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Charity Begins at Home: Cultural Differences in Social Discounting and Generosity

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ABSTRACT

People often consider how their actions influence others when making decisions. However, we are not equally generous to everyone alike. Our willingness to share resources declines as a function of social distance between the decision maker and the recipient. This function is likely to be influenced by culture, but research on behavioral decision making is still lacking empirical evidence. In Western societies, individuals generally perceive themselves as autonomous and independent from others, whereas the distinction between self and close others is less sharply defined by Eastern individuals where relationships and group membership are more centralized. Therefore, the social discount function should reflect this difference in the distinction of self and others by a reduced decline in generosity over close social distances. A social decision-making task was adapted to the intercultural context, and data were collected in Germany and China. For seven different social distances, we estimated how much money German and Chinese subjects were willing to forego to give a certain reward to another person. A hyperbolic model was fitted to the data. We found that other-regarding generosity declines as a function of social distance independent of cultural identity. However, German subjects showed a marked drop in generosity across close social distances, which was significantly less pronounced in Chinese participants. Copyright © 2013 John Wiley & Sons, Ltd.

KEY WORDS social distance; cross cultural; self-construal; social discounting

INTRODUCTION

Decision-making processes in canonical economic models are thought to be dominated by the "economic man," a rational and self-regarding decision maker isolated from external influences (Camerer & Fehr, 2006). However, because our individual decisions almost always have some kind of connection to our social environment, it is reasonable to expect that they are also guided by other-regarding preferences, making us generous and caring in some situations or spiteful and envious in others (Fehr & Fischbacher, 2003; Fehr & Schmidt, 1999; Marlowe et al., 2011; Wobker & Kenning, 2013). Although generosity often plays a role in our choices, it is apparent that we are not equally generous toward everyone. Instead, we tend to be more willing to share goods and resources with individuals we feel close to than with those we do not care about (Fareri, Niznikiewicz, Lee, & Delgado, 2012; Goeree, McConnell, Mitchell, Tromp, & Yariv, 2010; Harrison, Sciberras, & James, 2011; Hoffman, McCabe, & Smith, 1996). This decrease in generosity as a function of social distance is termed social discounting (Bradstreet et al., 2012; Jones, 2007; Jones & Rachlin, 2006, 2009; Rachlin & Jones, 2008; Sharp et al., 2012; Sozou, 2009; Takahashi, 2007, 2010).

Jones and Rachlin (2006) demonstrated that the decrease is best described by a hyperbolic function, which captures the tradeoff between selfish and other-regarding motives as a function of how large the social distance is between the decision maker and the recipient. Interestingly, the authors drew a parallel between social and time discounting, pointing out that a person's ability to practice self-control is also connected to his or her capacity to behave altruistically. The hyperbolic decay in altruism, much like intertemporal discounting, can be described by the following equation:

$$v = \frac{V}{(1 + kD)} \quad (1)$$

Equation 1: Hyperbolic discount function

where v symbolizes the discounted value, which reflects the other-regarding utility of another person's reward at a given social distance, and D represents the social distance. The parameter V refers to the social premium a subject is willing to pay in exchange for another person's reward. V is equal to self-regarding utility at social distance $D = 0$ and determines the height of the function without affecting its shape. The degree of discounting (k) refers to the discount rate, that is, the steepness and the asymmetry of the decrease in generosity across social distance (Jones & Rachlin, 2006). Hyperbolic social discounting implies that generosity decreases steeply across close acquaintances but flattens out for more socially

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distant individuals. Defining social distance as "the extent to which the decision maker cares about another person" incorporates the idea that the construal of social distances relating to different individuals varies among people.

A decision maker's perception of social distance is influenced by a multitude of factors, such as familiarity, relationship and common history (Fareri et al., 2012). Although research on the impact of culture on social discounting is scarce, there is reason to believe that this could also be an important moderating variable in the context of social-distance-dependent pro-social behavior (Henrich et al., 2005). As highlighted in a review published by Weber and Morris (2010), there is evidence that time discounting is affected by individual and contextual differences and thus also by culture. This cultural difference was also shown in the study by Du, Green and Myerson (2002). The idea that connects delay and social discounting is that a consistent tradeoff can be made between one discounted reward and another. Rachlin and Jones (2008) showed that both social and delay discounting can be described using a hyperbolic function. As two concepts seem to be related (Rachlin & Jones, 2008), it is plausible that culture would play a role in both.

In contrast to delay discounting, the discount function in social discounting depends on how the subject organizes his or her environment. That is, the way he or she sees himself or herself in relation to others relates to his or her concept of self-construal. Prior research strongly indicates that self-concepts differ across cultures (Bochner, 1994; Cross, Hardin, & Gercek-Swing, 2011; Heine, 2001; Markus & Kitayama, 1991; Zhu & Han, 2008). Two dimensions of self-construal have been identified that are believed to be central to explaining cross-cultural differences: the independent and interdependent self (Markus & Kitayama, 1991). The former is more prominent in Western cultures, such as in Europe and the USA, where the self is defined as fundamentally individual and separated from others (Markus & Kitayama, 1991). In these cultures, the question "Who am I?" is likely to be answered with reference to individual traits that are stable across situations or that distinguish the person from others. Members of these societies often display a high degree of autonomy. In contrast, interdependent self-construal is often associated with Eastern cultures, for example, with Japanese and Chinese societies. According to Markus and Kitayama (1991), individuals from these cultures are likely to have a self-definition heavily dependent on connections to and relationships with others. They would answer the question "Who am I?" with reference to important relationships, for example, that to the mother, or certain group memberships. Self-esteem is derived from the individual's ability to fit into the group, and changes in behavior are reactions to demands of certain situations to maintain group harmony. Therefore, interpersonal relationships are central to the interdependent self, resulting in stronger in-group coherence. The favoritism of the in-group is connected to an exclusion of the out-group, influencing decision making and social interaction. Overall, the most prominent difference between the two concepts is the role that is assigned to others in the self-definition (Markus & Kitayama, 1991).

The differentiation between the two types of self-construals suggests that a decision maker with a blurred distinction between himself or herself and the people within an extended self should be more generous toward socially close people than someone who delineates the boundaries more sharply. Because the sharpness of the distinction is a function of whether the self is construed as independent or interdependent, culture should affect the shape of the social discount function.

In the present experiment, which builds on the seminal work by Jones and Rachlin (2006), we empirically test the influence of cultural identity on social-distance-dependent decision making and compare social discounting between German and Chinese participants. We chose these two cultures because previous findings have identified a clear-cut difference in the degree of individualism and collectivism between German and Chinese (Hofstede, 1980; Hofstede, Hofstede, & Minkov, 2010).

We have several hypotheses about how culture exerts its effects on social discounting. First, we conjectured that generosity declines as a function of social distance independent of cultural identity. Second, given the differentiation between independent or interdependent selves, we anticipate that the decrease in generosity will vary across cultures, especially at close social distances, where German subjects would show a marked drop in generosity, which should be significantly less pronounced in Chinese individuals. Third, as interdependent individuals are expected to discriminate more strongly between in-group and out-group members than independent ones (Markus & Kitayama, 1991), we expect Chinese participants to be less generous toward socially distant others than German participants. Finally, as different concepts of self-construal are thought to highlight the alternate role of others when giving meaning to the self, we hypothesize that within-culture variations are related to culture-specific factors.

MATERIAL AND METHODS

The current study empirically tests the influence of culture on social discounting by adapting the social decision-making task originally developed by Jones and Rachlin (2006) to a cross-cultural context.

Experimental design

Testing was carried out in two laboratories (Bonn, Germany, and Zhejiang, China) using paper questionnaires as well as computerized tasks. The procedure started with a self-representation task asking participants to rate their perceived closeness to specific people in their social environment on a 20-point scale (mother, father, siblings, grandparents, family, kin, best friend, circle of friends, colleagues, neighbors, acquaintances, partner, child and stranger). If one of the people did not exist in the social environment of the subject (e.g., child, partner or a deceased relative), they skipped the trial. This task can be considered a manipulation check to control for fundamental differences in self-representation.

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The ratings should thus not contradict the allocated social distances in the following social discounting experiment.

In the actual social discounting experiment, participants were asked to make 70 decisions comparable with those presented in Figure 1.

Social distance was transformed into a scale consisting of 100 icons. The colored icon on the left represented the participant. The icon next to it (social distance 1) represented the person of the social environment the participant feels closest to, such as a close relative. The icon at the opposite end of the scale (social distance 100) indicated a person that is most socially distant to the participant (e.g., a random stranger), someone he or she does not care about but has no negative feelings against.

Decisions had to be made for the following seven distances: 1, 2, 5, 10, 20, 50 and 100. In each trial, the relevant social distance was indicated by a yellow icon. The participant was asked to imagine a real person who represented that specific social distance. None of the participants indicated problems with mentally assigning people from their environment to the different social distances. Participants were asked to exclusively think about people they did not have any negative feelings toward (Bechara, 2004; Lerner & Tiedens, 2006; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003).

In each trial, the participant had a choice between a selfish and a generous option. The former yielded a large reward for the participant only, and the latter produced a smaller reward for the participant, which was accompanied by a reward to another individual at the social distance relevant for that trial (Figure 1). We titrated the selfish reward magnitude across trials between €75 and €165, in increments of €10. The generous option was always identical across trials with a fixed amount of €75 for the participant and €75 for the interaction partner. For each social distance, we quantified the amount foregone as a measure of the social-distance-dependent level of generosity (see following text for details).

Subsequent to the task, participants were asked to name and describe their relationships to the people they used as representatives for each of the seven social distances.

It is important to comment on the way we elicited social discount functions, as it differed slightly from previous methods. Jones and Rachlin (2006, 2009) and Rachlin and Locey (2011) asked their participants to mentally sort 100 people they know in the order of their social distance, thus creating an ordinal-scaled ranking of 100 people. Although this approach was undoubtedly appropriate in previous settings, ordinal ranking of social distances may be problematic in the current context. First, according to network theory, it is possible that a unique mapping of people to specific social distances may not exist, because subjects might assign more than one person to a given distance (Harrison et al., 2011). For instance, a subject may feel equally close to both of his or her siblings or parents. It is likely that this social distance density function is different across cultural contexts, with Chinese assigning more family members to the same close social distance levels than Germans (see following text for a detailed analysis of this possibility). This would particularly hold for systematic differences in family size. Thus, enforcing a unique mapping of people to social distance ranks may be a confounding factor that could systematically distort the representation of our subjects' social reality. Second, fitting any mathematical function, such as a hyperbolic model, to ordinal-scaled data points requires equidistance between the numerical values. Any violations of this assumption would complicate the interpretation of the shape of the fitted function, and this problem would be further aggravated when comparing data across cultures. For example, if the "true" differences in social distance between close ranks, for example, ranks 1 and 2, were much

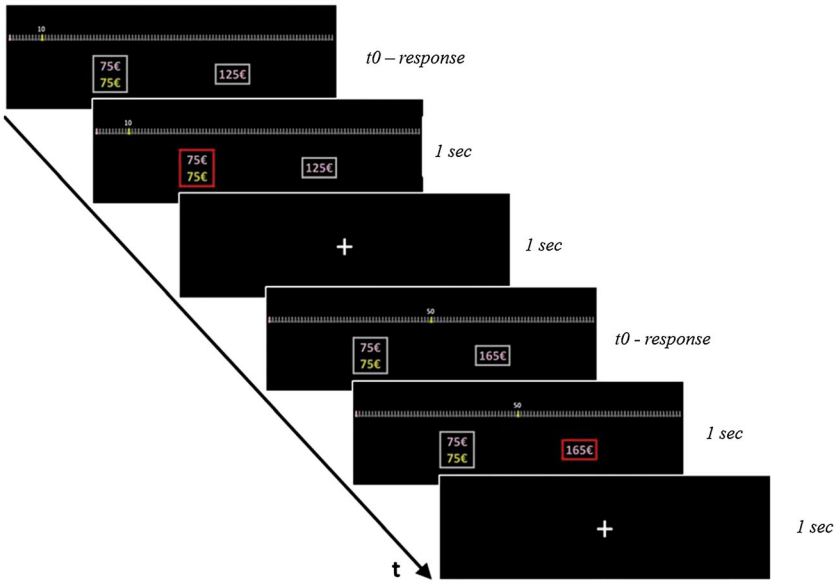

Figure 1. Example of the social decision making experiment. The social distance information for this trial is given on top of the screen. The two options for the trial are displayed below. The generous (shared) and selfish rewards are presented in the left and right sides, respectively. The side of the two options is randomized. As soon as the information is presented, the participant can make his or her decision. The participant's choice is confirmed by a red box around the chosen option

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larger than the "true" difference between remote ones, for example, ranks 90 and 91, then one can easily see that any monotonically decreasing constant discount function of social distance will be steeper at close than at remote social ranks, resulting in a hyperbolic shape. If the "true" distances between social distance ranks were also different across cultures, culture-specific differences in generosity could not be straightforwardly interpreted. A solution to these two problems is to refrain from using ordinal-scaled social distance rankings. A more appropriate solution is to elicit ratio-scaled ratings by asking subjects to imagine real persons from their own social environment and uniquely map them to given social distance values.

To quantify the manifestation of individualistic/collectivistic traits of our subjects, the experimental task was followed by the shortened version of the Individualism–Collectivism scale (Hui & Yee, 1994) to estimate target-specific collectivism. Although the scale had originally been designed to measure between-culture variations, it has extensively been used to study within-culture differences as well (Hui & Yee, 1994; Oyserman, Coon, & Kemmelmeier, 2002). It consists of 36 items allocated to five subscales, which can be grouped under two second-order factors. The subscales refer to group-specific interactions between members of a specific group and the individual, for example, the relationship between the individual and his or her parents, and to what extent the individual is willing to share private information.

Participants in Germany and China received a €4 or 7 Yuan participation fee, respectively. In addition, at the end of the experiment, one of the trials was randomly chosen, and 10% of the real decision value was paid out. Thus, in case of a selfish option, the participant received between €7.50 (13 Yuan) and €16.50 (29 Yuan) on top of their participation fee, and in case of the generous option, both the participant and the other person who was involved in the randomly selected trial received €7.50 (13 Yuan). Participants were asked to indicate the name and address of the virtual interaction partner they thought of in that trial. We compared the name stated with that indicated during the experiment to avoid abuse of the payment. The interaction partners received their rewards by mail. Additionally, subjects were also given the option to donate the money that would have gone to the other person to a charity instead (Germany: World Vision; China: Youth Development Foundation). Information about this possibility was only given at the end of the experiment and thus could not have influenced our subjects' decisions. The experiment did not involve deception and was performed in an incentive-compatible way and thus met the standards for economic research (Schram, 2005; Shane, 1998). A professional translator took responsibility for translating the instructions, which was further validated by back translation.

A problem in international research using monetary incentives often arises from differences in purchasing power of the currencies as well as per capita income levels (Kachelmeier & Shehata, 1997; Vijver & Leung, 1997). To keep incentives stable, the exchange rate was transformed on the basis of the gross domestic product (adjusted for purchasing power) and the average monthly expenses per participant. The amounts of Euro were multiplied by 1.7 and afterward rounded to the next 10 to obtain equivalent amounts in Chinese Yuan.

Population and sampling

Participants were recruited at the University of Bonn, Germany, and at Zhejiang University, China, using Grainer's Software "ORSEE – Online Recruitment System for Economic Experiments" (2003). The German sample consisted of $N = 50$ (26 male) students with an average age of 23.5 years ($SD = 2.47$). The Chinese sample consisted of $N = 55$ (28 male) students at Zhejiang University with an average age of 22.11 years ($SD = 2.27$). The samples were matched for student status and were balanced with respect to gender and income (gross domestic product adjusted). All participants had spent most of their lives in China or Germany, respectively.

As the aim of this study was to investigate cultural influences on pro-social behavior; data from four participants (three Chinese and one German) were excluded from further analysis, who responded exclusively selfishly even when choosing the generous option would have resulted in no loss for the participant (selfish option €75 for the participant, generous option €75 for the participant and €75 for the virtual interaction partner). All subjects gave their written informed consent prior to the experiment.

Data analysis

We aimed to quantify generosity levels by estimating how much money the participants were willing to forego to give a reward to another person at each given social distance (Jones & Rachlin, 2006). To this end, we titrated the selfish reward magnitude to determine, at each social distance, the point at which the subject was indifferent between the selfish and generous options. Logistic regression was used to determine the point of indifference where the statistical probabilities of answering generously and selfishly were both at 50%. For example, if a participant was indifferent between €100 for himself or herself and €75 for himself or herself and €75 for another person, he or she was willing to forego €25 in exchange for the €75 endowment to the other individual. If a participant made exclusively generous or exclusively selfish decisions at a particular social distance, the amount foregone was assumed to be €170 or €70, respectively. A standard hyperbolic model was fitted to the resulting indifference points (Jones & Rachlin, 2006). Differences between cultures were analyzed for each social distance, and the decay in generosity at close social distances was analyzed in more detail. Results were also examined in relation to the self-representation task and the Individualism–Collectivism scale.

RESULTS

On the basis of substantial evidence in existing literature (Bochner, 1994; Kitayama & Uskul, 2011; Markus & Kitayama, 1991; Weber & Morris, 2010; Zhu, Zhang, Fan,

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& Han, 2007), we anticipated that the Chinese sample would prove to be more collectivistic and show more interdependent traits than the Germans. In contrast, the German sample was expected to be more individualistic and express more independent characteristics. These predictions were confirmed by participants' answers given in the questionnaire. When asked which three words would describe their respective culture best, Chinese used words such as family (or relationship with family), Confucius (a symbol for Chinese tradition), harmony and tradition noticeably more often than their German counterparts, who preferred words that describe individual traits such as diligence, punctuality, individuality and orderliness. When subjects were asked to indicate how much they identified with their respective culture on a 5-point Likert scale, we found a significant difference between the two populations. Chinese showed stronger connections to their culture than did German participants (Chinese: $M = 4.0$, $SD = .816$; German: $M = 2.94$, $SD = 1.049$; $t(99) = 5.650$, $p < .001$). Similarly, when we asked participants to indicate how much they identified with their family, we found a significant effect of culture (Chinese: $M = 4.67$, $SD = .585$; German: $M = 3.84$, $SD = 1.161$; $t(99) = 4.53$, $p < .001$), indicating a more central role of the family in the Chinese sample. To further explore differences in self-construal, we analyzed the results of the self-representation task (Figure 2). An independent samples *t*-test showed significant differences ($t(73.87) = -2.188$, $p = .032$) between the perceived closeness to family members (pooling ratings of mother, father, sibling, grandparents, family and kin) in Chinese ($M = 11.98$, $SD = 4.96$, lower scores indicate greater closeness) and German subjects ($M = 15.16$, $SD = 8.97$).

Next, we asked whether there are commonalities in social discounting across cultures. We found that the willingness of participants from both cultural backgrounds to forego a reward for the benefit of another person decreased across social distance, which replicates prior research (Jones, 2007; Jones & Rachlin, 2006; Rachlin & Jones, 2008). A standard hyperbolic model (Equation (1)) was fitted to the median percentage of the maximum amounts foregone (Jones & Rachlin, 2008) separately for each cultural group. The hyperbolic model approximated both the German ($AIC_{German} = -26.259$) and the Chinese participants' data well on the group ($AIC_{Chinese} = -15.097$) and individual levels (cf. Table 1). Figure 3 shows the median amounts foregone and the hyperbolic fit.

Equation (1) had two free parameters—*V* and k. *V* represented the undiscounted value for the individual (the value at social distance = 0), and *k* corresponded to the individual discount rate (Green & Myerson, 2004). The parameters were fitted to the data of each participant individually and then compared across groups. Neither *V* (Chinese $Mdn = .962$; German $Mdn = 1.026$; Mann–Whitney *U*-test, $U = 1260.00$, $Z = -.092$, $p = .927$) nor *k* (Chinese $Mdn = .077$, German $Mdn = .069$; $U = 1210.00$, $Z = -.435$, $p = .664$) differed significantly between Chinese and German subjects, indicating no main effect of cultural affiliation on the shape of the discount curve. As stated earlier, the parameter *k* provides information about the steepness of the discounting curve. In a further step, the parameter *V* was entered as a constant (mean *V* of the respective culture; $M_{V,\ Chinese} = .970$, $M_{V,\ German} = .936$) into the hyperbolic model, so that all variance would be transferred to the parameter *k* ($AIC_{Chinese} = -21.439$; $AIC_{German} = -30.686$). However, this analysis also did not indicate a significant difference of the discounting curve between the Chinese and German samples ($Mdn_{Chinese} = .099$, $Mdn_{German} = .142$; Mann–Whitney *U*-test, $U = 1203.00$, $Z = -.328$, $p = .743$).

In addition to the hyperbolic model, two additional models were fitted to the data. The beta-delta (Laibson, 1997; Equation (2)) and constant sensitivity models (Ebert & Prelec, 2007; Equation (3)) provided good fits, too, although not considerably better than the hyperbolic model (Chinese beta-delta, $AIC = -18.200$; German beta-delta, $AIC = -24.899$; Chinese

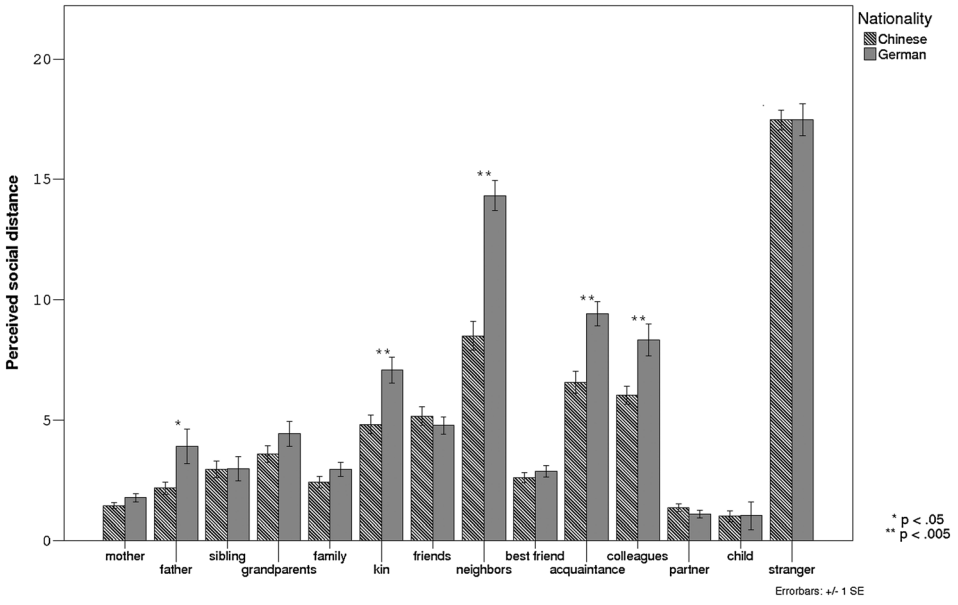

Figure 2. Results and between-group differences in the self-representation task. Lower numbers indicate higher closeness

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Table 1. Individual social discount parameters

	Formula		Fitted parameters (Mean)	Mean fit
Hyperbolic model	$v = \frac{V}{(1+kD)}$	Chinese	$V = .9701$, $SD_V = .2936$ $k = .1636$, $SD_k = .2505$	$AIC = -15.097$
		German	$V = .9361$, $SD_V = .4013$ $k = .1681$, $SD_k = .2248$	$AIC = -26.259$

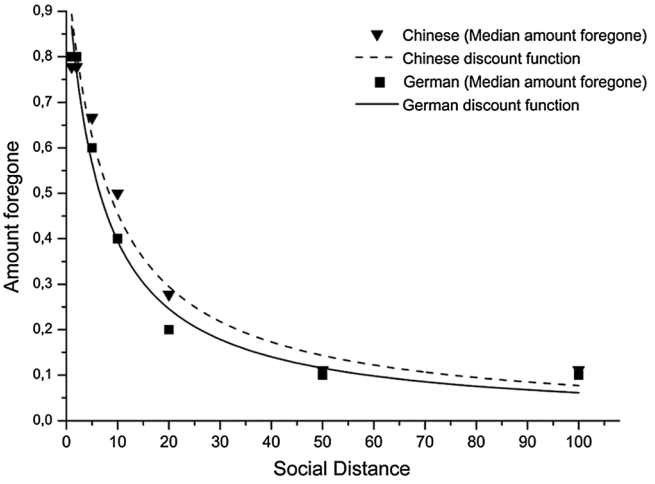

Figure 3. Fitting of the hyperbolic discount function for both cultures. A standard hyperbolic function was fitted to the amounts foregone for each of the two cultures. The solid line describes the German discount function, and the dashed line the Chinese discount function

constant-sensitivity, $AIC = -19.846$; German constant-sensitivity, $AIC = -25.552$). Because the improvement of the fit was not substantially better, it seems appropriate to stick to the hyperbolic model to keep comparability with previous studies (i.e., Jones & Rachlin, 2006). Moreover, none of the models indicated a significant difference between the Chinese and German samples regarding the shape of the discount function (Mann–Whitney U-test, all $p > .05$).

$$v = \beta * \delta^{D} \quad (2)$$

Equation 2: Beta-delta model (Laibson, 1997)

$$v = \exp\left[-(a*D)^{b}\right] \quad (3)$$

Equation 3: Constant sensitivity model (Ebert & Prelec, 2007)

Because the discount rates, thus the respective parameters in the model, are non-parametrically distributed in most cases, Myerson, Green, and Warusawitharana (2001) proposed using a model-free approach to analyze delay and probability discounting. This approach seems to also be suitable for social discounting. The area under the empirically determined discount curve is less sensitive to variability in the curve's shape, and its informative value is independent of any parameter estimates. The area under the curve (AUC) measure, therefore, allows a parametric analysis to contrast groups. The AUC was calculated for each participant individually. Comparing the AUC between the two cultures yielded a non-significant difference (Chinese: $M = 2846.03$, $SD = 1617.76$, German: $M = 2344.69$, $SD = 1363.22$; independent samples t-test, $t(99) = 1.679$, $p = .096$) with a trend indicating higher levels of generosity of the Chinese compared with the German subjects. Yet, the difference between the cultures might be too subtle to manifest itself in differences in the model-based parameters.

We hypothesized that within-culture variations in social discounting can be attributed to different aspects of self-representation among the two groups. To investigate this hypothesis, we used Hui and Yee's scale (1994) to quantify individual levels of individualism/collectivism in diverse social environments and correlated the distinctive factors regarding the self-representation with the individual discount parameters k and V for each culture. We found that different factors of individualism/collectivism correlated with the discount parameters within the two groups. Whereas for the Chinese, but not the Germans, the factor "Parents: consulting and sharing" significantly correlated with the discount parameter k (Chinese: $r_s = -.292$, $p = .042$; German: $r_s = .110$, $p = .457$; Spearman's rho), for the German, but not the Chinese, k correlated with the subfactor "Kin and Neighbors: Susceptibility to influence" (Chinese: $r_s = .123$, $p = .401$; German: $r_s = -.322$, $p = .026$; Spearman's rho). The factor "Parents: consulting and sharing" refers to the readiness to consult parents for help, with reference to the vertical relationship within a family. In contrast, the factor "Kin and Neighbors: Susceptibility to influence" relates to the manifestation of a none-of-your-business attitude (Hui & Yee, 1994). This indicates that social discounting is affected by diverse aspects of self-representation and the kind of interaction with an individuals' social environment across cultures.

When comparing levels of generosity separately for each social distance, we found a main effect of culture for several social distances. Significant differences between the two groups were apparent at social distance 1 and between the distances 20–100, with the Chinese sample showing less variability in other-regarding generosity across social distance as summarized in Table 2. Our results showed that the Chinese subjects tend to be less generous at close social distances compared with the German sample. Yet, the Chinese subjects exhibit greater generosity toward people at large social distance, whereas the German participant's generosity was significantly lower.

In addition, we calculated an efficiency standard. It is possible that subjects tend to maximize the total amount received, independent of how it is distributed between the subject and the interaction partner. We refer to the maximization of overall money paid out as the *efficiency standard*. Meeting the efficiency standard means being generous if the selfish reward is below €145 (250 Yuan) and selfish if it is higher. By calculating the deviation between the actual

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Table 2. Results of Mann–Whitney *U*-test: generosity per social distance across cultures

Social distance		Average rank	*z*-value	*p*-value
1	Chinese	45.35	−2.017	.044
	German	57.00		
2	Chinese	48.77	−.794	.427
	German	53.37		
5	Chinese	52.83	−.647	.517
	German	49.06		
10	Chinese	53.54	−.898	.369
	German	48.31		
20	Chinese	56.52	−.1957	.049
	German	45.14		
50	Chinese	57.69	−2.389	.017
	German	43.90		
100	Chinese	62.56	−4.165	<.001
	German	38.73		

point of indifference per social distance level and the efficiency standard, we can determine the differential influence of social distance onto the decision-making process for each of the two cultures. The analysis revealed that the Chinese subjects remained overall significantly closer to that indifference point and were therefore less influenced by social distance ($Mdn_{Chinese} = 35.5$, $Mdn_{German} = 50.0$; Mann–Whitney *U*-test, $U = 56197$, $Z = -2.3$, $p = .021$).

Next, we performed a more in-depth analysis to detect local differences of changes in generosity levels at close social distances between German and Chinese individuals. The separation of the self from others in the independent German participants should, compared with the more interdependent Chinese subjects, lead to a direct decay in the social-distance-dependent level of generosity. Thus, for the Germans, we expected to find a drop in generosity with every increase of social distance (Jones & Rachlin, 2006), which should be less pronounced in the Chinese. To test this hypothesis, the two samples were reanalyzed with a focus on close social distances. For the German sample, the results indicate a significant drop in generosity between social distances 1 ($Mdn = 80$) and 2 ($Mdn = 80$; $Z = -.2.807$, $p = .005$), as well as between 2 and 5 ($Mdn = 60$; $Z = -3.303$, $p = .001$). By contrast, in the Chinese sample, the difference in generosity between social distances 1 ($Mdn = 77.78$) and 2 ($Mdn = 77.78$) was less pronounced and did not reach significance ($Z = -.398$, $p = .691$), whereas the drop between social distances 2 and 5 ($Mdn = 66.67$) was significant ($Z = -2.772$, $p = .006$; Figure 4).

In sum, whereas German participants displayed a significant decrease in generosity across close social distances, Chinese subjects showed a less pronounced change. There are several potential explanations for this result. First, it may be the consequence of culture-specific differences in the mapping of the subjects' social world on the numerical values. That is, Chinese and German subjects may not differ in their other-regarding preferences to particular people, but because they assign different numerical social distance values to the people in their social environment, their social discount functions may differ. For example, Chinese participants may preferably assign family members to social distances 1–5, whereas Germans may assign family members

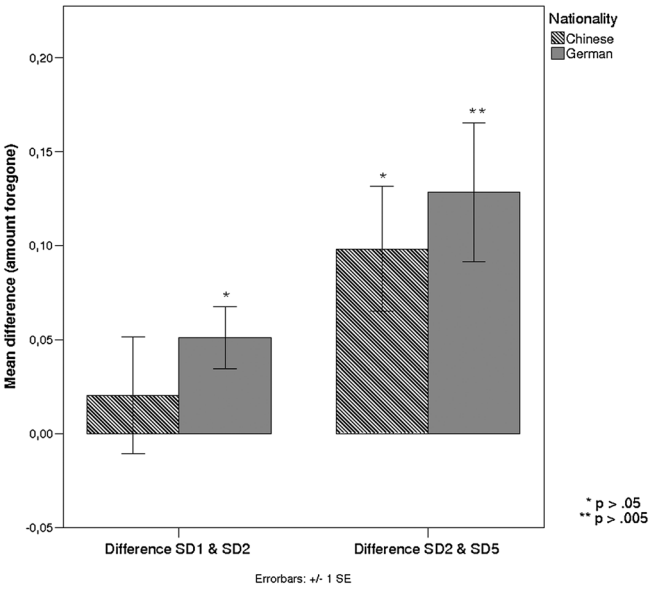

Figure 4. Initial step in the Chinese participants' generosity compared with the steep decay in the German subjects. Displayed are the mean differences in percentage of the amount foregone, split among nationality

to social distance 1 only and non-family friends and acquaintances to distances 2–5. Assuming these subjects are otherwise identical in their generosity toward family and friends, Germans would show a stronger decrease in generosity between social distances 1 and 2 compared with the Chinese simply because there is no family member at distance 2. A second possible explanation for our results holds that Chinese and Germans do *not* differ in the mapping of their social world to numerical social distance values, but they diverge in their other-regarding preferences toward members of a given social distance. To decide between these two explanations for our results, we compared the mapping of social categories with social distance values (Figure 5). Chinese participants assigned family members more often

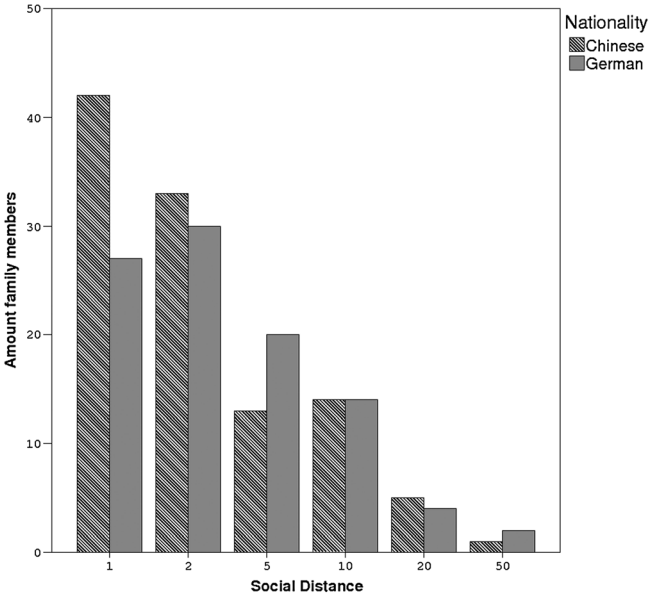

Figure 5. Percentages family members per social distance, split among nationality

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on social distance 1 (80.8%) compared with social distance 2 (63.5%). We found a different pattern in the German sample: They assigned family members more often to social distance 2 (61.2%) compared with social distance 1 (55.1%). Combined, the Chinese subjects display a drop in assigned family members, and the Germans show even an increase on social distance 2.

Thus, the assignment of numerical values to their social environment did differ between cultures, but in the opposite way than would have been expected if the discrepancy in numerical value mapping was the sole explanation for the culture-specific difference in the steepness of social discounting across close social distances: If German and Chinese subjects *only* differed with regard to their numerical construal of their social world, but *not* in their other-regarding preferences toward a specific social category, for example, family members, we would expect a *flatter* decay of generosity across social distances 1 and 2 for the German sample because they preferably assigned family members to these distances, and a *stronger* decay in the Chinese sample because they assigned family members to distance 1 and non-family members to distance 2. However, we found exactly the opposite pattern: Compared with the Chinese, the Germans had a steeper decay in generosity across distances 1 and 2, despite the fact that they assigned members of the same social category to these distances. Therefore, culture-specific differences in the numerical representation of the social world alone cannot account for the entirety of our results, only in combination with a genuine cultural dissimilarity in other-regarding preferences.

The fact that we found these differences described earlier in the decay of generosity over close social distances suggests that there are indeed differences among cultures in the way people discount socially. To characterize this cultural difference in discounting more, we used a more model-driven approach to identify parameters sensitive to differences in social discounting. The culture-dependent difference in the drop of generosity across close social distances can be described by a horizontal shift of the hyperbolic discount function along the x-axis. We therefore fitted the following function to our data:

$$v = \frac{V}{[1 + k*(c + D)]} \tag{4}$$

Equation 4: Hyperbolic function with parameter c, capturing the horizontal shift in direction of the x-axis

V was replaced by the mean V of the respective culture (Chinese: $M_V = .9701$; German: $M_V = .9361$), calculated in the hyperbolic fit. c is a constant reflecting the horizontal shift of the discounting curve along the x-axis. k is again the degree of discounting. This function also revealed comparably good fits for both cultures ($AIC_{\text{Chinese}} = -23.391$, $AIC_{\text{German}} = -26.259$). We hypothesized that a group comparison between the German and Chinese participants indicates a difference in c: The culture-dependent difference in the initial step in generosity should be reflected by higher c-values in the Chinese sample relative to the German sample. However, one problem arising, when performing this analysis, is that some subjects showed no or close to no discounting behavior, thus no changes in other-regarding utility over social distance. In those cases, the parameter k was close to zero, and the fit of function 4 was rendered meaningless. We therefore excluded four subjects from this analysis. Cutoff was determined to be $k < .01$. We found a main effect of culture on the parameter c, confirming the previous analyses ($Mdn_{\text{Chinese } c} = .0338$, $Mdn_{\text{German } c} = -.8171$; Mann–Whitney U-test, $U = 882$, $Z = -2.083$, $p = .037$). Culture thus modulates the shift of the hyperbolic function along the x-axis. In the Chinese sample, this shift is to the left, reflecting the less profound decay. Note, though, that this effect disappeared when including the four non-discounting subjects.

DISCUSSION

The goal of the present experiment was to investigate the effect of culture on social discounting. We employed an economic decision experiment to study differences in social-distance-dependent pro-social behavior between German and Chinese individuals. Our overall results replicate the findings of Jones and Rachlin (2006, 2008, 2009). That is, individuals from both cultures were willing to forego an amount of money for themselves for the benefit of someone else, but their generosity levels decreased with increasing social distance. The discount behavior of both cultures can be described by a standard hyperbolic function.

A more in-depth analysis revealed that cultural identity seemed to have an influence on how generosity changed with increasing social distance. First, we found a main effect of culture on generosity at several social distance levels and, second, a steeper drop in generosity across close social distances in the German compared with Chinese participants. For the main effect, there was a significant difference in generosity levels at social distances 1, 20, 50 and 100 between German and Chinese participants. The data suggests that the Chinese were less generous at close social distance and more generous on large social distances compared with the Germans. Thus, overall, the Chinese showed less variability than the Germans in other-regarding generosity, staying overall significantly closer to the financially most efficient outcomes in terms of maximizing overall wealth. This is at odds with the framework of the independent/interdependent self (Markus & Kitayama, 1991), according to which interdependent individuals should discriminate more strongly between in-group and out-group members than independent individuals and be *less* generous toward socially distant others than independent participants. One possible explanation for our finding is that the willingness to behave pro-socially toward socially distant individuals could reflect a mechanism to maintain equity (Buchan & Croson, 2004), which could be accomplished by maximizing the total reward for both players and not merely the individual's payoff. This process may be differently strong in Chinese and German

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participants. To explore the tendency to maintain harmony in the group, Buchan and Croson (2004) investigated the influence of differing social distances on trust and trustworthiness in a trust game (Berg, Dickhaut, & McCabe, 1995) with Chinese and American subjects. For both cultures, trustworthiness decreased with increasing social distance. However, they also found that Chinese individuals made weaker distinctions between close and distant people, leading to a generally higher proportion of behavior benefiting the interaction partner. This may also have been caused by the fact that Chinese subjects considered individuals at all social distances as in-group and therefore behaved in an interdependent fashion to everyone. Thus, our findings could indicate an overall tendency to maintain general and financial harmony in the group, which is a central aspect of interdependent self-construal (Markus & Kitayama, 1991). Another might be culture-dependent discrepancies in the definition of what a stranger is. However, this is unlikely as the social distance scores for strangers in the self-representation task were not significantly different between German and Chinese participants, suggesting that they mapped similar social distance values to this category.

Our second main finding was the marked drop in generosity across close social distances in the German sample, which was much less pronounced in Chinese. This was further verified by fitting a variant of the hyperbolic model to the data, in which an additional parameter reflected the horizontal shift of the function along the *x*-axis. There could be several reasons for this effect. It is possible that Chinese and German subjects did not differ with respect to their other-regarding preferences, but they varied in how they mapped their social world onto numerical social distance values. This was indeed the case to some degree, as Chinese were more likely to assign family members to social distance 1 and friends and acquaintances to higher distances, whereas Germans spread family members across social distances 1 and 5. However, if German and Chinese subjects *only* differed with regard to the numerical construal of their social world, but *not* in their other-regarding preferences toward a specific social category, we would expect a flatter decay of generosity across social distances 1 and 2 for the Germans because they assigned family members to both of these distances, and a stronger decay in the Chinese sample because they only allocated family members to distance 1. However, we found exactly the opposite pattern: Compared with the Chinese, the Germans had a steeper decay in generosity across distances 1 and 2, despite the fact that they assigned members of the same social category to these distances. Thus, the explanation of a culture-specific discrepancy in the mapping of the social world to numerical values cannot fully account for the observed differences in social discounting. Therefore, we maintain that Germans and Chinese genuinely differ with regard to their social-distance-dependent other-regarding preferences. With this in mind, decision experiments such as the present task can be considered a good alternative to studying cross-cultural differences and the influence of cultural differences on economic behavior.

Furthermore, our data suggest that social distance is conceptualized differently across cultures. Within-culture variations can be explained by distinctive factors relating to specific independent/interdependent self traits. The Chinese sample loaded high on a factor associated with vertical relationships within a nuclear family (Hui & Yee, 1994), which includes taking advice and sharing resources with family members. This means that a tighter and more confident connection to the family is linked to a lesser decay of generosity over increasing social distance. This highlights the centrality of relational attitudes in the Chinese culture and the manifestation of these traits within an individual.

In the German sample, the factor "Kin and Neighbors: susceptibility to influence," reflecting a "none-of-your-business" attitude (Hui & Yee, 1994), was associated with the slope of the discount function. This implies that Germans' discount parameter was unrelated to their attitude toward close family members but was modulated by the geographically close, non-kin social environment. These results suggest that, although the resulting meta-level of social-distance-dependent generosity seems to be relatively similar, within-culture variation can be attributed to different factors influencing the individual's social discount rate. Whereas other-regarding preferences in Chinese were influenced by family aspects, German participants distanced themselves from external influences.

Lastly, although our results suggest cultural differences in generosity, it is important to consider the possibility that these findings may have been due to differences in perceived anonymity between Chinese and Germans. Hoffman, McCabe, Shachat, and Smith (1994) demonstrated that anonymity exerted a significant influence on players' decisions to be generous in ultimatum and dictator games. When anonymity was granted, participants behaved in a more self-regarding fashion than when their identity was known. Although in the present experiment, anonymity does not play a role in relation to the interaction partner, it does become an issue with regard to the presence of the experimenter. Participants were aware that their answers were recorded and observed by a researcher, who knew their identity. Given cultural differences, this may have influenced decisions differentially in the two samples. However, although differences in perceived anonymity may have affected generosity, this would have been the same to all social distances. Therefore, although this may explain cultural differences at aggregate levels, it is unlikely that the differences in discounting can be attributed to a discrepancy in perceived anonymity.

In light of the present findings, we hope that our study initiates a more focused discussion about the role of culture in decision making and pro-social behavior. Culture seems to play a pivotal role in social decision making, and economical and psychological approaches should take these differences into account. We suggest that incorporating the differences between cultures would be beneficial for more general models of decision making.

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CONCLUSION

In the present study, we aimed to investigate culture-specific differences in social-distance-dependent levels of generosity. Our findings indicate that, compared with Chinese participants, German subjects showed a more pronounced decrease in generosity across close social distances. It is tempting to speculate that this difference stems from the way Chinese and German subjects construe themselves in relation to their social environment. According to this idea, German subjects draw a sharp distinction between themselves and others and therefore show a pronounced decrease in generosity with every increase in social distance. By contrast, Chinese subjects are more interdependent and show a more blurry differentiation between the self and close others. We argue that the flatter decrease in generosity across close social distances reflects this fuzzy boundedness between self and others. However, the fact that the same form of mathematical function described the discounting in both cultures underpins the idea that there is a general discount function that differs only in specific aspects across cultures. Nonetheless, our results demonstrate that integrating culture in social (economic) decision making in more detail could be meaningful to better understand humans social decision making as well.

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