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Norm Compliance in an Uncertain World[*]

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Abstract:

In many situations, social norms govern behavior. While the existence of a norm may be clear to someone entering the situation, it is often less clear precisely what behavior is required in order to comply with the norm. We investigate how people react to uncertainty about the prevailing norm using a modified version of the dictator game. Since the behavioral effects of social norms are tightly linked to the degree of anonymity in a situation, we also vary the extent to which subjects' behavior is observable. We find that when behavior is anonymous, uncertainty about which norm guides partners reduces aggregate norm compliance. However, when others can observe behavior, introducing a small degree of norm uncertainty increases aggregate norm compliance. This implies that norm uncertainty may actually facilitate interaction as long as behavior is observable and uncertainty is sufficiently small. We also document that reactions to norm uncertainty are heterogeneous with one group of people reacting to norm uncertainty by increasing compliance (over-compliers), while another group reacts by reducing compliance (under-compliers). The main effect of increased observability operates through the intensive margin of the under-compliers; they reduce their negative reaction to norm uncertainty when their actions become more visible.

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1 Introduction

Globalization has increased rapidly in recent decades, and it has undoubtedly brought many positive effects such as increased product variety, competition, specialization, and trade benefits. However, as travel and migration flows increase, and the exchange of goods and services moves to international contexts through online platforms and shopping, individuals frequently interact with others that do not necessarily share the same background, culture, or norms. This leads to greater uncertainty about what others expect of us and what we can expect of them when we interact. If the typical reaction to such uncertainty is a reduced level of trust and norm compliance, globalization comes at a cost.

Increased uncertainty about social norms could be detrimental to coordination and cooperation between sellers and buyers on markets, but also for everyday interaction at workplaces, schools, and in neighborhoods. Yet, at the same time, the sharing economy manifested in platforms such as Airbnb and Uber seems to be thriving globally because of increased cooperation and coordination between strangers (Dillahunt and Malone 2015). Why do sharing ventures and globalization seem to go hand-in-hand? Perhaps norm uncertainty is mitigated by the extensive and easily accessible participant ratings, which are often an integral component of these platforms. Or are these ventures successful internationally despite the increased norm uncertainty that characterizes the markets in which they operate? Off hand, rating schemes should be less valuable the less certain participants are about the norms on which the ratings are based.

To begin answering such questions, we must first understand how people react to increasing uncertainty about the norms that apply in the situations in which they interact. The questions we ask are: How do people tend to react when they become uncertain about how others think they should behave? Do they become more or less cooperative? More or less fair and trustworthy? For example, when an individual travels to a place where they are uncertain about how much to tip the waiter in a restaurant, would that person tend to tip on the high or the low side? Moreover,

how do people respond in situations where new, but yet uncertain, norms emerge, such as the social-distancing norm in response to the Corona virus? Our paper builds on the expanding literature in economics that emphasizes the role of social norms for decision making. Previous studies have shown that norms can explain various types of human behavior in the lab (López-Pérez, 2008; Andreoni and Bernheim, 2009, Krupka and Weber, 2013, Kimbrough and Vostroknutov, 2016; Ellingsen and Mohlin, 2019), and that norms can be important in numerous contexts including labor markets (Lindbeck, Nyberg, and Weibull 1999; Stutzer and Lalive 2004), contract design (Fischer and Huddart 2008), asset prices (Hong and Kacperczyk, 2009) and consumers' pro-environmental decisions (Allcott 2011). We depart from the previous literature by considering a situation in which there is uncertainty about how to implement the norm. To investigate the effects of such norm uncertainty on pro-social behavior, we do an experiment employing a modified dictator game. We show that if the theoretical model of behavior developed by Andreoni and Bernheim (2009) applies, this experiment captures the effect of increased uncertainty about what norm applies. Andreoni and Bernheim (2009) and earlier work (see, for example, Andreoni and Petrie, 2004 and Soetevent, 2005) find that social behavior depends on how observable people's actions are. Observability and ratings are also an essential part of online trading and sharing platforms (Bolton, Katok, and Ockenfels 2016; Bente, Baptist, and Leuschner 2012). Therefore, in addition to a baseline anonymous case, we investigate the effect of norm uncertainty in a treatment where behavior is observable.

We adapt the standard dictator game by adding a random transfer to the dictator's transfer choice. When presenting the game to the dictators, we stress that receivers are not informed about the automatic transfer. This places dictators in a situation where receivers will evaluate their transfers as if participating in the standard dictator game, presumably guided by the well-documented 50/50 norm. However, they are uncertain about what transfer will ensure compliance with the norm because of the added random transfer.

We find that when behavior is anonymous, increased uncertainty about what norms guide partners in the dictator game *reduces* aggregate norm compliance. However, if behavior is observable, small increases in norm uncertainty *increases* aggregate norm compliance. We also document that reactions to norm uncertainty are heterogeneous, with one group of people consistently reacting to norm uncertainty by increasing norm compliance (over-compliers), while another group consistently reacting by reducing norm compliance (under-compliers). However, the largest group consists of subjects that do not respond to uncertainty about norms (indifferent).

When we increase observability of behavior (without affecting uncertainty about what norm is applied to judge the behavior), the proportion of people who are indifferent to norm uncertainty decreases, and the proportion that reacts by over-complying increases. The main effect, however, is that under-compliers react to norm uncertainty by reducing contributions much less when their behavior is observable. In other words, observability reduces the under-compliance reaction to norm-uncertainty and, to a lesser extent, increases the over-compliance reaction. In fact, we find that small levels of norm uncertainty may facilitate interaction as long as behavior is sufficiently observable. Hence, the rating schemes used by sharing-economy platforms may bolster norm compliance more in markets characterized by some norm-uncertainty. As such, the greater norm-uncertainty of globalized markets may contribute to—rather than impede—the success of platforms such as Airbnb and Uber.

The remainder of this paper is organized as follows: In the next section, we propose a simple theoretical framework for understanding how the introduction of norm uncertainty affects norm compliance; in section 3, we outline the experimental design we use to test the impact of norm uncertainty; section 4 reports the results of the experiment, while section 5 concludes.

2 Theoretical framework

We want to identify the behavioral effect of increased uncertainty about how to comply with a given norm. Our strategy is to focus on a norm about which there is substantial agreement and

then induce uncertainty about what behavior complies with the norm in a controlled way. We use the dictator game (List, 2007), where a dictator receives an endowment and decides how much to transfer to a second player in the game (the receiver). We use the dictator game for our investigation because of the well documented universal and powerful social norm of the 50-50 split in this game (Forsythe et al. 1994). In addition, we try to strengthen the norm by drawing attention to it in the instructions preceding the experiment. We expect little or no disagreement about this norm.

2.1 The standard dictator game

To structure our thoughts about behavior in the dictator game, we use a version of the behavioral model suggested by Andreoni and Bernheim (2009).[1] A dictator receives a stake normalized to 1 and decides on a transfer, x, to the receiver, the size of which is observed by an audience. This audience includes the receiver and any other observers of the game. The dictator cares about her own monetary outcome, $1 - x$, and we let $M(1 - x)$ denote the utility derived from her monetary outcome. The dictator also cares about conforming to the established social norm of making the fair transfer to the receiver. Let x^N be the transfer value that satisfies the 50-50 norm (given our normalization $x^N = \frac{1}{2}$) and let $N(x - x^N|s)$ be the dictator's disutility of deviating from x^N. We let this function depend on how observable the transfer is and let s denote the degree of observability. The dictator may intrinsically dislike deviating from the social norm and so may find abiding by the norm attractive even in situations where his/her decision is not observable ($s = 0$). However, the dictator may also care about his/her social image, implying that the utility of abiding by the norm increases if an audience observes his/her behavior. The total utility attained by the dictator making a transfer of x, is:

$$U(x, x^N|s) = M(1 - x) + N(x - x^N|s) \qquad (1)$$

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[1] See Online Appendix A for a more detailed discussion.

where the first-order condition for the dictator's utility-maximizing transfer, x^*, is:

$$M'(1 - x^*) + N'(x^* - x^N|s) = 0 \tag{2}$$

This is illustrated in Figure 1, where the amount of transfer is depicted along the x-axis, while the y-axis depicts marginal utility costs and benefits of the monetary transfer. The marginal utility cost of transferring money, $M'(1 - x)$, is labeled M' in Figure 1, while the marginal utility benefit of many transfers through increased norm compliance $N'(x - x^N|s)$ is labeled N'.
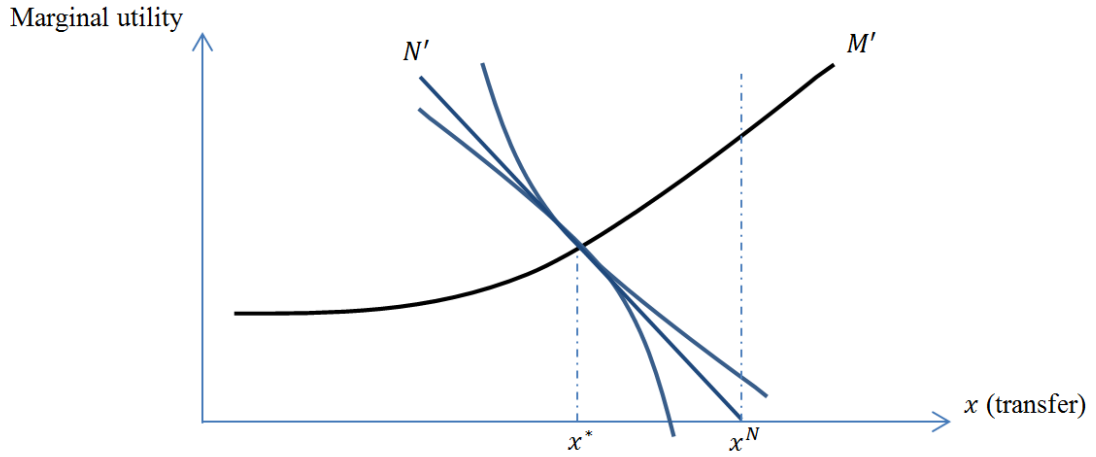

Figure 1. Utility cost and benefits of dictator game transfer

Consistent with the empirical literature on risk preferences, we assume that marginal monetary utility decreases with the stake ($M'' < 0$) and is weakly convex ($M''' > 0$). Therefore, marginal monetary utility costs increase with transfer x and are a convex function of x, as indicated in Figure 1. Following Andreoni and Bernheim (2009), we assume that norm utility increases as the transfer nears the social norm for a fair transfer and falls if the transfer exceeds the social norm. This implies a decreasing positive marginal norm utility ($N' > 0, N'' < 0$) around the optimal transfer, x^*, where marginal norm utility benefit equals marginal monetary costs. However, we have no a priori expectations about the curvature of this function, which could be concave ($N''' < 0$), convex ($N''' > 0$) or linear ($N''' = 0$) with all three alternatives illustrated in Figure 1. As we

shall see, it is the curvature of the N'-function that is decisive for how a dictator reacts to uncertainty about what transfer complies with the norm, x^N.

2.2 Norm uncertainty

Our goal is to investigate how the dictator's behavior changes when she becomes uncertain about what behavior complies with the social norm compared to a situation that is similar in all ways except that she knows precisely what behavior complies with the social norm.

Introducing norm uncertainty corresponds to subtracting a mean-zero stochastic component $\tilde{r}$ from the norm x^N, so that the norm-complying contribution in (1) and (2) is given by $x^N - \tilde{r}$. What we ask is how this affects the dictator's contribution, x, when everything else is held constant. Assuming that dictators maximize expected utility, the optimal contribution in this situation, x^{*r}, must satisfy the following first-order condition:

$$M'(1 - x^{*r}) + E[N'(x^{*r} + \tilde{r} - x^N|s)] = 0 \qquad\qquad (3)$$

Critical for whether x^{*r} is greater or smaller than x^* is the curvature of N' (i.e., the sign of N'''). By Jensen's inequality, if N' is convex (i.e., if, $N''' > 0$), then $E[N'(x^{*r} + \tilde{r} - x^N|s)] > N'(x^* - x^N|s)$ implying that $x^{*r} > x^*$. The reverse, $E[N'(x^{*r} + \tilde{r} - x^N|s)] < N'(x^* - x^N|s)$, is true if N' is concave so that in this case $x^{*r} < x^*$. Finally, if N' is linear, then $E[N'(x^{*r} + \tilde{r} - x^N|s)] = N'(x^* - x^N|s)$ implying that $x^{*r} = x^*$. Thus, norm uncertainty may result in increased, decreased, or unchanged transfers depending on the curvature of the dictator's N'-function.
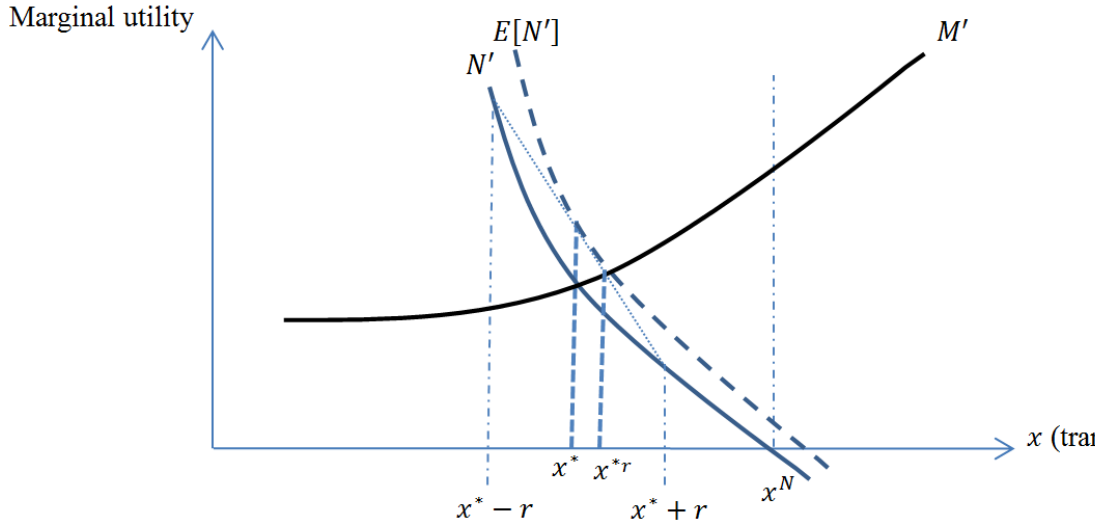
Figure 2. *How introducing norm uncertainty affects dictator transfers*

In Figure 2, we illustrate this for a convex marginal norm utility function (the upward curving N'-function depicted in Figure 1) when $\tilde{r}$ takes values $-r$ and r with equal probability. Consider a dictator with the prior that there is a 50% probability that $x^N + r$ is the norm-satisfying transfer and a 50% probability that $x^N - r$ is the norm-satisfying transfer. The marginal norm utility she expects from a transfer x, $E\lfloor N' \rfloor = E\lfloor N'(x + \tilde{r} - x^N|s) \rfloor$ is $0.5N'(x + r - x^N|s) + 0.5N'(x - r - x^N|s)$. This is illustrated in Figure 2 by the dotted line connecting the marginal norm utility (N') values of $x^* - r$ and $x^* + r$ with the average being the indicated point on the line directly above x^*. This is the expected marginal norm utility of transferring x^*. The $E[N']$ function indicates the expected marginal norm utility of any transfer x constructed in the same way. This illustrates that introducing norm uncertainty increases marginal norm utility of any given transfer when the marginal norm utility function is convex. Thus, introducing norm uncertainty will, in this case, induce the dictator to increase his/her transfer from x^* to x^{*r}.

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2.3   Introducing norm uncertainty into the dictator game experiment

To experimentally investigate the effect of uncertainty about how to implement the social norm in this game, we construct a variant of the standard dictator game with a forced random transfer, $\tilde{r}$, from the dictator's stake to the receiver. The random transfer $\tilde{r}$ is a mean zero random variable taking outcome $-r$ or r with equal probabilities. The outcome of the random variable is automatically added to the transfer decided by the dictator. The dictator does not know the realization of this draw prior to her transfer decision, but she knows that the automatic transfer will be made. The receiver, on the other hand, is not informed of the automatic transfer. The receiver only learns the sum of the automatic transfer and the dictator's discretionary transfer, and so presumably assumes that its size is decided by the dictator without any outside intervention. The dictator is told that that only the total transfer is revealed to the receiver, and any potential audience observing the transfer. That is, the receiver do *not* know about that automatic transfer and only the total transfer is revealed to them. Thus, the audience presumably makes inferences about the dictator's preferences for norm compliance using precisely the same information set as under a standard dictator game and, therefore, the dictator's priors should correspond to this situation and $N(\cdot)$ should remain unaffected. Thus, the dictator should evaluate her choice set with the same utility function as (1), but she knows that nature adds a random variable $\tilde{r}$ to the transfer so that her expected utility becomes:

$$U(x + \tilde{r}, x^N | s) = M(1 - x - \tilde{r}) + N(x + \tilde{r} - x^N | s) \qquad (4)$$

This game is similar to the dictator game variation used by Andreoni and Bernheim (2009), but with a critical difference. Andreoni and Bernheim let nature intervene (with a probability of less than one) by imposing a given (low) transfer *instead* of the transfer being decided by the dictator, and they *inform* the receiver that there is a certain level of probability that nature will intervene in this way. This makes it possible for dictators to 'hide' behind nature when choosing a transfer equal to the transfer nature might impose because the receiver knows that there is a certain level

of probability that a transfer of this size is caused by nature intervening. Andreoni and Bernheim do this to stress test the theoretical signaling model they propose. In our experiment, nature *always* intervenes and does so by *adding* a given amount to the dictator's chosen transfer. Further, our audience *does not know* about this intervention of nature and so interprets the transfer as if the dictator had selected it in a standard dictator game. Hence, in our experiment, the intervention of nature does *not* provide the dictator with an opportunity to 'hide' his/her true preferences from an audience or give him/her an excuse to not abide by the social norm in other ways. Rather, in our experiment, nature places the dictator in a setting in which the audience interprets the dictator's behavior as resulting from the standard dictator game setting, which presumably implies that the dictator's priors and perceived signaling equilibria characteristics remain unchanged compared to the standard dictator game. In our experiment, nature perturbs the dictator's transfer by making her norm-compliance and the signal she sends about this to the audience uncertain. Thus, the dictator will set the transfer in our experiment, x^{*EX}, to maximize expected utility of (4) with the first-order condition:

$$E[M'(1 - x^{*EX} - r)] + E[N'(x^{*EX} + r - x^N|s)] = 0 \qquad (5)$$

Note that the experimental intervention (equation 5) corresponds to the solution with norm uncertainty that we investigate in equation (3), except that, in addition, the transfer in the $M(\cdot)$ function also becomes stochastic. This is because $\tilde{r}$ is added to the transfer x while norm uncertainty implies that the stochastic variable is subtracted from the norm x^N. Thus, our experiment replicates the theoretical norm uncertainty treatment in all ways except that a zero-mean symmetric stochastic $\tilde{r}$ is added to the transfer in the first function. We have to do this in order to ensure that the dictators' perceived distributions of audience inferences about dictators remain the same in all the treatments of our experiment. If dictators are prudent, the added stochastic transfer increases the expected marginal cost of transfers. In Online Appendix B, we calculate the so-called prudence correction that neutralizes the effect this has on our experimental results. The correction turns out to be very small compared to the statistical uncertainty of our

results for all levels of norm uncertainty we investigate. Therefore, it can be ignored for all practical purposes.

3   Experimental Design

In this section, we begin by providing details about the version of the dictator game that represents the backbone of our experimental design. We then describe our treatments and summarize a set of other measures that were collected in the experiment.

3.1   The dictator games

The main part of the experiment consisted of six dictator games. Subjects were randomly chosen to be dictators or receivers. Dictators were endowed with 100 DKK and asked to transfer a fraction of this to another subject. Anonymity was ensured.

The six dictator games are described in Table 1 below. The first game was a standard dictator game (*Standard*) in which the dictator had the opportunity to transfer any part of the initial endowment of 100 DKK to the receiver. To help reinforce the equal split social norm, we primed subjects by telling them "in previous experiments, the most common way to divide the 100 DKK between the dictator and the recipient was to choose 50 DKK each".[2]

Table 1. The dictator games

Game:	*Automatic Transfer*	*Size of automatic transfer*
Standard	No	0
S0	Yes	10 DKK
S1	Yes	9 DKK with 50% and 11 DKK with 50%
S3	Yes	7 DKK with 50% and 13 DKK with 50%
S5	Yes	5 DKK with 50% and 15 DKK with 50%
S10	Yes	0 DKK with 50% and 20 DKK with 50%

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[2] The statement is based on evidence from a pilot study we conducted prior to this experiment.

After the Standard game, we introduced an automatic transfer on top of the amount chosen by the dictator. Dictators were informed that in addition to the transfer they chose, an additional automatic transfer of 10 DKK would be added to their transfer. That is, the total transfer to the receiver would equal the dictator's transfer plus an additional 10 DKK. The total transfer, including the automatic transfer, would be deducted from the dictator's initial endowment .[3]

The dictators were informed that receivers would be told that the dictator had been endowed with 100 DKK and given the opportunity to transfer all or part of the endowment to the receiver. Dictators were also told that the receivers would only be informed about the total transfer and that they would not know anything about the automatic transfer to the receiver.

After the game with automatic transfers of 10 DKK (referred to as S0), subjects played the remaining four games in random order. These games included a *stochastic* automatic transfer. The expected value of the transfer was 10 DKK in all cases, but the size of the stochastic transfer varied. For example, in game S1 (Stochastic transfer of ± 1), the automatic transfer was either 9 DKK or 11 DKK, with equal probability, while in S10 (Stochastic transfer of ± 10), the automatic transfer was either 0 or 20 DKK, with equal probability.

3.2   Treatments

Approximately half of the subjects ($n = 132$) participated in the *Baseline* treatment, which was conducted using a standard anonymous lab protocol. The remainder of the subjects ($n = 136$) participated in the *Facebook* treatment designed to increase subjects' concerns for norm compliance by making their transfers observable. After completion of the main experiment, the subjects in the Facebook treatment had to fill in a report sheet indicating the total transfer sent to the receiver in the different games. The experimenter took a picture of the subject and his/her report sheet and posted the picture on the public Facebook account of the experiment (see Online

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[3] Note that if a dictator, for example, chose to transfer 100 DKK, it would have resulted in a negative dictator account. However, this never happened in the experiment.

Appendix D for details), which meant anyone could log on to the Facebook page and see the results. The report sheet also contained the participant's name. Importantly, the subjects were informed about this procedure at the start of the experiment.

3.3 Other measures

After the dictator games, we collected a set of other incentivized measures: a public good game, a norm elicitation task (Krupka and Weber, 2013) and a risk aversion task (Eckel and Grossman 2002). After the incentivized tasks, we included a survey that contained the Cognitive reflection test (CRT), initially introduced by Frederick (2005), a conformity test, and some scenario-style questions regarding norm uncertainty. Further information about these tests is available in Online Appendices C and E.

3.4 Procedures and subjects

The experiment was conducted in the summer of 2016, over 14 sessions, which last approximately 1½ hours. We used the Laboratory for Experimental Economics at the University of Copenhagen. Participants were recruited through the ORSEE database of the laboratory (Greiner 2015). Participants with prior experience of dictator games were excluded. A total of 268 participants took part in the experiment, out of which 136 were in the Baseline treatment, and 132 were in the Facebook treatment. Participants were mainly students with diverse study backgrounds with a mean age of 26 [ranging from 18 to 56]. 58% were females.

4 Results

In this section, we first provide an overview of the aggregate results and then explore heterogeneity and potential drivers of heterogeneous reactions to norm uncertainty.

4.1 Aggregate results

The raw results from the experiment are presented in Figure 3: Panel A. The y-axis displays mean contributions, and the x-axis indicates the level of norm uncertainty induced in the different treatments. Recall that S0 indicates no norm uncertainty (the span of the experimentally induced uncertainty about the implemented behavior is 0 DKK), while S1 indicates a norm uncertainty level of 1 DKK (induced by nature randomly choosing between adding or subtracting 1 DKK from the automatic transfer).

We see higher dictator transfers in the Facebook treatment than in the anonymous Baseline treatment. Jointly evaluated by a Mann-Whitney test, the transfers are found to differ significantly between treatments ($z = $ -9.115, $p < 0.001$). Transfers also differ significantly in each game when tested separately.[4]

In Panel B, we present the change in mean transfers caused by introducing different levels of uncertainty (e.g. S1 indicates the difference between the mean transfer under uncertainty S1, and the transfer when there is no induced uncertainty, S0). This indicates the point estimate of the effect on mean transfers of inducing norm uncertainty of the indicated level.[5] In the Baseline treatment, the average reaction across all uncertainty levels is negative (two-sided t-test: $t = $ -4.4043, $p = 0.000$), while it is positive, but not significantly different from zero in the Facebook treatment (two-sided t-test: $t = 0.9689$, $p = 0.333$).

We see that the effect of norm uncertainty depends on the size of the uncertainty. As uncertainty increases, transfers tend to decrease (dependent sample two-sided t-test S1 vs S10, average of both treatments: $t = 2.6805$, $p = 0.0076$). However, whereas changes in dictator transfers in Baseline are in the negative domain, the change goes from positive to negative in the Facebook treatment. At low levels of norm uncertainty (S1 and S3), the effect is positive and significant in

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[4] S0: z=-3.085 (p=0.002), S1: z=-4.098 (p=0.000), S3: z=-4.118 (p=0.000), S5: z=-4.711 (p=0.000), S10: z=-4.307 (p=0.0000).
[5] We ignore the prudence correction discussed above. In Online Appendix B, we calculate the prudence correction relevant for our results, which turns out to be very small, and clearly within the indicated confidence bands.

the Facebook treatment (two-sided t-test of average of S1 and S3: $t = 2.044$, $p = 0.043$) and negative but insignificant in the Baseline treatment (two-sided t-test of average of S1 and S3: $t = -1.4759$, $p = 0.1423$). For high levels of uncertainty (S5 and S10), the effects are negative for both treatments, but only significantly so for the Baseline treatment (two-sided t-test of average of S5 and S10: Baseline $t = -3.257$, $p = 0.0014$, Facebook $t = -0.774$, $p = 0.4405$).

All uncertainty effects in the Facebook treatment are significantly more positive than the corresponding effects in the anonymous Baseline treatment when tested separately[6]. When tested jointly, the difference is highly significant (two-sided t-test: $t = -3.982$ $p = 0.0001$). In conclusion, we find that when transfers are anonymous, our subjects reduce their transfers to the receivers when uncertainty is introduced. When transfers are observable, our subjects react by increasing transfers when the induced level of norm uncertainty is low. The positive reaction is, however, reduced and ultimately disappears when the induced level of norm uncertainty becomes large.
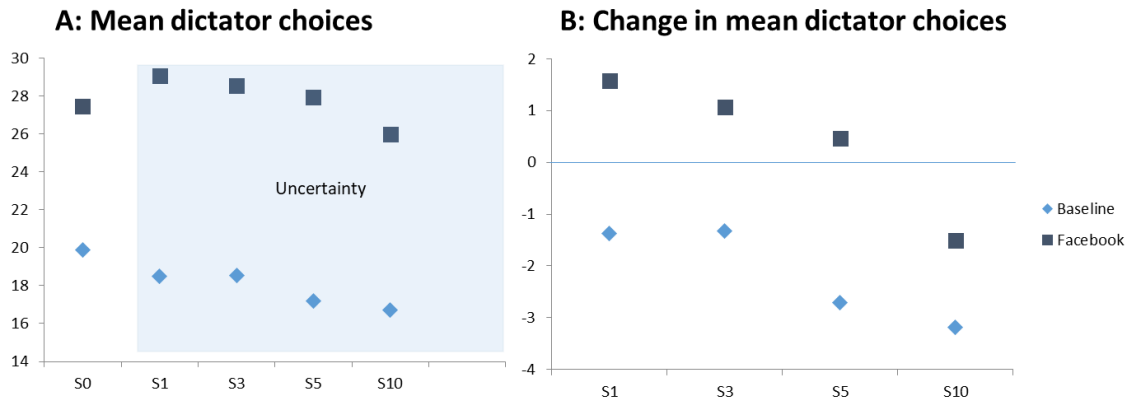

Figure 3. Main effects in the dictator games. A: The mean dictator transfer across games and treatments. B: The individual change in mean dictator transfer between S0 (no uncertainty) and each of the games with uncertainty.

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[6] One-sided t-test: S1: t=-2.29, p=0.011, S3: t=-1.83, p=0.034, S5: t=-2,55, p=0.006, S10: t=1,32, p=0.095

4.2   Heterogeneity

In this section, we explore heterogeneous reactions to norm uncertainty. Initially, we categorize subjects according to whether they react to a small level of norm uncertainty by increasing or decreasing transfers based on their response in the two treatments with the lowest degree of norm uncertainty (S1 & S3). This is a rough indicator of whether the subject is an over-complier (with a convex N-function for transfer values close to the no uncertainty equilibrium transfer) or an under-complier (with a concave N-function) or indifferent (with a linear N-function). We categorize a subject as *an over-complier* if she consistently increases her transfer in response to the introduced norm uncertainty; as *indifferent* if she consistently does not change her transfer; as an *under-complier* if she consistently reduces her transfers; and as *inconsistent* if she reacts inconsistently in the two games. In Figure 4, we illustrate the average transfer of these four types across all levels of uncertainty by each treatment. The figure also indicates the proportions of the four types for each treatment identified in the subject pools.
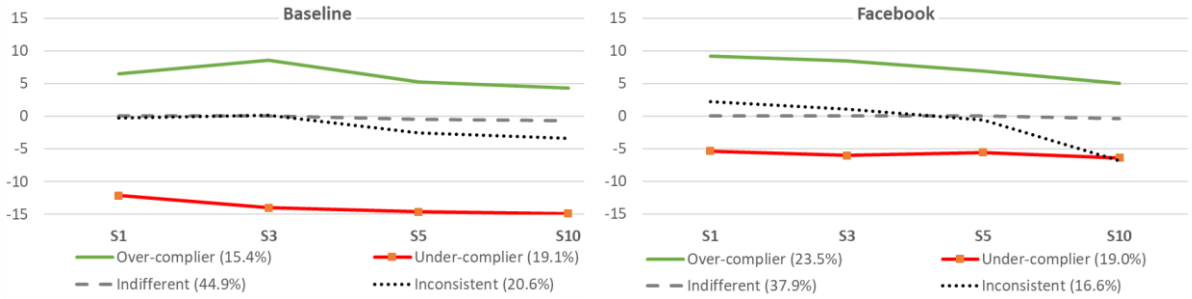

Figure 4. Across treatment; Average transfers under different degrees of uncertainty for over-compliers, under-compliers, indifferent and inconsistent subjects.

In the baseline treatment, almost half of the subjects (45%) do not react to the introduction of norm uncertainty, while about 15% of subjects react by over-complying, and 20% react by under complying. When comparing behavior in the two treatments, we observe that the Facebook treatment induces an increase in the proportion of dictators who over-comply (who increase their transfer when norm uncertainty is introduced) and a corresponding reduction in the proportion of

indifferent subjects. On the other hand, the Facebook treatment does not change the average transfer of people who 'over comply' or those who are 'indifferent'. It seems that signaling is of little importance for how much over-compliers transfer, suggesting that these subjects may be mainly intrinsically motivated to prefer over-complying rather than facing the risk of under-complying. The Facebook treatment does not affect the proportion of under-compliers; their average transfers are, however, substantially increased. Potentially, the disutility of the increased 'stigma' of signaling that 'I am an under-complier' is important for their behavior, suggesting that these subjects, in contrast to over-compliers, are motivated by social signaling to a substantial degree. The share of the inconsistent and indifferent types fall in the Facebook treatment but their average transfers are not affected.

We extend our exploration of heterogeneous reactions to uncertainty using regression analysis. Table 2 below displays random effect OLS regression estimates using the difference between the transfer under norm uncertainty and the transfer without uncertainty as the dependent variable. The dependent variable is hence given by: $x^{Sj} - x^{S0}$, $j = 1,3,5,10$ with positive numbers indicating over-compliance (i.e., higher transfers under norm uncertainty) and negative numbers indicating under-compliance.

Table 2 contains several regression specifications. The first model (1) only includes the treatment variable. In the second model (2), we add controls for S1, S3, and S5 (with S10 as the baseline category). In the third model (3) we add controls for gender and age and allow interaction between gender and the Facebook treatment. In the fourth model (4), we add dummies that indicate whether the initial dictator transfer with no uncertainty in S0 was low (below 15), or high (above or equal to 40). Above 15, but below 40, is the base category. We also include interactions between these dummies and the Facebook treatment.

The regression estimates of Table 2 reveal some clear patterns. As is visually apparent already in Figure 3, subjects react more positively to uncertainty in the Facebook treatment. The Facebook

dummy (FB) is positive and significant across all specifications. Controlling for the treatment effect, we see in model 2 that transfers in S1, S3, and S5 are significantly higher than the transfers in S10 (the left-out category). Again, this confirms the pattern visible in Figure 3 with more negative reactions under the high degree of uncertainty in S10. Introducing gender, age, and interactions between Facebook and gender in model 3 shows that norm uncertainty causes men to reduce transfers significantly more than women in Baseline. In the Facebook treatment, men react strongly by transferring more, while women's reaction is much smaller and insignificant. In effect, there is no significant difference in the response to norm uncertainty between genders in the Facebook treatment. Hence, when transfers are observable, men and women have similar reactions to norm uncertainty, but when transfers are anonymous men react to norm uncertainty by reducing transfers significantly, while women do not.

In model 4, we have also added indicators of High and Low initial contributions in S0 and interactions of these with the Facebook treatment. The non-interacted coefficients show that in the anonymous Baseline treatment, subjects with a high transfer close to 50 DKK under certainty (S0) react to norm uncertainty by reducing their transfers (under-comply) more than others. The interacted coefficients show that these subjects under-comply much less in the Facebook treatment. In other words, subjects that normally abide by the 50-50 norm react to norm uncertainty by reducing transfers substantially in the anonymous setting, but this negative reaction disappears in the Facebook treatment.[7]

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[7] We have also explored heterogeneity in the reaction to norm uncertainty with respect to other variables that we captured in the experiment, including under complying without uncertainty and norm perceptions. In addition, we have also explored the role of other variables such as cognitive reflection, risk aversion, and (self-reported) fairness attitudes. In short, the only considered variables that had any relation to the reaction to uncertainty was the response to a question about fairness. Subjects that were more likely to state that "people will treat you fairly" reacted more negatively to uncertainty. The results of these analyses are reported in Online Appendix C.

Table 2. Random effects OLS regression estimates explaining heterogeneous reactions to norm uncertainty

	(1)	(2)	(3)	(4)
FB	2.545**	2.545**		
	(2.39)	(2.39)		
S1		2.437***	2.369***	2.369***
		(4.24)	(3.80)	(3.80)
S3		2.209***	2.205***	2.205***
		(3.84)	(3.54)	(3.54)
S5		1.213**	1.180*	1.180*
		(2.11)	(1.89)	(1.89)
Female			3.935**	4.780***
			(2.15)	(2.74)
Age			0.058	0.090
			(0.54)	(0.87)
Female X FB			1.450	0.448
			(0.95)	(0.18)
Male X FB			5.061***	4.712*
			(2.71)	(1.73)
Low ($x^{S0} < 15$)				3.134
				(1.40)
High ($x^{S0} \geq 40$)				-6.320***
				(-2.66)
FB x Low				-0.665
				(-0.22)
FB x High				5.252*
				(1.78)
Constant	-2.147***	-3.612***	-7.818**	-8.667**
	(-2.88)	(-4.38)	(-2.37)	(-2.43)
R2 overall	0.015	0.023	0.035	0.112
N	1.072	1.072	976	976
chi2	5.722	28.186	28.337	59.833
P	0.017	0.000	0.000	0.000

Notes: The dependent variable is the difference between transfer with uncertainty and without uncertainty for uncertainty levels S1, S3 and S5, i.e. $x^{Sj} - x^{S0}, j = 1,3,5$. Hence, a positive number indicates over-compliance (i.e. higher transfers under uncertainty), and a negative number indicates under-compliance. FB denotes the Facebook treatment.
* p<0.10, **p<0.05, *** p<0.01

5 Conclusion

We find that introducing norm uncertainty, on average, reduces norm compliance in an anonymous setting and that the negative effect increases with the level of norm uncertainty. In contrast, when individual transfers are revealed on Facebook, small levels of norm uncertainty actually increase norm compliance, but the positive effect becomes smaller and finally becomes negative as the level of norm uncertainty increases. Our findings also point out that the reactions to increased uncertainty about how to implement a social norm are heterogeneous. About 20% of subjects react to norm uncertainty by over-complying, about 20% under-comply and about 40% do not react at all. Increased observability of behavior increases the proportion of over-compliers while reducing the proportion of indifferent subjects. However, the main effect is that the size of the under-compliance reaction for this type of subjects is reduced.

Our results suggest that uncertainty about what norm applies in a given situation is more likely to induce reduced norm compliance when observability is low, when the proportion of "under compliers" is large and when the degree of norm uncertainty is sizable. Perhaps more surprising, our results also suggest that there are circumstances in which increased norm uncertainty could increase norm compliance. This could happen if observability of behavior is high, and the induced norm uncertainty is moderate. Observability of behavior generally counteracts the negative effect of norm uncertainty on norm compliance and may even reverse it. Making actions observable seems to curtail under-compliers' bad behavior, while leaving over-compliers' behavior unaffected, thereby generating a positive aggregate effect. Therefore, while norm-uncertainty, in general, may have negative consequences for people's ability to coordinate and cooperate, in specific settings, the effects can be the opposite. This may be part of the reason for the international success of platforms with observability-increasing rating and reputation systems (e.g. Airbnb, Facebook Marketplace and Uber). Not only does increased observability likely promote good behavior when the social norms are unambiguous, it may even induce participants to increase norm compliance when they are uncertain of what the correct behavioral norm is;

something, which is especially important in a globalized world, where interactions involve people with heterogenous backgrounds and norm conceptions.

We believe our study presents novel evidence of people's reactions to norm uncertainty and to the interaction between norm uncertainty and observability. While we think this is important for understanding the effects of globalization in markets and cooperative environments, it should be noted that our setting is highly stylized. On real markets, increased heterogeneity of the interacting parties will not just increase uncertainty about what norm applies, but will probably also affect beliefs about others' preferences for following norms. We have estimated the marginal effect of increased norm uncertainty on behavior while holding this and other factors constant. However, we believe our approach is a natural starting point. First, it enables us to cleanly identify the effects of increased uncertainty about how to comply with the norm that governs a given setting. Second, while we find it likely that increased heterogeneity due to, for example, globalization will increase norm uncertainty, the effect on other factors is much less clear and may depend, to a great extent, on the specific situation.

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