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Dictator games: A meta study

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**Preprints of the
Max Planck Institute for
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Bonn 2010/07**



**Dictator Games:
A Meta Study**

Christoph Engel



MAX PLANCK SOCIETY



Dictator Games: A Meta Study

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March 2010

Dictator Games: A Meta Study^{*}

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Abstract

Over the last 25 years, more than a hundred dictator game experiments have been published. This meta study summarizes the evidence. Exploiting the fact that most experiments had to fix parameters they did not intend to test, the meta study explores a rich set of control variables for multivariate analysis. It shows that Tobit models (assuming that dictators would even want to take money) and hurdle models (assuming that the decision to give a positive amount is separate from the choice of amount, conditional on giving) outperform mere meta-regression and OLS.

JEL: C24, C91, D03

^{*} Helpful comments by Sebastian Kube and Susanne Prantl are gratefully acknowledged.

I. Introduction

Some 25 years ago, Daniel Kahneman first had students in his classroom play an ultimatum game (Güth, Schmittberger et al. 1982), which was then followed by the question:

“You will be matched at random with two other students, and you will get to share some money with one or both of them. If the two people made different decisions in the first stage (e.g. one of them took \$10 and one took \$18), then you must make a decision about how to allocate the money. Call the person who took \$10 and gave the other one \$10 student E (for even). Call the person who took \$18 and gave the other one \$2 student U (for uneven). Your choices are as follows: you may allocate \$5 to yourself, \$5 to student E, and nothing to student U; or you may allocate \$6 to yourself, nothing to student E, and \$6 to student U”.

74 % of their participants chose the first option although this cost them \$1 (Kahneman, Knetsch et al. 1986:S290 f.). This is how a literature started to which in the meantime 129 contributions have been published, testing a total of 616 different treatments.¹ The experimental paradigm has proven so powerful precisely because it is so simple. Actually the successors of Kahneman have further simplified the game (starting with Forsythe, Horowitz et al. 1994). The game now is typically stripped of the third party punishment component and played in isolation. The dictator's action space is complete, so that she may distribute the pie at her will between the recipient and herself.

Kahneman invented the game as part of his programme that turned textbook assumptions into behavioural hypotheses. While normally a sizeable fraction of participants does indeed give nothing, as predicted by the payoff maximisation hypothesis, only very rarely this has been the majority choice. It by now is undisputed that human populations are systematically more benevolent than *homo oeconomicus*. Later experiments have explored this predisposition in two dimensions: situational and demographic. The former implicitly sticks to the claim that, at least at the population level, behavioural dispositions are human universals. It engages in refining the conditions under which benevolence is to be expected. The latter puts the research question upside down and uses the extremely simple design as a tool for quantifying systematic behavioural differences between populations.

The dictator game has become popular among experimentalists. In the one year of 2008, 30 new papers with this game have been published. It therefore is time to take stock, and to make the existing body of evidence accessible. Yet this paper aims beyond merely providing orientation. Implicitly, through their design choices, experimenters have generated data on independent variables they have not explicitly set out to test. They for instance have played a one-shot game with students, asking dictators to divide a pie of \$10 given to them between themselves and an anonymous recipient from the same subject pool. What looks like a perfectly standard dictator game implicitly provides data on one shot versus repeated games; on games with students versus other populations; on manna from heaven versus earned money; on stakes; on a specified degree of social distance; on dictator-recipient anonymity versus dicta-

1 For detail, see the list of papers used for the meta study in Appendix 1.

tor identification. This evidence is untapped as yet. It is useful for two purposes. The basis for univariate analysis becomes much broader. More interestingly even, multivariate analysis becomes possible to a degree that by far transcends what is feasible in individual experimental studies. That way one learns which effects are robust, and how big effects are once one controls for other factors that have been shown to matter for the willingness of dictators to give.

The remainder of this paper is organised as follows. Section 2 explains how the sample has been collected and addresses analytic methodology. Section 3 treats all experiments as contributions to one question: how much are dictators willing to give? Section 4 focuses on individual experimental manipulations. Section 5 simultaneously uses all these independent variables to explain sociability in multivariate analysis. Section 6 concludes.

2. Data and Methodology

Two papers have engaged in a similar exercise. In 2003, Camerer has done a meta-study of 11 experiments (Camerer 2003:57 f.). In 2008 Cardenas and Carpenter have done the same for 10 experiments playing the dictator game in developing countries (Cárdenas and Carpenter 2008:317). This meta-study covers all 129 papers published between 1992 and the end of 2009, including 4 papers to come out in 2010 but already available through advance access. 4 papers do not report sample size. The remaining papers cover a total of 41,433 observations.

The search for papers has started with the two predecessor studies. The keyword “dictator game” produced 89 hits in the EconLit database, and 240 hits in RePEc. Finally I have checked the references of the papers thus found. Unsurprisingly, these sources frequently pointed to the same publications. Moreover, in particular but not only in RePEc, not so rarely one and the same publication is listed repeatedly within the same database, usually since earlier and later versions are kept. Subtracting duplicates, the resulting gross sample includes 255 papers. I have excluded 76 papers since they test a different game. I in particular have left aside papers that give the recipient any kind of power (and thereby bring the experiment close to an ultimatum game); papers (like (Kahneman, Knetsch et al. 1986) that started the literature) that mix the motive of benevolence with one of sanctioning the recipient; papers that limit the dictator's action space such that it does not include the option to give nothing (again like (Kahneman, Knetsch et al. 1986)). Six experiments play the right game, but ask a different research question. They for instance want to know how much unendowed observers expect dictators to give (Aguiar, Branas-Garza et al. 2009). Another 15 papers do not report the data such that it can be used for meta-analysis. Seven papers have no original data. Another five are surveys or (the two) meta-studies. 20 are pure theory papers. One is a pure econometrics paper. The papers included in the final sample comprise a total of 616 treatments.

The prime dependent variable is the mean fraction of the pie that dictators give recipients, per treatment. For 498 treatments, this measure has been reported. For the remaining treatments, it can be calculated from the pie size and information on individual contributions. Meta-analysis

exploits the fact that individual studies have different size and different variance. Yet standard deviations or standard errors are only reported for 191 treatments. Fortunately, for another 254 treatments, the standard error can be reconstructed from information on the distribution of give rates. Frequently, this information is presented graphically, as a histogram or as a cumulative distribution, with no exact numbers reported. I then have checked whether my measurement of the height of bars is sufficiently precise. I have accepted the outcome if numbers add up to a result within [.95 1.05]. I thus have accepted a translation mistake of at most 5%. This procedure seemed more reliable than ex post forcing precision on insufficient factual basis.

Meta-analysis is a variant of weighted least squares. It treats findings from each experimental treatment as one observation. The weight reflects the precision of this information. Fixed effects meta-regression weights each data point by the respective standard error.² That way it is sensitive to both sample size and variance within the respective study. Following the procedure proposed by DerSimonian and Laird (1986), random effects meta-regression allows the standard error of each study to itself result from a random draw. It thus works with model

$$y_i = \mathbf{x}_i' \boldsymbol{\beta} + u_i + e_i$$

where y_i is the fraction of the pie one participant gives the recipient, $\mathbf{x}_i' \boldsymbol{\beta}$ is a vector of explanatory variables with its coefficient vector, $u_i \sim N(0, \tau^2)$ is the between studies error, with variance τ^2 , and $e_i \sim N(0, \sigma_i^2)$ is the within study (residual) error. Consequently, each study is weighted with $1/(\sigma_i^2 + \tau^2)$ (Harbord and Higgins 2008). The weight thus also reflects how much the respective treatment contributes to explaining the between studies variance.³

Normally, meta-analysis cannot go any further. Fortunately, the literature on dictator games frequently not only reports means and standard errors, but also distributions. The measure is slightly imprecise though. Even if dictators' action space was not limited to integers of 10, usually only deciles are reported. Moreover, I mostly had to translate graphs into numbers for the purpose, with a small risk of translation error. With these limitations, based on distribution information and on the N of the respective study, for those 83 papers with complete distribution information, I am able to reconstruct the original data, resulting in 20,813 observations. Note that I have full information of independent variables in that they are fix per treatment. I use this second data set for complementary analysis, and for comparing distributions in particular. If I work with this data set, I correct standard errors through clustering at the level of treatments. Along with this, classical meta-analysis is always reported since it is more conservative, and since it can cover more papers.

2 Terminology slightly differs from the terminology that is standard in econometrics. The “fixed effects” model actually does not have an individual specific effect in the model, but exclusively captures differences between studies by the weight.

3 For the restricted maximum likelihood estimator of τ^2 , see (Harbord and Higgins 2008).

3. Overall benevolence

If one calculates the grand mean from all reported or constructed means per 616 treatments, dictators on average give 28.35 % of the pie. As Figure 1 demonstrates, the distribution of means is left skewed. Dictators are more likely to give little. In 6 of 616 treatments, they on average give zero. Only in one of these six cases, this results from the fact that dictators had a take option.

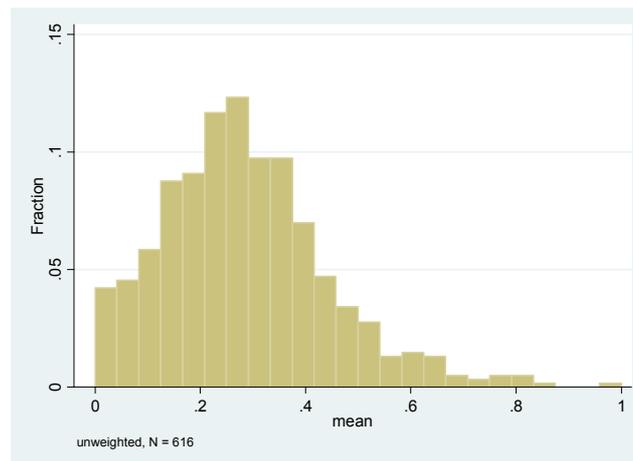


Figure 1
Distribution of Mean Contributions per Treatment

Technically, meta-analysis is more reliable. It can be undertaken for those 445 treatments for which standard errors are reported or can be reconstructed. Interestingly, random effects meta-analysis almost perfectly matches the unweighted grand mean. It establishes a give rate of 28.3 %.⁴ In principle, this is a very reliable result. The null hypothesis that the give rate is 0 is rejected with $z = 35.44$, $p < .0001$. Yet between studies heterogeneity is pronounced. Between studies variance⁵ explains 97.1 % of the overall variance. Since we have information on a host of independent variables, this is a strong indicator that meta-regression is preferable over mere meta-analysis.

Finally, using the supplementary dataset with reconstructed individual observations, we learn that contributions are very unevenly distributed over the unit interval, Figure 2. 36.11 % of all participants give nothing to the recipient. 16.74 % choose the equal split. As many as 5.44 % give the recipient everything.

4 The result from fixed-effects meta-analysis differs though. If weights are not corrected for the contribution of a treatment to explaining between studies variance, the estimated give rate goes down to 20.4 %.

5 In technical terms, parameter τ^2 .

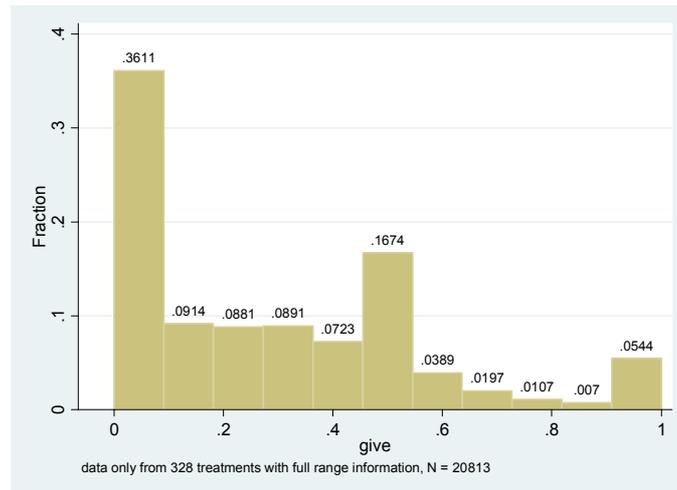


Figure 2
Distribution of Individual Give Rates

4. Explanatory Factors

Experiments are designed to test the effect of one, maybe two or three, manipulations. In the motivation of their papers, experimentalists link their tests to the related literature. Yet if experiments are not meant to test formal theory, which is normally not the case in dictator games, it is not always clear how one effect is related to another. In a fully satisfactory way, these links could only be built if the mediating factors, from the environment or from participants' attitudes, were isolated; this would require new experiments. Here, I must content myself with ex post generating order in this literature. In so doing, I start with those manipulations that are closest to standard economic theory. A number of experiments have slightly altered the incentive structure (a). Others have given the dictator all the power, but have exposed her to social control. This tests the power of social expectations and of the risk of social sanctions (b). Textbook agents only care about their own payoff. Many experimental games point to the fact that participants are also sensitive to relative, not only to absolute payoffs. Many dictator games have explored the motivating force of payoff comparisons by making the dictator and the recipient differently deserving (c). Some experiments have introduced context by framing the situation. Since context defies standardisation, for this meta-study only one manipulation is analysed in detail: the effect of having participants handle real coins or notes (d). I may be willing to give to the victims of an earthquake at the opposite side of the globe, and my neighbours may have annoyed me so much in the past that they would be the least to whom I would want to be generous. Yet if such contextual factors are excluded by design, one would expect that people give the less, the higher the social distance between themselves and the recipient (e). Finally, demographics like age, gender, race, or the country of origin matter (f).

As is typical for meta-studies, these independent variables are not distributed equally across the (meta) sample. Some independent variables are not reported in all studies. For detail, the

interested reader is referred to Appendix 2. Since the dataset is rich, despite the imbalance most effects turn out significant. In this section, I introduce the independent variables and present univariate tests. In Section 5, multivariate models are presented.

a) Incentives

In most dictator games, the action space is quasi continuous. For instance the stake is \$10, and dictators can give any amount of integer dollars they deem fit. Sometimes, experimenters have constrained the action space. They for instance have excluded the equal split, or they have only given dictators a choice between keeping everything and contributing half of the pie (both is, e.g. used in Bolton, Katok et al. 1998). Meta-regression with this explanatory variable is insignificant. However if one uses individual data, limiting the action space has a weakly significant positive effect: OLS, cons .266***, limited action space .106⁺, N = 20,813, adj.R² .008.⁶

In the standard dictator game, the dictator may be sure that her decision determines her payoff. Some papers have introduced uncertainty about the dictator's own payoff. A lottery determines whether the dictator's choice is implemented, or whether it is replaced by a random draw (a key contribution is Andreoni and Bernheim 2009). Again meta-regression is insignificant. However using individual data, one establishes a significant negative effect. The less the dictator is sure that intended benevolence becomes effective, the less she gives in the first place: OLS, cons .273***, degree of uncertainty -.126**, N = 20,813, adj.R² .0004.

Normally, there is just one dictator. What if more than one dictator competes? The key contribution to this question is a study with school children. After the whole class had played, the payoff ranking was posted on the blackboard, and the dictator with the highest payoff got an additional treat (Houser and Schunk 2009). Once more, meta-regression is insignificant. At the level of individual data, dictators give less if they are under competitive pressure⁷, OLS, cons .273***, dictator competition -.074*, N = 20,813, adj.R² .0008.

It is standard in dictator games to pay out each individual choice. Yet if experimenters have repeated the game, or if they wanted to use high stakes, they sometimes have only paid some choices, or some dictators for that matter, at random. Occasionally, experimenters have not used pecuniary incentives at all, and have just asked the hypothetical question how much participants would be happy to give, were they to have the money. Again, the effect is insignificant in meta-regression, whether one treats this as an ordinary variable with three expressions, or as three categorical variables. In the specification as an ordinary variable, the effect remains insignificant at the level of individual data ($p = .108$). Yet random pay substantially and significantly reduces giving if one treats all three types of payment as distinct categories. The

6 Throughout the paper, significance levels are reported by *** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .1$.

7 Which is coded as a dummy variable.

effect of hypothetical, as opposed to a real, pay remains insignificant: OLS, cons .377***, random pay -.117***, hypothetical pay -.045, N = 20,813, adj.R² .010.

The standard stakes in a dictator game are \$10. Especially when repeating the game, or when using the strategy method (Selten 1967), stakes can be fairly low. An additional challenge stems from the fact that many experiments have been run in countries with a national currency other than the dollar. If papers have indicated the exchange rate at the time of the experiment, I have used the dollar equivalent. Nonetheless, for this independent variable, I only have 440 (rather than 616) treatments. Stakes range from \$0 to \$130, with mean \$21.77. This time, both meta-regression and a regression with the original data are insignificant. Meta-regression is significant, though, if one reduces the sample to those 158 treatments that have manipulated stakes. Higher stakes reduce the willingness to give. If there is more to gain, dictators keep more, not only in absolute, but also in relative terms (although the effect is very small): meta-regression, cons .326***, stake -.002**, N = 158, adj.R² .036.

The standard dictator game is one shot. Some experimenters have repeated the game, but changed recipients every round. Others have used the strategy method. I have coded both manipulations as multiple tests. Multiple tests have a clear negative effect on giving: meta-regression, cons .297***, multiple tests -.071**, N = 445, adj.R² .058.

What if the dictator is not an individual, but a group? Again, meta-regression is insignificant, but there is a highly significant effect when analysing individual data. Groups are more selfish than individuals: OLS, cons .274***, group decision -.083***, N = 20,813, adj.R² .002.

b) Social Control

Many experimenters have wondered whether dictator greed would disappear with increased social control. The most obvious way to increase social control is making recipients identify the person in whose hands they are. One for instance makes dictators stand up, so that recipients observe who decides (Frey and Bohnet 1995). Here, meta-regression yields a surprising result. The effect of identification is insignificant in univariate analysis. But it becomes significant if one controls for stakes. Yet the effect is negative: meta-regression, cons .283***, identification -.060*, stake .0002, N = 346, adj.R² .045. At the level of individual data, the effect reverses and thus is positive, as one would expect: OLS, cons .270***, identification .068*, N = 20,813, adj.R² .002. Comparing distributions, one sees the likely reason for the surprising result of meta-regression, Figure 3. If dictators are identified, this has two effects: they are less likely to give nothing, but they are also less likely to give more than half of the pie. The mode shifts from 0 to 10. Seemingly, even in the dictator game benevolence may crowd out.

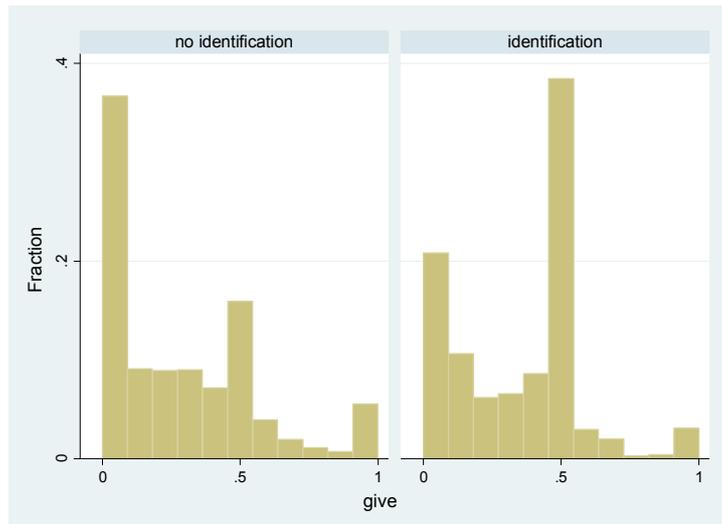


Figure 3
Effect of Dictator Identification
based on individual data

A less intrusive form of increasing social control is giving the dictator a social cue. For instance one study has shown part of the dictators three large dots that were arranged in a way that evokes a face (Rigdon, Ishii et al. 2009). Since standard dictator games are devoid of any social cues, it is meaningful to compare them. Yet neither with meta-regression nor with individual data is there a significant effect. Yet if one confines the analysis to those experiments that have explicitly manipulated the presence of social cues, such cues have a fairly pronounced positive effect on giving: meta-regression, cons .215***, social cue .131*, N = 52, adj.R² .239.

Other experimenters have not increased, but reduced the degree of social control, compared to the standard design of dictator games. To that end, they have given the dictator a chance to hide her decision, such that the recipient does not learn (for sure) that her payoff is due to a dictator's decision (see e.g. Dana, Cain et al. 2006). This reduces dictators' generosity: meta-regression, cons .288***, concealment option -.077*, N = 445, adj.R² .007.

Early on, experimenters were concerned that dictator-recipient anonymity would be insufficient to measure true benevolence. They were afraid that participants would give because they were aware the experimenter would learn their choices. Fairly elaborate procedures have been invented to also guarantee dictator-experimenter anonymity (starting with Hoffman, McCabe et al. 1994). Both in meta-regression and when using individual data, in univariate analysis such doubleblind protocols do not have a significant effect. This changes if one controls for one shot versus repeated interaction. One then finds a weakly significant, small reduction of generosity: meta-regression, cons .309***, repeated interaction -.082***, doubleblind -.036⁺, N = 445, adj.R² .066.

c) Distributive Concerns

Ultimately, a dictator game is about distribution. One should therefore expect that dictators give more if the recipient's claim to her fair share is made more legitimate. This expectation is not always borne out. One way of manipulating legitimacy is property rights. In the standard dictator game, the dictator receives money from the experimenter and is free to give a fraction to the recipient. What if, instead, the money is allocated to the recipient, but the dictator is free to take a fraction (as first investigated by Eichenberger and Oberholzer-Gee 1998)? In univariate analysis, this has no significant effect, neither in meta-regression nor with individual data. One finds a significant effect if one controls for stakes and adds the interaction term. Then, if stakes are not too low,⁸ through the interaction term, participants do indeed leave recipients a larger share if they have to take away money from them: meta-regression, cons .273***, takeoption -3.664*, stake .0003, takeoption*stake .687*, N = 346, adj.R² .016.

In the standard dictator game, the recipient is not needy. Many experiments have checked how generosity increases if it is made clear that the recipient is deserving. They for instance have asked dictators whether they were happy to make a donation to a charity. This has a clear and strong effect: meta-regression cons .261***, deserving recipient .115***, N = 445, adj.R² .075. Figure 4 demonstrates that this can be decomposed into two effects. If the recipient is deserving, only half as many dictators keep everything. More than 20% give everything. The difference in distributions is significant: Epps Singleton, $p < .0001$.⁹

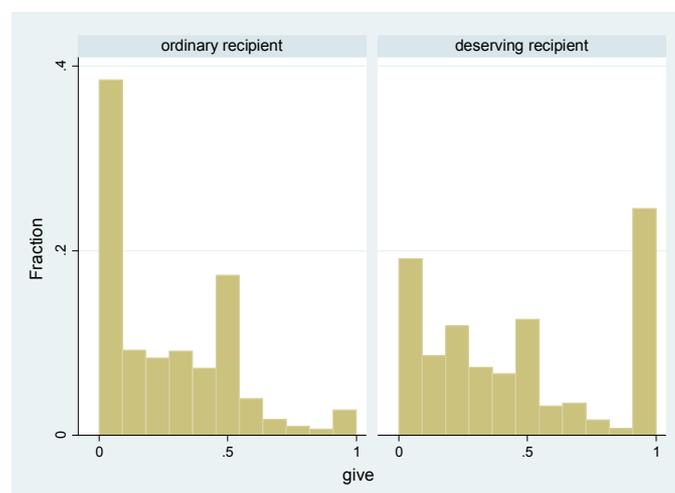


Figure 4
Giving to a Deserving Recipient

8 If stakes are above 5.333, dictators give more if there is a takeoption. With the standard stakes of \$ 10, they leave \$ 3.206 more if they have to take, rather than give.

9 On methodology see (Epps and Singleton 1986; Goerg and Kaiser 2009). The test is preferred over Kolmogorov Smirnov since it has higher statistical power.

Dictators do take even less if the recipient had earned the money into which they are now free to tap: meta-regression, cons $.286^{***}$, recipient earned money $-.059$, takeoption $-.084$, earned*takeoption $.616^+$, $N = 445$, $\text{adj.R}^2 .008$.

The standard dictator game is a zero sum game. One dollar won for the recipient is one dollar lost for the dictator. Quite a few experiments have turned the game into a positive sum game. They for instance have stipulated that one dollar lost for the dictator increases the recipient's payoff by three dollars. Other experiments have reduced the efficiency of giving, so that one dollar lost for the dictator creates less than a dollar for the recipient. These manipulations have a significant effect in the expected direction. The larger the multiplier, the more dictators give, and vice versa: meta-regression, cons $.248^{***}$, multiplier (fraction or multiple of 1) $.030^*$, $N = 445$, $\text{adj.R}^2 .016$.

What if there is more than one recipient? One might have thought that the presence of a second recipient serves as an excuse for giving little to both. Actually, the opposite is true. If there is another recipient, both receive substantially more: meta-regression, cons $.280^{***}$, multiple recipients $.112^*$, $N = 445$, $\text{adj.R}^2 .022$.

In the standard dictator game, the recipient is poor while the dictator is rich. If the recipient also receives an endowment upfront (as, for instance, in Eckel, Grossman et al. 2005), this strongly reduces giving: meta-regression cons $.291^{***}$, recipient endowment $-.213^{***}$, $N = 445$, $\text{adj.R}^2 .052$. As Figure 5 shows, if the recipient has received a positive endowment at the start of the interaction, the reduction is almost perfectly proportional to the size of the endowment; datapoints almost perfectly lie on the regression line.

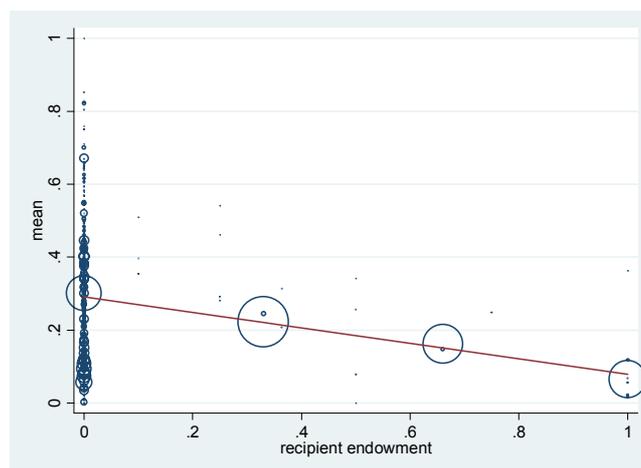


Figure 5
Effect of Upfront Endowment to Recipient

Perceived distributive fairness is also altered if the pie is not manna from heaven, but if the dictator had to earn it. This strongly reduces her generosity: meta-regression, cons $.295^{***}$, earned pie $-.169^{***}$, $N = 445$, $\text{adj.R}^2 .084$. The mere fact that the dictator is ostentatiously

entitled with the pie does not have a significant effect though, neither in meta-regression nor with the original data.

d) Framing

The standard dictator game is presented as a context free opportunity structure, giving the dictator all the decision power, and the recipient none. Experimenters have added a variety of frames to the dictator game, like buying and selling a commodity (Hoffman, McCabe et al. 1994). Unsurprisingly, the abstract fact that a frame has been added does not have a significant effect; each frame is different. Another manipulation that is related to framing has a remarkably strong effect though. If dictators handle coins or notes, they give substantially more: meta-regression, cons .268***, real money .075***, N = 445, adj.R² .023. As Figure 6 demonstrates, the effect has two sources. If they handle real money, participants are less likely to give nothing. More remarkably even, they become much more likely to give everything. The difference in distributions is significant: Epps Singleton, p < .0001.

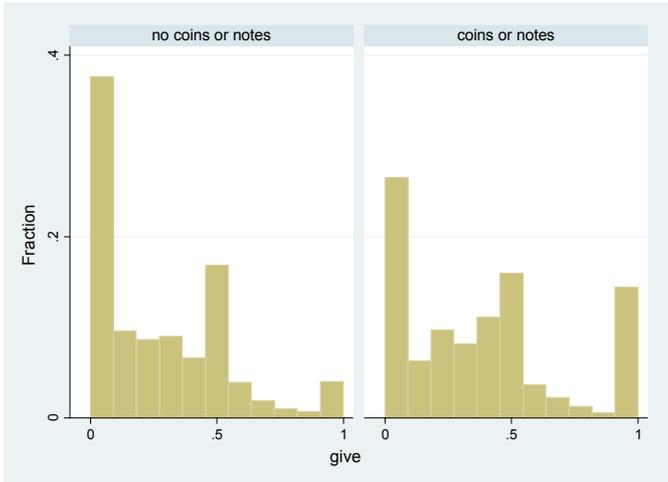


Figure 6
Effect of Handling Real Money

d) Social Distance

In the standard dictator game, it is common knowledge that the dictator and the recipient are randomly selected members of the same student subject pool. Experimenters have manipulated the degree of social distance, ranging from a total stranger over another member of the subject pool to a member of a more closely defined group, to the friend of a friend of a friend, to the friend of a friend, to an immediate friend (the most elaborate study is Leider, Möbius et

al. 2009).¹⁰ Statistically, the degree of social distance has a surprising negative effect. The model predicts that dictators give the less the closer the recipient: meta-regression, cons .355***, degree of social distance -.063***, N = 445, adj.R² .098. Inspecting Figure 7, one should become suspicious though. If dictators and recipients are any closer than being members of the same subject pool, their generosity is practically stable. The significant effect is a statistical artefact, driven by other explanatory factors inducing ordinary members of the subject pools to contribute substantially more. This of course strongly indicates that multivariate analysis is preferable over univariate models (see below section 5 for this).

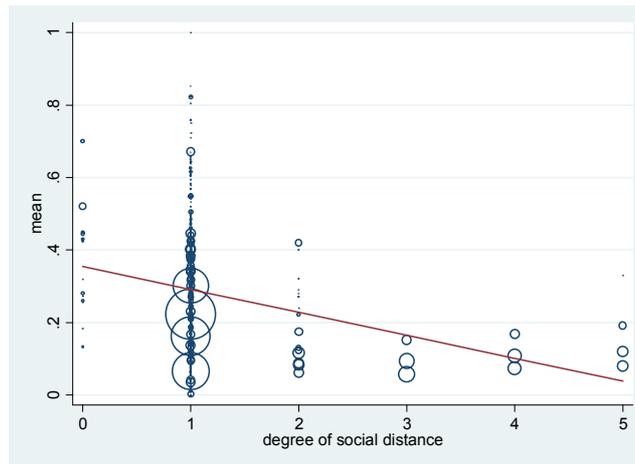


Figure 7
Effect of Social Distance

f) Demographics

The normal participant of a dictator game is a student. On average, non-students give much more: meta-regression, cons .398***, student -.151***, N = 445, adj.R² .153. As Figure 8 shows, students are much more likely to give nothing, and they are much less likely to choose the equal split, or to even give everything. The difference in distributions is statistically significant: Epps Singleton, $p < .0001$. These are remarkable findings. Experimental economists have often been criticized for generating artificial findings with a subject pool that has little to do with the much harsher reality of economic relations (see e.g. Levitt and List 2007). At least in dictator games, the opposite turns out to be true. Student experiments *underestimate* the deviation from the textbook prediction.

10 Note that social distance measures proximity, not distributive concerns. If, for instance, dictators are invited to give to a charity, social distance is high, but there is a higher than ordinary social expectation of giving.

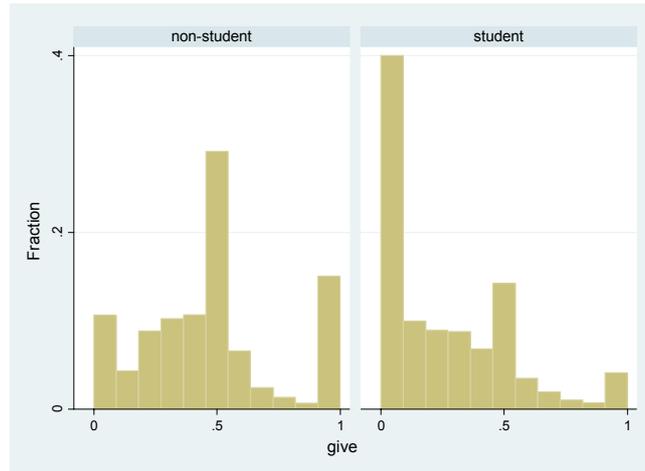


Figure 8
Comparing Students to Non-Students

Starting with (Eckel and Grossman 1998), many have tested gender effects. Since in ordinary papers on dictator games gender is not reported, meta-regression with all data would not be meaningful. If one confines the sample to those papers that have explicitly tested gender, it turns out that women give significantly more: meta-regression, cons .212***, female .058*, N = 12, adj.R² .106.

If one does the same with dictator race, there is no significant effect. For this independent variable, meta-regression is the only option since no paper that has manipulated dictator race has also reported distributions.

Women do not only give more in dictator games, they also get more as recipients. In a meta-regression confined to those experiments that have explicitly tested recipient gender, this factor alone explains 73.2 % of the observed variance, cons .052, female recipient .150***, N = 39. If one controls for recipient gender, dictator gender is insignificant, cons .041, female dictator .016, female recipient .143*, N = 33, adj. R² .7203. Recipient race does not have a significant effect.

Anthropologists have frequently used the dictator game as a technology for quantifying the sociability of developing or primal cultures. If one codes Western subject pools as 0, pools from developing countries as 1, and pools from primal societies as 2, one establishes a remarkable significant positive effect: meta-regression, cons .275***, society characteristic .053**, N = 445, adj.R² .024. The more a society is primal, the more dictators are willing to share. If one treats the two non-Western origins as categorical variables, seemingly the difference between Western and developing countries disappears, while the difference between developed and primal societies is all the stronger: meta-regression, cons .275***, developing country .050, primal society .108**, N = 445, adj.R² .020.

As Figure 9 demonstrates, this impression is misleading. In Western societies, the typical picture from student populations is replicated. Close to 40 % of participants give nothing, less than 20 % choose the equal split, some 5 % give everything. Both in developing countries and in primal societies, giving more than 50% is rare. However, in primal societies the equal split is the mode, and giving little is rare. Developing countries are in the middle. Giving nothing is much less frequent than in Western societies, but much more frequent than in primal societies. Contribution patterns basically distribute over the range [0, .5]. All bilateral comparisons of distributions are statistically significant: Epps Singleton, $p < .0001$.

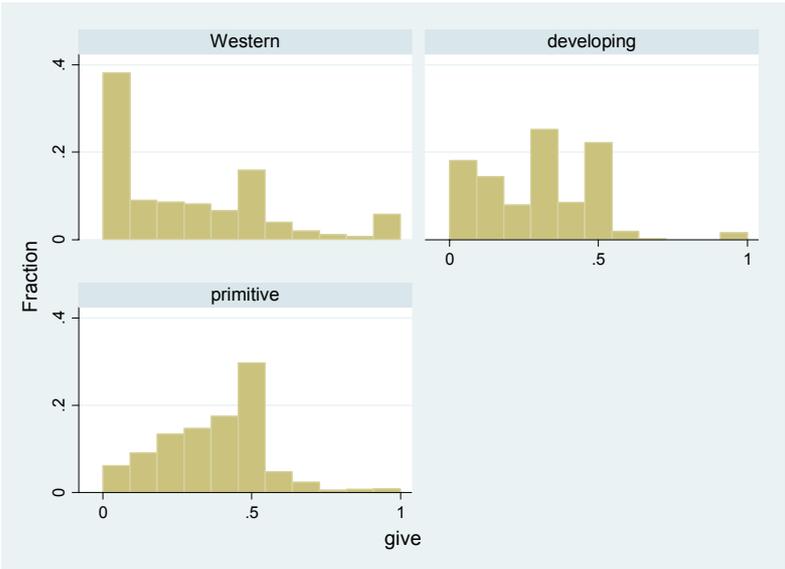


Figure 9
Society of Origin

Age also has a strong effect. If one codes children with 0, students with 1, middle-aged adults with 2, and the elderly with 3, there is a highly significant, substantial effect: meta-regression, $\text{cons} .187^{***}$, $\text{age} .098^{***}$, $N = 445$, $\text{adj.R}^2 .038$. If one treats each age class as a categorical variable, in meta-regression, the behaviour of children is not significantly different from the behaviour of students, while there is a significant difference with respect to the remaining age classes: meta-regression, $\text{cons} .269^{***}$, $\text{child} .036$, $\text{middle age} .138^{**}$, $\text{elderly} .443^{***}$, $N = 445$, $\text{adj.R}^2 .122$. Again distributions are more informative than means. Children are unlikely to give more than half of the pie, and many give less. This explains why there is no difference in means, compared to students. Yet children are much less likely to give nothing. Giving nothing is even rarer in participants of middle age, and it never happens in the elderly. For people of middle age, the equal split is the mode, while for the elderly this is giving everything. All bilateral comparisons of distributions are statistically significant: Epps Singleton, $p < .0001$.

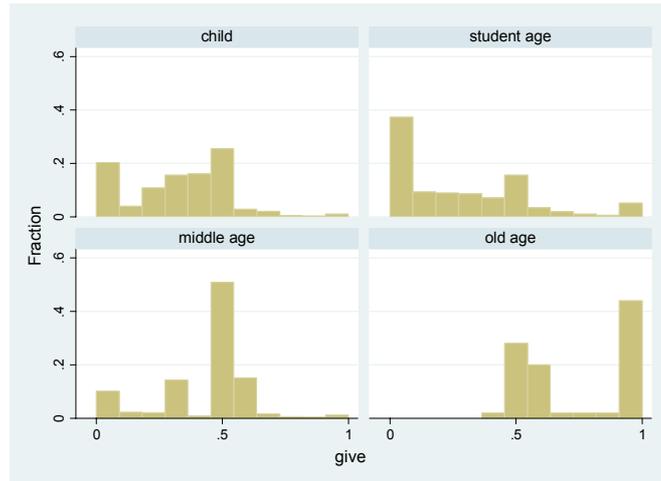


Figure 10
Effect of Age

5. Multivariate Analysis

In univariate analysis most effects turns out significant. Yet univariate analysis has little explanatory power. This becomes patent through the measure for the adjusted R^2 . In most regressions, it is below .1, implying that more than 90 % of the variance remains unexplained. Compared to the meta-analysis of means, which left 97.1 % of the variance unexplained, this is only a marginal improvement. Multivariate analysis has a much better fit. Table 1 uses complementary analytic strategies. The complete meta-regression model, i.e. the regression with weighted study means as the dependent variable, explains almost half of the variance, even if one adjusts the R^2 for the fact that one uses 24 explanatory variables.

	meta-regression	ols	tobit	logit 0	truncated ols	logit 50	logit 100
limited action space	-0.062+	0.036	0.027	1.33	0.124**	0.299***	1.04
degree of uncertainty	-0.036	-0.082	-0.068	1.395	-0.232	1.352	1
incentive	-0.01	-0.034*	-0.067**	1.506**	0.009	0.848	0.86
repeated game	-0.064**	-0.017	-0.024	1.032	-0.024	0.556***	1.514
group decision	-0.054+	-0.105*	-0.103+	0.925	-0.207***	0.954	1
identification	0.042	0.052*	0.077**	0.588*	0.041	1.891**	1.02
social cue	0.005	-0.03	-0.033	0.968	-0.059	1.097	0.711
concealment	-0.065*	-0.029	-0.035	1.087	-0.036	0.848	0.866
double blind	-0.024	-0.035	-0.023	1.038	-0.049	0.893	0.627
take option	0.067	-0.035	-0.083	1.549	0.048	1.489	1.139
deserving recipient	0.086***	0.175***	0.226***	0.393***	0.128**	0.683+	6.281***
recipient earned	0.128*	0.169**	0.275***	0.382*	0.259***	2.435*	1.814
efficiency recipient	0.026+	0.009	0.022	0.743**	-0.023	0.688*	2.398**
multiple recipients	0.148***	0.037*	0.028	1.208*	0.125**	0.544***	1.712+
recipient endowment	-0.173***	-0.042	-0.147	2.312*	0.091	0.63	1.323
dictator earned	-0.174***	-0.183***	-0.374***	4.430***	-0.222***	0.276***	1
real money	0.025	0.068+	0.076+	0.851	0.101*	0.732	7.961***
degree of social proximity	-0.053***	0.007	0.005	1.027	0.024	0.482*	14.643***
student	-0.104**	-0.217***	-0.233***	1.561	-0.301***	0.997	0.113***
child	-0.117**	-0.190**	-0.172*	0.72	-0.379***	2.799*	0.002***
middle age	0.001	-0.034	0.031	0.223+	-0.246***	8.207***	0.090***
old age	0.336***	0.182**	0.247**	1	0.013	3.219*	0.247*
developing country	0.015	0.015	0.042	0.534*	-0.044	1.359	0.265*
primal society	-0.009	-0.098	-0.027	0.157*	-0.335***	1.599	0.016***
constant	0.416***	0.497***	0.432***	0.264+	0.613***	1.109	0.005***
N	603	20491	20491	20341	13056	20491	19080
F or chi ²	11.28	34.8		291.3	537.22	315.6	1106
adj.R ² / pseudo R ²	.485	0.15	0.106	0.0744		0.0708	0.269

Table 1
Multivariate Analysis
codes are explained in section 4

Not all regressors turn out significant. The degree of uncertainty is insignificant, as is the kind of incentives, dictator identification, the presence of a social cue, dictator-experimenter anonymity, a take option, the use of real money, the fact that the dictator has middle age, and that she comes from a developing country or from a primal society. Figure 11 collects those regressors that remain at least marginally significant if one controls for all other explanatory variables. Old age has by far the strongest positive effect. A fairly strong effect also stems from having more than one recipient. The remaining three positive variables concern different dimensions of recipient need and legitimacy. By contrast, if the recipient's desire is only weakly legitimate, this strongly reduces giving. This may result from the fact that the recipient had an endowment in the first place, or that the dictator had to earn the pie. In demographic terms, children and students give less. Dictators also exploit concealment options. Finally they give less if the game is repeated, if the action space is limited, if groups decide and, surprisingly, the smaller the social distance to the recipient.

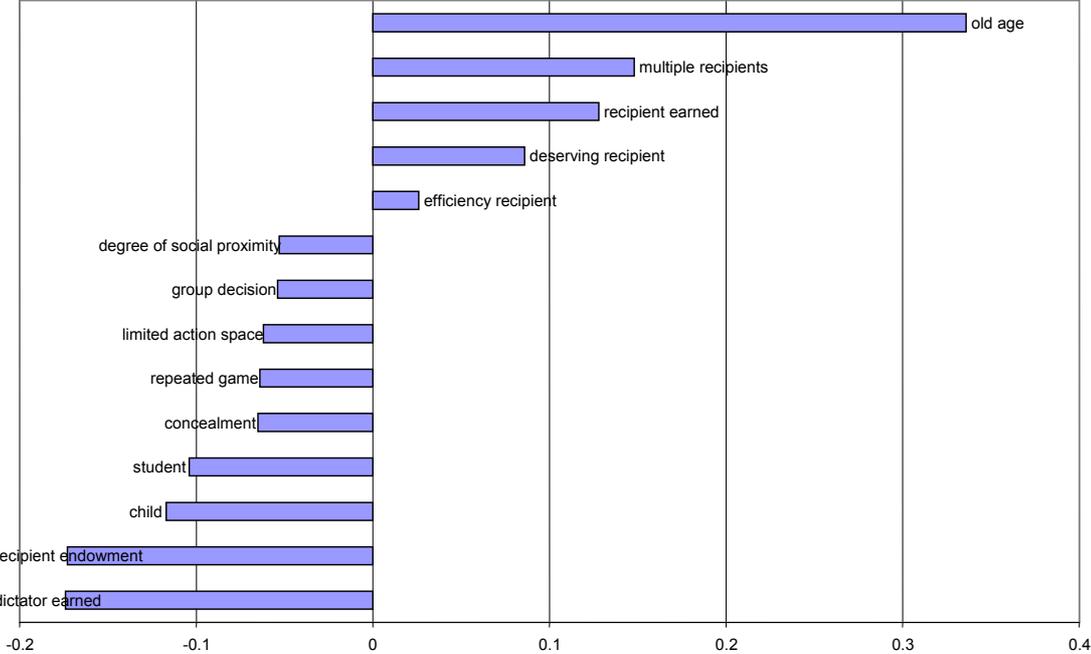


Figure 11
 Significant Regressors in the Complete Model
 meta-regression

If one replaces study means by the original data, one works with 20,491 instead of 445 data-points. One should expect that this makes it easier to establish significance; standard errors are the standard deviation, divided by the square root of N, after all. This indeed holds for dictator identification and for the use of real coins and notes. Both now also have their positive effect if one controls for all the other explanatory variables. Interestingly, in multivariate analysis the effect of incentivising individual choices turns out negative; dictators give less. The equally negative effect of group decision is now significant at conventional levels. Two more regressors become significant at a more demanding level. Yet there are also three regressors that were

significant in meta-regression, and that become insignificant when using individual choices. Two more regressors are only significant at a lower level. Yet if one reduces the sample of the meta-regression to those studies that reported distribution information, one finds the same or even lower significance levels. The differences are thus due to sample attrition.

As Figure 2 demonstrates, a fairly substantial fraction of dictators maximises individual payoff and gives zero. One may therefore consider the individual data to be left censored. The standard treatment of censored data is a Tobit model. It assumes that there are dictators who would have given a negative amount, had they not been prevented from this by experimental design. As the experiments demonstrate that give participants a take option, this assumption is tenable. If they have a take option, quite some participants seize it. This even holds if they can both give and take (Bardsley 2008). In the Tobit model, significance levels look very similar to OLS. However, a number of coefficients become substantially larger.¹ This in particular holds for the fact that the recipient is deserving, and that she or the dictator earned the pie. Also the effect of old age becomes more pronounced.

An equally plausible analytic approach assumes that the decision to make a positive contribution, and the decision how much to give, conditional on the willingness to give at all, are two separate processes. Then, a hurdle model is appropriate. It first analyses the binary decision to give or not to give with a logit model.² For the size of positive contributions it uses OLS, adjusting the distribution assumption to the fact that observations are taken from a truncated normal distribution (for background see McDowell 2003).

From this exercise, one learns that the willingness to give anything is indeed not driven by the same forces as the choice of the size of the contribution to the recipient. Let us first compare the logit component with the least squares model of all data. One now finds a strongly significant effect of the factor by which dictator generosity translates into recipient benefit. The larger this factor, i.e. the higher the efficiency of a dollar given, the less likely a dictator is to give nothing. Conversely, the larger the upfront endowment of the recipient, the more a dictator is inclined to keep everything. In this model, one also reestablishes the difference between Western and developing countries or primal societies. In developing countries, dictators are less likely to give nothing. In primal societies this is extremely unlikely. Finally there is a fairly pronounced, although only weakly significant negative effect of middle age.

For the truncated least squares model, two comparisons are of interest: with unconditional least squares, and with the logit model. The first comparison reveals that dictator-experimenter anonymity significantly reduces the willingness to give, as does middle age and being a member of a primal society, while a limited action space increases conditional giving; none of these four effects was significant in the unconditional model. For another four regressors, the significance

1 To allow for direct comparisons with the OLS model, the Tobit model reports marginal effects, not the coefficients of the latent variable.

2 All logit models report odds ratios. Hence a coefficient of 1 indicates no effect. A coefficient larger than 1 indicates a positive, a coefficient smaller than 1 indicates a negative effect.

level goes up, compared to the unconditional model. This holds true for the negative effect of group decision and of being a child, and for the positive effect of the recipient having earned her endowment, and of the dictator being faced with multiple recipients.

Interestingly, in the very same respects truncated OLS also differs from the hurdle equation. The logit model is either insignificant in these respects, or it has a lower level of significance. This strongly indicates that the hurdle model indeed outperforms OLS. Apparently, the decision to give nothing is indeed driven by forces that differ from the conditional choice of a contribution level. Three regressors only matter for the conditional choice, not for the willingness to give at all. Students and groups make smaller contributions. If dictators handle real coins and notes, this slightly increases their contributions, conditional on their willingness to give. By contrast, a number of explanatory factors only matter for the willingness to give anything, not for the size of the contribution. This holds for the question whether each and every choice is paid out, for the factor by which a dollar given translates into a dollar received, for the question whether the recipient has her own endowment, and whether the dictator comes from a developing country. Actually, no more than three regressors significantly explain both the willingness to make a positive contribution and its size. If the recipient has earned the pie, she is more likely to get something, and the size of the contribution increases. Interestingly, the remaining two regressors that are significant in both models predict conflicting effects. Being of middle age and being a member of a primal society reduces the likelihood of giving nothing, but it also reduces the size of contributions. Such dictators think they should give something, but they give rather little.

While giving nothing is the mode, the distribution of dictator giving may also be described as trimodal, with the equal split and giving everything as the two other peaks. This invites two more logit models. The first tests the hypothesis that a dictator goes for the equal split, against the null that she makes another decision. This model too is revealing. The equal split is most popular in middle age and in primal societies. If the recipient identifies the dictator, this also pushes the dictator towards the equal split. By contrast, if the game is repeated, or if there are multiple recipients, the equal split becomes considerably less likely.

The final logit model tests the hypothesis that the dictator gives everything, against the null that she makes a different choice. The strongest force pulling dictators into this direction is social proximity. Handling real coins and notes and knowing that the recipient is deserving also make total generosity much more likely. If a dollar given is worth more to the recipient, this also makes it more likely that the dictator gives all. By contrast, the elderly, dictators from developing countries and students are quite unlikely to donate the entire pie. This is extremely unlikely in middle aged dictators, in members of primal societies, and in children.

Table 2 summarises the evidence. In this table, if a cell is empty, the respective regressor does not have a significant effect. + signs indicate a significant positive effect, – signs indicate a significant negative effect. If either meta-regression or least squares at the level of individual data demonstrates a positive effect, one should expect less dictators to give nothing. This expectation is borne out for deserving recipients and for recipients who have earned their endowment. By the

same logic, dictators who have earned the pie give less and are more likely to give nothing. One has a similar picture if dictators handle real coins and notes and if each individual choice is paid, although here the overall effect is insignificant in meta-regression. The logic is violated by the effect of deciding for multiple recipients. The overall effect is positive. Nonetheless, dictators are more likely to give nothing. Yet they are also more likely to give everything. This manipulation thus polarises choices.

Being a student, being a child or deciding as a group have a significant overall effect, but do not significantly influence the decision to make a positive contribution. If the action space is limited, the game is repeated, the dictator can conceal her action, social proximity is different from being a member of the same subject pool or if the recipient has a positive endowment, this explains differences in study means, but it does not explain individual choices (in the reduced sample). Having middle age, being a member of a primal society or of a developing country or providing dictator-experimenter anonymity does not explain overall effects. Yet these regressors become significant if one separately analyses the decision to make a positive contribution, and its size. Manipulating the degree of uncertainty, providing the dictator with a social cue, or giving her a take option does not have a significant effect once one controls for the other explanatory factors.

	meta-reg	ols	tobit	logit 0	truncols	logit 50	logit 100
deserving recipient	+	+	+	-	+	-	+
recipient earned	+	+	+	-	+	+	
old age	+	+	+			+	-
multiple recipients	+	+		+	+	-	+
real money		+	+		+		+
identification		+	+	-		+	
efficiency recipient	+			-		-	+
dictator earned	-	-	-	+	-	-	
student	-	-	-		-		
child	-	-	-		-	+	-
group decision	-	-	-		-		
incentive		-	-	+			
limited action space	-				-	-	
repeated game	-					-	
concealment	-						
degree of social proximity	-					-	+
recipient endowment	-			+			
middle age				-	-	+	-
primal society				-	-		-
developing country				-			-
double blind							
degree of uncertainty							
social cue							
take option							
constant	+	+	+	-	+		-

Table 2
Significant Effects in Multivariate Analysis

6. Conclusion

Daniel Kahneman and his co-authors invented the dictator game to refute the income maximisation assumption of economics textbooks. If one translates the assumption into the categorical hypothesis that all humans maximise income, their first experiment was sufficient to falsify the hypothesis. After 25 years of experimentation, the original result has not been refuted. Actually, in the sample of those experiments that provide distribution information, the probability of giving a positive amount, and hence violating the income maximisation hypothesis, comes close to the original result. In Kahneman's experiment, 74 % did not seize the option to gain an additional dollar. In later dictator game experiments, 63.89 % of all participants, i.e. 13,298 of 20,813 dictators, made a positive contribution.

If this was everything one wanted to test, 129 experiments would certainly have been an overkill. The research question becomes richer, and more meaningful for understanding social interaction, if one turns the finding upside down. While 63.89 % violate the income maximisation hypothesis, 36.11 % do not. Hence more than a third of a typical population does indeed consist of subjects who have no reticence to leave a recipient with nothing, although this recipient is at their mercy. Clearly, generosity is not a human universal. Moreover, those who are willing to make a donation do neither give everything, nor do they split the pie equally. On average, they give 42.64 %. Hence even those who in principle are generous to a degree exploit the opportunity to their advantage. Even generous subjects thus tend to have a selfish side.

Consequently, the ample evidence on dictator games is better read as an exercise in exploring human heterogeneity. The radically simple design of the game makes it a powerful tool for the systematic variation of conditions that moderate sociality. As differential psychology, using different experimental approaches, has established long ago (Ross and Nisbett 1991), (perceived) situation and personality interact. In and of themselves, neither situational nor personality variables suffice to predict behaviour. One must understand how a person with a certain personality trait reacts to the situation, as she perceives it. Dictator games are helpful for exploring human sociality, because the situation can be tightly controlled, because the simple game can be played with all classes of participants and, of course, because decisions are incentivised.

Individual experiments for good reason usually do not manipulate more than two or at most three factors. This limits the possibility to assess the effect of one situational or personality variable, conditional on other variables. Consequently, the main contribution of this meta-study has been adding a rich set of control variables. This has been made possible by the fact that experimenters, even if they have not manipulated control variables, still have fixed them. As a result, one now knows which explanatory variables are robust and which not. Comparing coefficients, one further is able to distinguish strong from weak effects. Finally, comparing analytic approaches, it has become clear that the mean fraction of the pie should not be the only dependent variable. Additional insights into human sociality are to be gained if one assumes that some dictators would even have wanted to intrude into the recipient's protected sphere. The picture becomes

even clearer if one separately analyses the decision to make a positive contribution and its size, conditional on being positive.

Ironically, the radically simple dictator game provides ample evidence that human sociality is far from simple. The existing evidence is best compared with a map. After 25 years of expeditions into human sociality, some major roads have been safely documented. Yet aside those roads, there are still many white spots. It is safe to predict that dictator game experimentation will continue to thrive.

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Appendix 1: List of Papers Used for the Meta Study

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Appendix 2: Descriptives

limited action space	unlimited		several options		two options			
	414	19581	29	1184	2	48		
degree of uncertainty	0		0.25		0.5		0.75	
	438	20615	3	87	2	56	2	55
incentive	no		random payment		each choice paid			
	9	241	115	3225	321	17347		
repeated	one shot		repeated					
	381	11756	64	9057				
group decision	no		group involvement		group decision			
	436	20315	5	426	4	72		
identification	no		yes					
	393	20069	52	744				
social cue	no		yes					
	423	19849	22	964				
concealment	no		optional		mandatory			
	426	19773	17	1006	2	34		
doubleblind	singleblind		doubleblind					
	327	16720	118	4093				
takeoption	no		yes					
	440	20605	5	208				
deserving recipient	ordinary		deserving					
	376	18252	69	2561				
recipient earned	no		yes					
	430	20273	15	540				
efficiency recipient	0.33		0.5		1		1.25	
	7	0	8	302	372	19580	4	0
	1.33		1.5		2		3	
	8	0	2	0	18	431	26	500
multiple recipients	single recipient		multiple					
	433	17002	12	3811				
recipient endowment	0		0.1		0.25		0.33	
	420	19852	3	116	5	175	2	0
	0.363		0.5		0.66		0.75	
	2	202	3	200	2	0	1	27
dictator earned	no		yes					
	421	20098	24	715				
real money	no		yes					
	349	18023	96	2790				
degree of social distance	foreign group		unspecified		same group			
	12	198	409	20273	15	342		
	friends (3)		friend of friend		friend			
	3	0	3	0	3	0		
student	yes		no					
	351	18229	94	2584				
age	child		student age		middle age		old age	
	25	513	401	19720	10	430	9	150
development of country	Western		developing		primitive			
	389	19280	17	590	39	943		

left hand column: frequency in meta-study; right hand column: frequency in reconstructed original data

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