Altruistic or strategic considerations: A meta-analysis on the ultimatum and dictator games*

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Abstract

In this article, we investigate the relative weights of fairness and strategic considerations of players in the ultimatum game. For that purpose, we perform a total of 3 separate meta-analysis involving 97 observations of simple ultimatum games in 42 articles published between 1983 and 2012 on the one hand and 150 observations of simple dictator games in 70 articles published between 1986 and 2014. Among the included explanatory variables, the country where the experience is run and being a student in economics have a significant impact on the offered amount in the ultimatum game. In the dictator game, the country where the experiment is run and the double-blind protocol significantly impact the amount given by the dictator. Our comparative pooled meta-analysis also reveals that players from less industrialized countries tend to have a greater proportion of fairness considerations.

Keywords: ultimatum game, dictator game, meta-analysis, altruism
JEL Classification: C13 C78 D03 D64

1 Introduction

Most economists no longer see (and have probably never seen) the classical representation of a purely selfish *Homo economicus* as a realistic representation of human behavior. Everyday life experiences as well as hundreds of experiments suggest that systematic rationality biases and "social" or "other-regarding" preferences do exist (e.g. Roth, 1995; Camerer, 2003). People care about the way material payoffs are distributed among each other and about others' past acts and intentions. They are also motivated by their reputation, by their self-consciousness and they are influenced by social norms. Among various forms of other-regarding preferences, the presence of some altruism—defined as the willingness to bear a cost to increase others' benefits (Fehr and Fischbacher, 2003)—seems to be widespread in the population. At the same time, people of course pay attention to their own material gain, and behavior that sometimes looks like altruism is in fact motivated by purely strategic concerns. Decision is the result of mixed motivations,

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as reflected by new models of individual utility functions (see e.g. Fehr and Schmidt, 1999; Charness and Rabin, 2002; Cox et al., 2007). What are nevertheless the relative weights of altruistic and selfish motivations in the typical human utility function is still an object of debate. Among the experimental games that have contributed to this field of research, the ultimatum (Güth et al., 1982) and the dictator games (Kahneman et al., 1986; Forsythe et al., 1994) are the simplest and the most famous ones. It is interesting to confront the behavior of the allocator or proposer in both games because the ultimatum confounds altruistic and strategic motives, whereas strategic considerations are absent from the dictator game. The first dictator games by Kahneman et al. (1986) and Forsythe et al. (1994) helped to determine the extent to which generous offers in ultimatum games occurred because proposers were fair-minded or because they feared that low offers would be rejected (Camerer and Thaler, 1995). Now, after hundreds of experiments have been carried out on both games, a clean comparison of behavior in the two games becomes possible. This is what we do in this paper, taking advantage of the last advances of meta-analysis methods.

In the standard ultimatum game, the proposer is endowed with an amount of money by the experimenter, and has to decide how much to keep for himself and how much to offer another anonymous subject (the recipient). The recipient has however the opportunity to accept or refuse the offer. In case of acceptance, the proposer's decision is implemented and the game ends. In case of refusal, the proposer has to give back all the money to the experimenter, so both subjects earn nothing. The subgame perfect equilibrium offer is of course for the proposer to offer the minimal amount of money because it is supposed to be accepted by the recipient. Experiments show that, perhaps not surprisingly for most people, the recipient usually does not behave according to this prediction and prefers rejecting low offers (see for example Roth, 1995; Camerer, 2003). The majority of proposers share equally, and offer 40% of their endowment on average. The majority of recipients reject offers lower or equal to 20% of the endowment.

Among the main hypotheses put forward to explain this result are the recipient's inequality aversion (see e.g. Fehr and Schmidt, 1999) and reciprocity or sensitiveness to intention (see e.g. Rabin, 1993). Anticipating this kind of social preference from the recipient, the proposer would realize that his best strategy is to send a sufficiently high amount. Nevertheless, as roles are typically assigned randomly, there is no reason why the proposer would not have this kind of social preferences as well. An inequality averse proposer would anyway send a reasonably large amount to the recipient, not for strategical reasons but only because he resents being unfair. Any form of altruism would lead the proposer to behave in a fair way. Hence, the proposer's offer can be motivated both by selfishness or altruism. To disentangle both kinds of motivations, Forsythe et al., 1994 introduced the so-called dictator "game", in which the recipient no longer has the opportunity to reject the offer. In this extremely asymmetric situation, the amount offered by the proposer cannot be caused the fear of rejection, so that any strategic explanation can be ruled out. A positive offer is generally considered as a form of altruism, to the extent that the proposer gives something without expecting any material reward.[1] Hundreds of studies show that the average offer is around 20%-30% of the endowment. In an exhaus-

[1]It has however been shown that the offer could be motivated by other factors. The amount offered is very sensitive to the design of the game, such as for example the fact that the proposer initially had to earn the endowment (e.g. List, 2007), or the observability of the proposer's decision, by the recipient or by the experimenter. To control for the effect of observability, authors early implemented the "double blind" procedure, insuring subjects that their decision cannot be observed by any other participant nor by the experimenter (see Hoffman et al., 1994).

tive meta-analysis, Engel (2011) estimated an effect size of 27%. However, it should be noticed that the latter analysis includes a very large range of dictator games protocols, resulting in a difficult interpretation of the average estimate. Also, even if estimated, the average offer does not take into consideration the highly bimodal distribution of offers in the dictator game. Three types of behaviors are typically observed: about half of the subjects keep of all the money for themselves, a quarter share equally, and the last quarter make intermediate offers between these two bounds.

Because strategic motives are absent from the dictator game, the difference in offers between the ultimatum and the dictator game is generally interpreted as an estimation of the strategic motives in the former. Very few studies carry out such an analysis in a within design (e.g. Brañas Garza et al., 2014). The reason is maybe that the analysis is problematic because of obvious contagion effects across both games. This question may however be studied in a between analysis, as a large number of experiments is now available on the subject. In this paper, we therefore aim at providing such an estimation of the difference in offers in both games, by fully exploiting the last advances of meta-analysis.

Meta-analysis refers to the quantitative synthesis of a large number of independent studies that have been collected systematically (see e.g. Borenstein et al., 2011; Stanley, 2012). The database used in a meta-analysis does not consist of the concatenation of the databases of each individual study. In the meta-analysis, only the dispersion and average values of of the variable of interest (or "effect size") of each study are required. While these two pieces of information are often provided by the authors in the published versions of articles, the distribution of individual values is not always included. Therein lies the advantage of the meta-analysis: the large number of studies that could be included enables a high statistical power while avoiding some methodological problems such as selection bias. Some published versions of the articles do not report the standard error of the effect-size. For those articles, we contacted the authors to ask them the missing information. From a methodological point of view, the standard error of the effect-size is a fundamental element that allows the statistician to define the appropriate weights of the various studies in the meta-analysis and to obtain a reliable estimate. From this point of view, our meta-analysis of the ultimatum game differs from that made by Oosterbeek et al. (2004).[2]

Meta-analysis is considered as having several advantages with respect to traditional narrative review. First, it is less subjective, as its conclusions do not rely on the reviewer's way of synthesizing the contradictory results of studies. For example, one reviewer might consider that largest studies are more reliable, while another one will be more confident in the quality[3] of studies. Second, the method of meta-analysis allows the researcher to take into account a very large number of studies, which is virtually impossible in a narrative review. This is because the effect size generally depends on a large number of characteristics that vary across studies, and the reviewer would need to identify the individual effect of each of these characteristics to be able to extrapolate correctly. Thus, while a simple survey of the empirical literature may lead to erroneous intuitions, meta-analysis provides a systematic and thorough reading of the aggregated data with an accuracy that cannot be matched by individual studies.

[2]In their article, the authors specify that they were not able to gather the whole data relative to the dispersion of offers for each study. Hence, they weighted the mean offers by the number of subjects per study. To avoid this shortcoming, we either requested the missing data from the authors or reconstructed them from the distributions.

[3]The quality of a study can be measured by its publication rank for example.

The method also allows the investigation of the heterogeneity of the effect size across studies. Heterogeneity is an issue when one wants to aggregate several studies. Even if very standard protocols are often used for both games, a number of slight differences between studies still remain and their effect is uncertain (all environmental factors, such as the room of the experiment, the sex, appearance, voice, sympathy of experimenters and monitors, the weather, the season, the time of the experiment, etc.). Meta-analysis is able to handle this problem by separating within and between-study heterogeneity. Also, the meta-regression allows the investigation of which explanatory variables have an impact on the effect size. The advantage of meta-regression is that many more factors can be analyzed than in an individual study. A standard study is generally able to investigate say one, two or three factors at a maximum because the number of feasible treatments is limited. The advantage of meta-regression is that any observable factor can be examined provided that there is a sufficient number of observations.

As noted by Stanley (2012), the number of meta-analysis in economics has been exponentially increasing in the last decade. The use of the method is also developing in experimental economics (e.g. Balliet, 2010; Balliet et al., 2011; Balliet and Lange, 2013a; Croson and Marks, 2000; Balliet and Lange, 2013b; Engel, 2007, 2011; Johnson and Mislin, 2011; List and Gallet, 2001; Murphy et al., 2005; Oosterbeek et al., 2004; Sayman and Öncüler, 2008; Zelmer, 2003; Zhang and Ortmann, 2013). However, the word "meta-analysis" is often used in the experimental economic literature to designate a statistical analysis simply pooling the full databases of many studies. Perhaps surprisingly, such a procedure is not a panacea. It is almost impossible to have access to the full databases all relevant experiments, implying that a severe selection bias is very likely. The canonical procedure of the meta-analysis certainly reduces this risk as the only data collected on each study is limited to the mean and standard deviation of the variable of interest.

In the ultimatum game, our estimation of the proposer's offer is about 41% of the endowment, and it is about 26% in the dictator game. We investigate the main determinants of offers in both games, and find in particular that subjects from industrialized countries tend to offer significantly less in the dictator game and to offer significantly more in the ultimatum game. Given that strategic consideration are only present in the ultimatum game, this highlights the fact that the strategic consideration are more important for players from industrialized countries (even though they also exist in low industrialized countries). Our study, by integrating both games in a single analysis, therefore provides a new insight into a puzzle first identified by Henrich (2000) in a ultimatum game. The fact that proposers' offers were relatively lower in a less developed society was not due to less altruism, but rather to the fact that strategic considerations were less pregnant.

The rest of the article is organized as follows. Section 2 presents the data and design of the meta-analysis. We describe successively the procedure used to select the studies, the explanatory variables of the meta-regression, and the estimation methods. The effect sizes in the ultimatum and the dictator game are presented and compared in Section 3. Section 4 is devoted to meta-regressions, which aim at identifying the variable that significantly affect the effect sizes. Section 5 will make a special focus on the individual distributions in both games, showing that they differ a lot. Section 6 concludes.

2 Data and design

2.1 Design of meta-analysis

For this comparative meta-analysis of the ultimatum and the dictator games, we constructed two separate databases. To obtain the highest number of observations, we used multiple information resources. In particular, the different combinations of keywords that we used with Econlit and Google Scholar allowed us to access over 500 articles and working papers on the dictator and ultimatum games in an experimental setting with titles and keywords that seemed to be related to our study.

In that respect, since the relevance of the results is directly related to the choices made regarding the construction of the database, we have established some restrictions on our selected experimental treatments to be comparable.

First, in the case of the dictator, we chose to retain only standard dictator games. A standard dictator game refers to the dictator game under it's original form initially proposed by Forsythe et al. (1994) with 2 anonymous players and a random entitlement. Each experience offers a minimum of 8 separate decisions to dictators: it excludes the dictator games where individual sets of strategies are too small and force players to opt for extreme choices. Furthermore, we chose to retain only the experiments in which subjects negotiate a sum of real money. This basic requirement is to ensure that players are subject to monetary incentives, the importance of which is assumed by economic theory. As a consequence, with these criteria, we selected a single observation for many articles: the control treatment. As we seek to estimate the average proportion of the sum at stake offered by a dictator, these restrictions are needed to ensure that our estimate is as accurate as possible and is not altered by protocol differences of experiences.

Second, the literature of the ultimatum game is very rich and offers a number of different experimental protocols. Out of these, we chose to include only simple ultimatum game treatments. Again, we chose to make this restriction in order to obtain an accurate estimate of the average proportion of the amount at stake offered by the proposer in the ultimatum game excluding protocol differences. The simple ultimatum game refers to the game in its original form in which a proposer and a recipient play anonymously. Proposers and recipients are re-matched in each period of play to form new pairs, reputation effects are excluded ("stranger" protocol). Each experience offers a minimum of 10 separate actions to offerers: it excludes ultimatum games in which the individual sets of strategies are too small. For this database also, we decided to keep only the experimental treatments in which the players were subjected to a monetary incentive. For a large majority of articles, we chose to retain only the control treatment.

If our criteria for selection of the articles may seem restrictive, they are necessary for the realization of our comparative study of the ultimatum and dictator games. It is important that both the dictator and ultimatum game average rates are computed on the basis of similar criteria and are not affected by protocol differences. Finally, our dictator game database contains a total of 150 observations collected in 72 articles. Publication dates of articles range from 1994 to 2013, 2007 being the median year. With respect to the geographical diversity of the studies, our data cover 30 different countries. Our ultimatum game database contains a total of 97 observations collected over 41 articles and a book of experimental economics on the ultimatum game. For the sake of representativeness of 30 years of experimental research on the ultimatum game we selected a large number of articles whose publication dates range from 1983 to 2011, and 2001 was the median date of our sample. With regard to the geographical diversity of the studies, all the data we

work with have been collected on a set of 29 different countries.

2.2 Variables

For each article that was selected, ultimatum or dictator, we noted two categories of variables. First, the average offer made and its standard error: these two variables must be collected in order to include the study in the meta-analysis. The average offer made is our variable of interest, also called 'effect-size'. The standard error of the average offer is also mandatory to define the assigned weights to each study in the meta-analysis.

Then, the second category of variables are the explanatory variables that allow us to identify potential causal links with the mean offers submitted trough a meta-regression. The information is as follows:

- Amount of money to share. We systematically converted this amount in dollars in Purchasing Power Parity (PPP). Both in the ultimatum game (Hoffman et al., 1996; Slonim and Roth, 1998; Cameron, 1999) and in the dictator game (Carpenter et al., 2005; Cherry et al., 2002; Forsythe et al., 1994), the literature has shown no evidence of significant effect of the amount of money at stake on the player's choices.

- The fact that the subjects of the experiments are economists or not. Economists players are supposed to play closer to the theoretical equilibrium. In the ultimatum game, the results of Carter and Irons (1991) show that economists players indeed behave in a more selfish way than other player. With respect to the dictator game, there is no evidence of significant effect of being an economist on the amount offered.

- The average age of the subjects. There is no special belief in the literature with respect to the effect of age on the choices made in the ultimatum or dictator game. That being said, the average age of subject is not systematically reported in the studies. Consequently, due to the numerous missing data for this variable, we were not able to include the age as an explanatory variable in our meta-regression.

- The fact that the game is played for several periods or not. The experimental literature has shown that there is no evidence of experience effect on the proposer's choices in the ultimatum game (Roth and Erev, 1995; Cooper and Dutcher, 2011). Nevertheless, in their meta study dedicated to experience effects, Cooper and Dutcher (2011) highlight two effects of experience on the recipient's choices in the ultimatum game. First, experience has the effect of increasing the acceptance rate of high offers (above 20) and decreasing the acceptance rate of low offers (under 20). Then, the probability of acceptance of a given offer is higher if an offer is higher than the previous one and conversely. As regards the dictator game, it seems doubtful that experience could have any influence on player's choices since it is a very simple and non-strategic game.

- The country where the experiment took place. In the ultimatum game, there is no consensus about the effect of this variable on the player's choice in the literature. One the one hand, Henrich et al. (2005) find that player's choices are correlated with their everyday choices and their environment. In the ultimatum game, this means that lower offers are made in the countries where institutions such as trade or welfare state are precarious. One the other hand, Oosterbeek et al. (2004) find no evidence of a significant influence of the cultures or countries on the player's choices. However, it is useful to have in mind that the authors clustered the countries of their database per continent. As regards the dictator game Engel (2011) finds, with statistically significant results, that "the more a society is indigenous, the more a dictator is willing to share".

The country where the experiment was run was then matched with contextual eco-

nomic data: for the year of the experiment, we noted the GDP per capita, the HDI (Human Development indicator) index and the poverty rate of the countries where the experiment took place. All this information was collected on the world bank database (www.worldbank.org). Note that the GDP per capita, the HDI index and the poverty rate are obviously highly correlated. Consequently, including them simultaneously in the meta-regressions would lead to serious multicolinearity problems. In order to avoid this issue, we constructed a synthetic variable based on a principal component analysis (PCA) on these three variables. From this analysis, we only kept the first axis since it explained more that 80% of the total inertia. This synthetic variable should be interpreted as a proxy of the degree of industrialization of the country. In the meta-regressions, we used both the original continuous version of this synthetic variable and a binary version of this variable, in order to be able to distinguish clearly the comparative effects of highly industrialized versus less industrialized countries. The binary version of the variable has been constructed using standard CART regressions (Breiman et al., 1984) **** RÉFÉRENCE À AJOUTER DANS LA BIBLIO****: the dataset is split based on homogeneity of the data, based on the minimization of the sum of squared errors for each possible split point.

Table 1 gives an overview of the main descriptive statistics of our two databases.

Table 1: **Descriptive statistics of the ultimatum and dictator game studies**

	Ultimatum game				Dictator game			
	Mean	*Median*	*Min*	*Max.*	*Mean*	*Median*	*Min.*	*Max.*
Mean offer	40.9%	41.9%	25%	56.8%	25.67%	25.72%	3.5%	53.14%
Number of players	82	40	14	320	66	35.5	12	426
Publication date	2002	2001	1983	2012	2006	2007	1994	2013
GDP per capita	20981	23400	400	54000	30700	35290	992	83460
HID	0.778	0.88	0.4	0.93	0.8786	0.951	0.467	0.961
Amount at stake (PPP)	41.01	11.7	1	700	18.09	10	1	110
Repeated stranger	24 %					0%		
Economists players	23.7%					10%		

2.3 Estimation methods

The two main estimation models used for meta-analysis are the fixed effects model and the random effects model. These models used in the meta-analysis do not reflect the models of the same name commonly used in the treatment of panel data. Each of these models presents two different assumptions about effect-sizes across studies (see e.g. Borenstein et al., 2011; Stanley, 2012). The fixed effects model is based on the assumption that all studies included in the analysis share the same real effect-size. Then, the differences between the several observed effect-sizes are, therefore, only due to sampling errors. In contrast, the random effects model is not based on this restrictive assumption and assumes that the real effect-size that we wish to estimate can vary from one study to another. For example, the effect size can vary depending on the subject's age, nationality, experimental parameters or other variables.

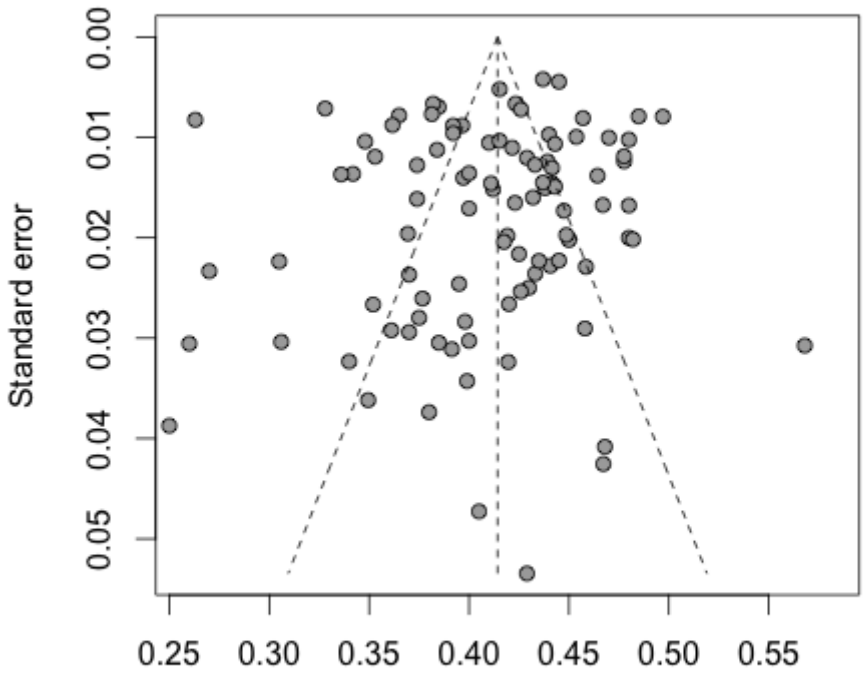
To estimate the average proportion offered by the proposer in the ultimatum and the dictator games, a preferable option is to use the random effects model which seems more suited to experimental data due to its non-restrictive design. Indeed, the characteristics

of the subjects and the heterogeneity of the experimental protocols and parameters may cause variations between actual effect-sizes across studies (despite the fact that we focused on standard protocols). The choice of a random effects model requires a large number of studies to provide an accurate estimate of the between-study variance τ^2 involved in the definition of weights. In our case, this prerequisite is not a problem: we have 150 observations for the dictator game and 97 for the ultimatum game.

3 The ultimatum game

We begin our analysis with a meta-analysis of the ultimatum game. Each observation of our pool of studies corresponds to a simple ultimatum game. To ensure the robustness of our results, we have implemented the funnel plot of our meta-analysis in Figure 1. In particular, this tool allows checking the presence of a selection bias in the sample of studies. Indeed, the funnel plot offers the statistician an overview on the effect-sizes and standard errors of the studies included in the sample. On the graph, the average effect of each study is reported on the x-axis and standard error on the y-axis. Sampling errors are assumed random and distributed according to a normal distribution. Then, in absence of bias, the studies should be distributed symmetrically on either side of the estimated effect by the meta-analysis (represented by the central axis). If the cloud of points returned by the funnel plot shows a strong asymmetry, it is likely that some studies with common characteristics were omitted during the data collection phase.

Figure 1: **Funnel plot for the ultimatum game, fixed effect model**



The visual impression is that the studies are indeed homogeneously distributed on either side of the central axis. However, as a graphical analysis is not sufficient to determine the presence of publication bias, we additionally performed the Egger's test[4] to characterize the asymmetry of our funnel plot (see Table 2). The results show that the null hypothesis of symmetry in the funnel plot cannot be rejected.

Table 2: **Egger test for the ultimatum case**

Bias	Std.error	t	p-value
-0.588	0.796	-0.738	0.46

Table 3 provides the results of the meta-analysis for the ultimatum game based on the random effect model. The proposer gives on average 41.04% of the whole amount to the recipient. The high statistical power provided by the aggregation of 97 observations allows us to ensure the accuracy of this estimate: indeed, the standard deviation is 0.005 yielding a 95% confidence interval for the average value of the offer of [40.03%; 42.05%].

Table 3: **Meta-analysis of the ultimatum game: random effects model**

Number of studies	Effect-size estimate	Std.error	95%-confidence interval
97	0.4104	0.005	[0.4003 ; 0.4205]

Statistics relating to the heterogeneity of our sample of studies are presented in Table 4. They show that the null hypothesis of the Q test of identical effect-size for all studies is strongly rejected, despite the fact that the between-study variance τ^2 is low. Also, 93.7% of the total variation across studies is explained by differences in true effect-sizes. Hence, these results indicate a heterogeneous distribution of the effect-size across the different studies of our sample.

Table 4: **Heterogeneity statistics for the meta-analysis of the ultimatum game**

τ^2	I^2	Q test
0.0022	93.7%	1535.59***

Notes: *** significant at 1%

To analyze the origin of the variance across the studies of our sample, we perform a meta-regression on all variables collected in our database. The results of our meta-regression estimated by the mixed-effects model approach are presented in Table 5. In column (1) we include the continuous measure of the industrialization proxy while in column (2) we use the binary version of the variable.

Our results on methodological variables show that neither the amount of money involved, nor the repetition of the game (stranger) have a significant influence on the choice

[4]Egger's test is the most commonly used test for funnel plot asymmetry. In the following regression : $\frac{Effect_i}{\sigma_i} = \beta_0 + \beta_1(\frac{1}{\sigma_i}) + e_i$, the test is to verify the null hypothesis $\beta_0 = 0$. Egger et al. (1997) show that the estimation of the constant of this equation indicates the direction of the bias. Thus, when the null hypothesis is not rejected, the presence of publication bias is not detected.

of the proposer in the ultimatum game. In other words, neither the modest remuneration of players, nor the lack of familiarity with the game are thus able to explain the observed average offers in our sample of 97 observations. These results are consistent with studies by Cameron (1999), Hoffman et al. (1996) and Slonim and Roth (1998) for the amount of money; and Roth and Erev (1995), Brenner and Vriend (2006), Cooper and Dutcher (2011) for the repetition of a game. With respect to demographic variables, being a student in economics significantly and negatively influences (at the 1% level) the amount offered in the share. This confirms the results of Carter and Irons (1991) who show that the choices of a student in economics are closer to the theoretical equilibrium than the choices other players in the ultimatum game. Regarding the various countries in which the studies were conducted, the continuous version of the industrialization proxy does not explain the offers but looking at column (2), we see that the offers made in the experiments carried out in industrialized countries are on average 3.05% higher than offers made in the non-industrialized countries. This result is statistically significant at the 5% level. Study by Henrich et al. (2005) show a similar trend, but fail to identify a statistically significant effect. According to the authors, the players are influenced by social institutions and cultural norms of fairness of the environment in which they evolve (Henrich et al., 2005). The absence of trade and welfare or redistributive system in some countries could then account for the lower offers observed.

Table 5: **Meta-regression of the ultimatum game: random effects model**

Variables	(1)	(2)
Constant	0.4245***	0.3986***
	(0.0063)	(0.0126)
Economist	-0.0483***	-0.0482***
	(0.0121)	(0.0118)
Amount at stake	0.0001	0.0001
	(0.0001)	(0.0001)
Repeated stranger game	-0.0123	-0.0127
	(0.0115)	(0.0113)
Industrialized country	0.0044	-
(continuous)	(0.0036)	-
Industrialized country	-	0.0305**
(binary)	-	(0.0129)

Notes: *** significant at 1%, ** significant at 5%

4 The dictator game

Engel (2011) provides a thorough and exhaustive meta-analysis on the dictator game. The study nevertheless aggregates the results of very heterogeneous experiments. Even though the method of meta-analysis is suited to handle this type of issue, the purpose of our analysis requires to perform a more specific analysis on the simple dictator game only. From this point of view, our meta-analysis of the dictator game differs from that made by Engel (2011). In our dictator game meta-analysis, we choose to incorporate only standard dictator games protocols. As previously, before proceeding to the analysis and

interpretation of our results, we display the funnel plot of our meta-analysis to detect the presence of publication bias in our study sample (Figure 2). As we can see graphically, the scatterplot is slightly offset to the left. This is confirmed by the Egger's test of symmetry of our funnel plot (Table 6). The test shows that the null hypothesis of symmetry of the funnel plot is rejected: there is a significant negative bias. This negative bias may be explained by the presence of publication bias in favor of the lowest rates in the literature. Indeed, the first experiments of the standard dictator game have set relatively low standards compared to the literature that followed (e.g. Forsythe et al., 1994; Hoffman et al., 1994). It is therefore conceivable that the studies whose results are too distant from the reference articles were considered as methodologically weak. Nevertheless, publication bias is not the only source of funnel plot asymmetry: other sources such as data irregularities, true heterogeneity or other selection biases could also be part of this negative bias (Sterne and Harbord, 2004).

Figure 2: **Funnel plot for the dictator game, fixed effect model**

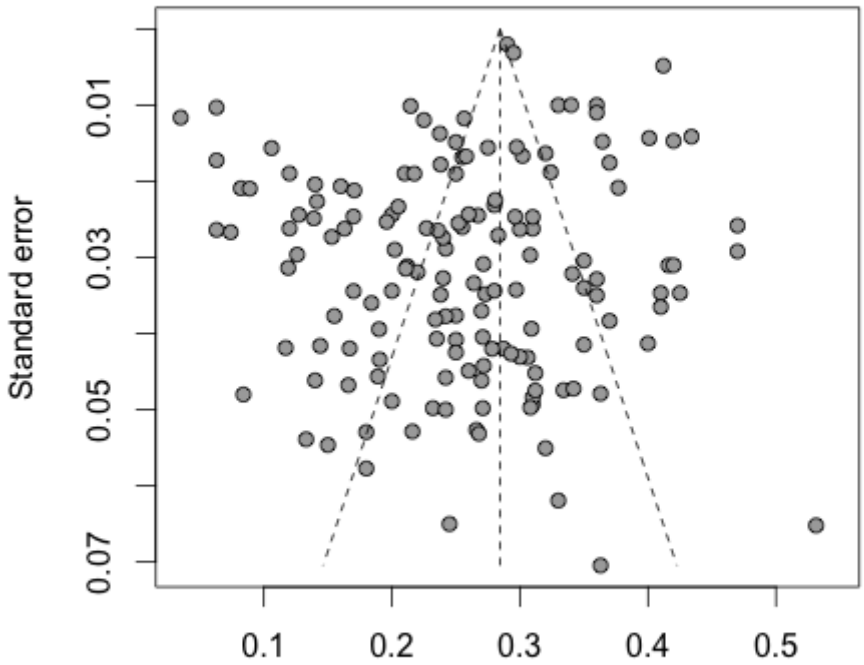


Table 6: **Egger test for the dictator case**

Bias	Std.error	t	p-value
-1.645	0.537	-3.065	0.002

Table 7 provides the results of the meta-analysis for the dictator game based on the random effect model. Dictators offer on average 25.6% of the total amount to share. The

150 observations we collected allow us to have a narrow confidence interval. However, due to the negative bias previously highlighted, we can imagine that the actual estimate is slightly higher.

Table 7: **Meta-analysis of the dictator game: random effects model**

Number of studies	Effect-size estimate	Std.error	95%-confidence interval
150	0.256	0.007	[0.2418 ; 0.2701]

Statistics relating to the heterogeneity of our sample of studies are presented in Table 8. They show that the null hypothesis of the Q test of identical effect-size for all studies is strongly rejected. Also, 96.1% of the total variation across studies is explained by differences in true effect-sizes. Hence, these results indicate a heterogeneous distribution of the effect-size across the different studies of our sample.

Table 8: **Heterogeneity statistics for the meta-analysis of the dictator game**

tau^2	H	I^2	Q test
0.0067	5.07	96.1%	3832.53***

Notes: *** significant at 1%

Finally, to establish possible correlations between our dependent variable and explanatory variables, we perform a meta-regression on all variables collected in our database. The results of our meta-regression estimated by the random effects approach are presented in Table 9, again for the continuous (column 1) and the binary (column 2) versions of the industrialization proxy variable. Two important results appear.

First, regarding the methodological variables, playing the dictator game under a double-blind protocol has a significantly negative influence on the amount given by the dictator: on average, dictators keep an extra 3.07% of the amount to share for themselves when their identity is kept secret from the experimenter and other subjects. This result confirms the findings of Cherry et al. (2002) and Hoffman et al. (1996). Conversely, the amount of money at stake (PPP) has no significant influence on subjects' choices. No matter how big the pie is, a dictator will tend to give the same proportion of money to its recipient. This result is therefore in line with studies by Carpenter et al. (2005), Cherry et al. (2002) and Forsythe et al. (1994). Second, with respect to the demographic variables, being an economic student has no significant influence on the amount offered. This suggests that the low offers of economist proposers in the ultimatum game was not due to a lack of altruism; rather, it may be that a game involving strategic interaction primes economists with standard game-theoretic reflexes, leading them to offer less in the ultimatum game. Finally, the results display a strong negative significant influence of the level of industrialization on the amount given by the dictator. For the binary version of this variable, it appears that a dictator in a highly industrialized country offers 11.41% less that a dictator in low industrialized country. This result is in line with that of Engel (2011) who found that "the more a country is indigenous, the more a dictator is willing to give".

Table 9: **Meta-regression of the dictator game: random effects model**

Variables	(1)	(2)
Constant	0.2926***	0.3604***
	(0.0131)	(0.0174)
Economist	-0.0122	-0.0002
	(0.0257)	(0.0250)
Amount at stake	-0.0003	-0.0005
	(0.0004)	(0.0003)
Double blind	-0.0307**	-0.0259*
	(0.0153)	(0.0148)
Industrialized country	-0.0319***	-
(continuous)	(0.0054)	-
Industrialized country	-	-0.1141***
(binary)	-	(0.0166)

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%

5 Ultimatum versus dictator game

5.1 Meta-regression and the fairness hypothesis

According to Forsythe et al. (1994), under the 'fairness hypothesis', distributions of offer in both the dictator and ultimatum game should be the same. Alternatively, if the distribution of offers differs between the two games, then fairness alone is not enough to explain the subjects' choices in the ultimatum game. The structure of the ultimatum game differs from the dictator game with respect to the veto power of the respondent. This strategic configuration may encourage the proposer to offer a greater amount to avoid rejection by the respondent: we describe this effect as strategic behavior. Our purpose in this section is then first to use the meta-analysis high statistical power to test the 'fairness hypothesis' of Forsythe et al. (1994). Then, in case of rejection of the fairness hypothesis, we estimate the average proportion of an offer related to subjects' strategic considerations in the ultimatum game.

To perform this meta-regression, we pooled our two databases that we then restricted to common explanatory variables. Common variables in our ultimatum game and dictator game databases are: Economist, Amount at stake, Industrialized (continuous or binary). We also added a dummy variable to distinguish between dictator game and the ultimatum game, this dummy is equal to 1 for an ultimatum game and 0 otherwise. To distinguish the influence of a variable in a game or the other, we interacted this dummy with the three explanatory variables. Finally, since playing in a double blind set up had a significant influence on the dictators' choice, we also performed the meta-regressions with a sample of dictators restricted to double blind setups as a robustness check.

The result of our meta-regression is shown in Table 10. Three of our variables in addition to the constant show a significant impact on the amount offered by the players: the fact that the game is an ultimatum game or a dictator game, the fact that the country where the experiment is run is industrialized or not (this result stands for both versions of the industrialized proxy), and the fact that the game is an ultimatum game played in an industrialized country.

Table 10: **Meta-regression for pooled sample of ultimatum and dictator games: random effects model**

	Full sample		Double blind	
Variables	(1)	(2)	(3)	(4)
Constant	0.2766***	0.3370***	0.2695***	0.3617***
	(0.0086)	(0.0122)	(0.0138)	(0.0196)
Ultimatum	0.1461***	0.0865***	0.1533***	0.0621***
	(0.0123)	(0.0153)	(0.0160)	(0.0214)
Economist	-0.0204	-0.0301	-0.0235	-0.0335
	(0.0217)	(0.0210)	(0.0257)	(0.0248)
Amount at stake	-0.0001	-0.0003	-0.0004	-0.0004
	(0.0003)	(0.0003)	(0.0006)	(0.0006)
Industrialized country	-0.0314***	-	-0.0423***	-
(continuous)	(0.0044)	-	(0.0061)	-
Industrialized country	-	-0.1051***	-	-0.1501***
(binary)	-	(0.0130)	-	(0.0196)
Economist*Ultimatum	-0.0324	-0.0186	-0.0293	-0.0153
	(0.0275)	(0.0268)	(0.0299)	(0.0291)
Amount at stake*Ultimatum	0.0002	0.0003	0.0004	0.0004
	(0.0003)	(0.0003)	(0.0006)	(0.0006)
Industrialized*Ultimatum	0.0375***	-	0.0482***	-
(continuous)	(0.0069)	-	(0.0078)	-
Industrialized*Ultimatum	-	0.0992***	-	0.1438***
(binary)	-	(0.0208)	-	(0.0245)

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%

Our results show that the offers of players are statistically different between the dictator to the ultimatum game. Indeed, computing marginal effects, we see for instance that a non-economist player in the ultimatum game in a non-industrialized country offers an extra 6.21% to 14.61% depending of the specification compared to the dictator. For the players from industrialized countries, the difference between the offers made in the two games is much more pronounced as the coefficient pertaining to the interaction term between the ultimatum dummy and the industrialized country is positive and significant. For example, the extra difference amounts for 9.92% for the full sample and the binary version of the industrialized proxy variable. The effect of the degree of industrialization also differs depending on the game considered. For instance, looking at column (2), in a dictator game, players from industrialized countries keep on average an extra 10.51% of the pie for themselves compared to players from non-industrialized countries. Conversely, in the ultimatum game, players from industrialized countries offer an extra 0.59% (10.51%-9.92%) of the pie compared to players from non-industrialized countries. These two results are statistically significant at the 1% level. The explanation relies in the fact that despite a very similar structure, the dictator and ultimatum games imply different incentives from players: the ultimatum game implies strategic considerations from players whereas the dictator game does not. The fact that players from industrialized countries tend to offer significantly less in the dictator game and to offer significantly more in the ultimatum game highlights the fact that the strategic consideration are more important

for players from industrialized countries.

In order to fix ideas, we computed the estimated offers for non-economist players in low industrialized countries and in high-industrialized countries in the dictator and the ultimatum games. We computed these offers for an amount at stake equal to the average amount at stake (27$). The results are displayed in Table 11. In the low industrialized countries, the non-economist average offer of the dictators is estimated at 32.97% of the amount at stake while it amounts to 23.64% in high-industrialized countries. This first result, consistent with the study of Engel (2011), allows highlighting a more pronounced altruism for subjects from low industrialized countries. Moreover, we note that estimations of the difference in average offers (ultimatum minus dictator) are lower in low industrialized countries than in high industrialized countries: respectively 8.75% and 19.84%. This shows that the strategic considerations of the ultimatum game are more relevant in high-industrialized countries. The interpretation of our results leads us to the conclusion that players from high industrialized countries, all things being equal, behave more strategically than players from low industrialized countries whose altruistic considerations seem to be the bulk of the amount offered in the ultimatum game. The "fairness hypothesis" of Forsythe et al. (1994) is hence rejected for both industrialized and non-industrialized countries.

Table 11: **Estimated offers of non-economist players, average amount at stake**

	High industrialization	Low industrialization
Ultimatum	42.31%	41.72%
Dictator	22.47%	32.97%

5.2 Individual data analysis

To be exhaustive in our comparison, we now analyze the individual distribution of each dataset. Indeed, in some cases, for instance when the distribution is not gaussian or when it is multimodal, the mean as a measure of central tendency is not a meaningful summary of the distribution. Precisely, since in the ultimatum and dictator games, distributions are radically different, mean interpretations and comparisons must be done carefully.

For both the ultimatum and the dictator game, we collected all the individual observations when it was possible. In the end, we gathered 2266 individual observations for the ultimatum game and 5255 for the dictator game, representing about half of the total individual data in the sample for each game.[5]

With respect to the ultimatum game, the distribution we can observe from our 2,266 individual observations (Figure 3) is unimodal. Extreme offers are very rare and most players' choices are clustered from 30 to 50% of the amount at stake. We also note a gap between the 50% and 60% offers: equal sharing is the modal offer in ultimatum game, while offers larger than 50% are very rare. The unimodal shape of the distribution of the ultimatum games offers allows us to have a direct interpretation of the mean we have estimated by our meta-analysis.

[5]We collected all the individual data for each study when the distribution of offers was given in a table or on an exploitable graph. This was the case for 40 of our 97 ultimatum game observations and 70 of our 150 dictator game observations.

Figure 3: **Individual data distribution for the ultimatum game**

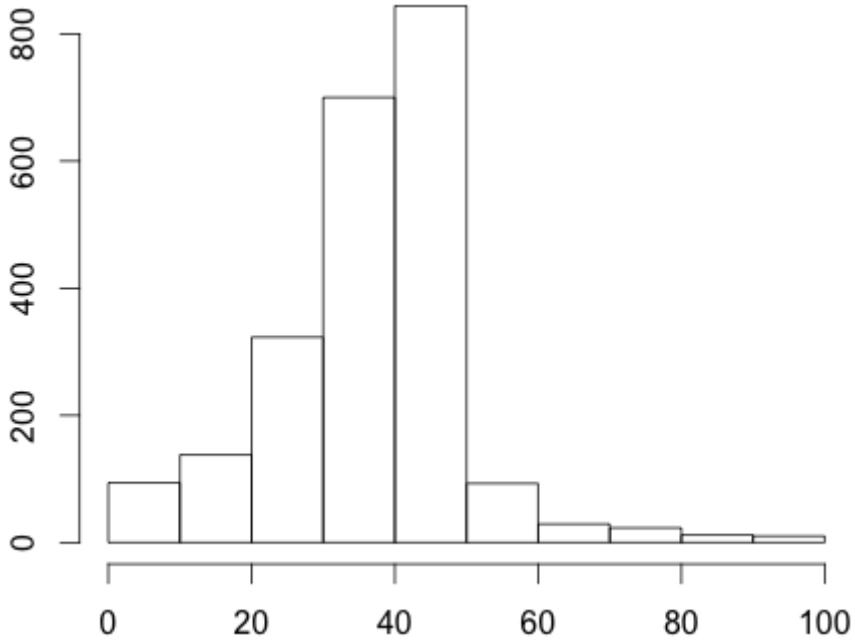
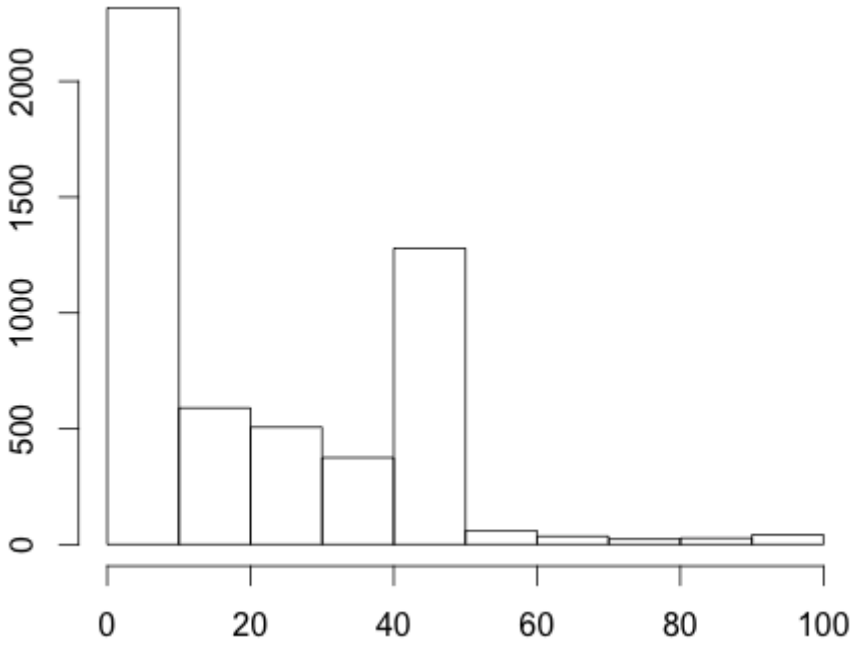


Figure 4: **Individual data distribution for the dictator game**



The distribution of 5255 individual observations for the dictator game, shown in Figure 4, is very different. A two-sample Kolmogorov-Smirnov test indeed strongly rejects the null hypothesis that the two distributions are similar. As most individual studies show, the offers of the dictator games' proposers follow a bimodal distribution with a high concentration of purely selfish and perfectly fair offers. These concentration peaks of offers at respectively 0% and 50% highlight the existence of two categories of players in the dictator game that we can respectively call 'selfish players' and 'altruistic players'. As a consequence, the dictator game, given the bimodal nature of its distribution, requires

a more detailed interpretation of the average bid. If the estimate of the average offer in the dictator game is 26%, it should be noted that most of the population of subjects did not opt for this offer but for one of the two categories mentioned above. As we mentioned earlier, the ultimatum game differs from the dictator game by granting veto power to the player who receives the offer. The existence of this veto power implies strategic considerations from the proposer who wants to avoid the rejection and the null earnings. In the dictator game, so-called 'selfish' and 'altruistic' players differ by their offers. In the ultimatum game, where most of individual offers are clustered, it is not the amount of the offer that differs but the reasons of giving: players being altruistic in the dictator game keep being altruistic in the ultimatum game but selfish players become strategic players to avoid a rejection. Considering our results about the impact of the industrialization degree of a country, altruistic players are very likely to represent a greater proportion in the non-industrialized population.

6 Conclusion

In this study, we aimed at exploiting the hundreds of experiments that have been carried out on the ultimatum and dictator games to improve our understanding of strategic and non strategic motives in human behavior. To do so, we carried out a thorough meta-analysis on both games. Concerning first the ultimatum, the random effect meta-analysis provides us with a 95% confidence interval for the average value of the offer of [40.03%; 42.05%]. The results also indicate a heterogeneous distribution of the effect-size across the different studies of our sample. The meta-regression shows that neither the amount of money involved, nor the lack of familiarity with the game have a significant influence on the choice of the proposer in the ultimatum game. Being a student in economics significantly and negatively influences the amount offered in the share. Regarding the various countries in which the studies were conducted, we see that the offers made in the experiments carried out in industrialized countries are slightly higher than offers made in the non-industrialized countries. As argued by Henrich et al. (2005), "payoffs to cooperation" and market integration are two important characteristics of a country to explain the players' behavior.[6]

Turning to the dictator game, we note first that a publication bias might be present in the data in favor of low offers. The (possibly downwardly biased) 95% confidence interval for the average value of the offer is [24.18%; 27.01%]. As for the ultimatum game, our analysis indicates a heterogeneous distribution of the effect-size across the different studies of our sample. The meta-analysis reveals that playing the dictator game with a double-blind protocol has a significantly negative influence on the amount given by the dictator. Conversely, the amount of money at stake (PPP) has no significant influence on subjects' choices. Being an economic student has no significant influence on the amount offered, suggesting that economic students are not less altruistic. They behave more closely to the standard theoretical equilibrium when strategic interaction is present. It may be a sort of reflex behavior due to their economic training.[7] Finally, the results display a strong

[6] According to Henrich et al. (2005), if people experience a lot of market transactions and earn incomes from cooperation in their everyday lives, they will be more likely to experience abstract sharing principles with strangers as involved by the ultimatum game.

[7] It can be argued that the explanation rather relies on beliefs. Usually economist subjects know that they are interacting with other economist subjects. Economist proposers may thus offer less if they expect economist responders to behave more closely to the standard theoretical equilibrium. However,

negative significant influence of the level of industrialization on the amount given by the dictator.

We then pool the two databases to investigate whether the "fairness hypothesis" can explain behavior in the ultimatum game. This analysis would be difficult to be done in a single within study because of obvious contagion effects. The meta-analysis provides a powerful way to do this. Our results confirm the expected result that the offers of players are statistically different between the dictator to the ultimatum game.

However, the most striking result of our study is that players from industrialized countries tend to offer significantly less in the dictator game and to offer significantly more in the ultimatum game. This highlights the fact that the strategic considerations are more important for players from industrialized countries (even though they also exist in low industrialized countries). Our study therefore provides a new insight into a puzzle first identified by Henrich (2000). In a ultimatum game experiment from a less developed society, the Amazonian Machiguenga, he observed lower offers than in the standard studies. The result was confirmed in subsequent researches (Henrich et al., 2004). Does this mean that people from less developed countries are less altruistic? This hypothesis may be consistent Montesquieu's famous thesis of "doux commerce", according to which the involvement into market interactions tends to pacify relations with others. In a more developed country, market integration tends to increase, inducing subjects to be more sensitive to fairness. Hirschman (1982) explains the softening effect of trade by the importance of reputation for agents involved in markets. The best way to build and maintain a good reputation would be to engage in fair transactions. The subject is nevertheless still debated. Marx and others have long demonstrated the negative impact of commercial interactions on the moral foundations of society. Moreover, in a complex society, where life is regulated and protected quasi exclusively by large and anonymous institutions (the constitution, laws, social security, big companies, etc.), close relationships with others may become less frequent and necessary. In more developed societies, individuals know that social security will provide them some protection in case of severe illness or if their home is destroyed by fire. So, what's the use of maintaining good relationships with others? Things are completely different in traditional (small) societies, where life accidents require the help of relatives, friends, but also other known persons. As shown by Hofstede (1991), richer societies are typically characterized by more "individualism". Our results are supportive of this view.

again, this amounts to saying that economic responders show a sort of spontaneous behavior acquired by economic training.

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