999) regarding differences between Japan and the US. Moreover, when differences across countries are interpreted as cultural differences, the next issue is to relate these cultural differences to underlying factors.

A way to circumvent the first criticism is to run the same experiment in several cities per country and then test whether between country differences exceed within country differences. Meta-analysis provides a useful alternative. For the meta-analysis in this paper, we have grouped countries into geographic regions. We find no significant differences in proposers' behavior across regions. Respondents' behavior does, however, differ. Asian responders have significantly higher rejection rates than responders in the US and responders in the western part of the US have lower rejection rates than responders in the eastern part of the US.

In our attempt to relate cross-country differences in subjects' behavior in ultimatum games to cultural characteristics, we examined the relation between this behavior and some country-level cultural variables. These traits are extracted from the work of Hofstede and Inglehart. We find no relation between subjects' behavior and Hofstede's measures of individualism and power distance. Proposers' behavior seems, however, to vary in line with Inglehart's scale of respect for authority. A higher score on this scale is associated with lower offers. There is no relation between this score and responders' behavior. We also found no relation between subjects' behavior and countries' scores on trust and competition scales or per capita income and income inequality.

As an interesting by-product, the analysis in this paper also provides some new evidence regarding the effect of an increasing pie size, the field of study of the subject population, multiple play of the game, and the use of the strategy method on bargaining behavior. Varying the pie size affects behavior of both proposers and responders. This is in line with findings reported by Cameron (1999), Hoffman et al. (1996), Munier and Zaharia (1998) and Slonim and Roth (1998). The field of study (economics versus non-economics or non-students) of the subject pool does not seem to affect their behavior. This supports the findings of Kagel et al. (1996), but contradicts those of Kahneman et al. (1986a, 1986b) and Carter and Irons (1991). Multiple play of the ultimatum game increases the proposed share and does not affect rejection rates. The finding that experienced proposers behave differently from inexperienced proposers is in line with the results reported in Roth and Erev (1995) and Slonim and Roth (1998). The use of the strategy method has no effect on proposers' increases both the offered shares and the rejection rates. This confirms Güth and Tietz (1990) idea that the strategy method strengthens fairness considerations.

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## Notes

1. Other experimental studies that focus on differences in subjects' behavior across countries include the following. Brandts et al. (1997) analyze cross-country differences in public good experiments and find no differences in their experiments between subjects from Japan, Spain, The Netherlands and the US. Lensberg and Van der Heijden (1998) find different behavior between subjects in Norway and The Netherlands in an experiment of the gift exchange game. Kachelmeier and Shehata (1992) investigated the presence of cultural differences in market experiments in the US, Canada and China, and concluded that there were no such differences.
2. <http://www.economics.harvard.edu/~aroth/alroth.html> and <http://www.people.virginia.edu/~cah2k/> respectively.
3. In fact, two forms of the strategy method can be distinguished. In one form responders specify a response to each possible offer, in the other form responders do only specify a cutoff level below which they reject all offers. This latter form forces responders to a monotonic strategy. The studies using the strategy method that are included in our analysis all use the second form.
4. When available, always the result of only the first play of the ultimatum game was taken.
5. The field of study of the subject pool is not always reported; when this information was missing we assumed that subjects came from the student population of the authors' department.
6. The figures in italics show that weighing the statistics with the numbers of observations changes the results somewhat but that the overall picture remains the same.
7. Columns (4) to (8) of Table 2 are discussed in the next section.
8. Because mean offers and rejection rates are typically not near the boundaries of the feasible range between 0 and 100, we employ standard OLS rather than an adjusted two-sided censored Tobit model. We also estimated random effects models to take account of the fact that some data points come from the same paper. This gives almost identical estimates.
9. When PDI is excluded from the specification in column (3) of Table 3, the coefficient of IDV equals  $-0.0093$  (s.e. 0.028). When IDV is excluded from the specification in column (3) of Table 4, the coefficient of PDI equals 0.107 (s.e. 0.084). This leads to the same qualitative conclusions.
10. In terminology, this variable is related to the variable "market integration" used by Henrich et al. (2001). This study reports a significantly positive impact of this variable on offers in ultimatum games. It should be noted, however, that market integration measures "how much people do rely on market exchange in their daily lives". This is really different from the competition variable we use.

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