Relative Deprivation and Prosocial Behavior: Evidence from South Korea

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Abstract

Previous research suggests that the emotional consequences of unfavorable social comparisons determine individual attitudes and behaviors. However, few studies assessed the effect of relative deprivation on prosocial behaviors, and any evidence in the Asian context is particularly scarce. In this study, we examined the association between relative deprivation and prosociality among Korean adults. We used two complementary approaches involving experimental manipulation of relative deprivation via an online survey (Study 1) and an econometric analysis of longitudinal data (Study 2). Study 1 showed that exposure to the relative deprivation condition reduced participants' willingness to donate, volunteer, and accept unwanted public facilities. Study 2 showed that relative disadvantage within the reference group was negatively related to the extensive and intensive margins of donating or volunteering. We conclude that relative disadvantage constitutes a major determinant of prosocial intention and behaviors among Korean adults.

Keywords: relative deprivation; upward social comparison; donation; volunteering
JEL classification: D64, D90, H40

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1. Introduction

The prevalence of charitable acts has declined in South Korea (Korea hereafter) over the past decade. Korea ranked 57th among 153 countries listed in the CAF World Giving Index 2011—a classification based on donating money, volunteering, and helping a stranger (Charities Aid Foundation, 2011). In 2021, Korea's score fell significantly across all types of charitable acts, putting the country in 110th place in a group of 114 surveyed nations (Charities Aid Foundation, 2021). According to Statistics Korea, about 35% of Korean adults made donations to charity in 2011. This percentage dropped to 24% in 2019, with the sharpest drop observed for households in the lowest income group (Statistics Korea, 2019).

What motivates Korean people to behave less generously is not fully understood. One plausible hypothesis is that feelings of relative deprivation (RD) induced by upward social comparisons may have undermined altruism and generosity towards others. RD refers to the perception that one is deprived of deserved outcomes compared to a relevant referent, accompanied by feelings of anger and resentment (Pettigrew, 2015). Empirical studies built upon RD theory show that those who feel relatively deprived tend to develop negative affective responses such as anxiety and depression (Gero et al., 2017; Kuo & Chiang, 2013; Lyu & Sun, 2020; Pak & Choung, 2020) and exhibit hostile attitudes towards others (DeCelles & Norton, 2016; Greitemeyer & Sagioglou, 2017; Mishra & Novakowski, 2016). The feeling that people do not have what they deserve could motivate the desire to pursue self-interest as a means to redress deprived status and catch up with those ranked higher in the social hierarchy (Kim et al., 2017). For those who feel unfairly disadvantaged, sacrificing private interests for the benefit of others might not be an attractive course of action as it would not help improve their social standing (Zhang et al., 2016). Indeed, self-interest and altruism are two conflicting motives manifested by divergent behavioral intentions (Wolosin et al., 1975).

Some extant evidence points to a link between RD and intentions to engage in prosocial activities. For example, Kim et al. (2017) found that employees who learned about their lower discretionary income than others displayed a greater desire for personal gains. Zhang et al. (2016) demonstrated that the sense of deservingness arising from the perception that one does not get what he/she deserves led Chinese college students to prioritize their private interests over others' and reduce prosocial behaviors. Other research showed that unfavorable social comparisons in workplace contexts were negatively related to generosity towards colleagues and cooperative work intentions (Gheorghiu et al., 2021). The existing evidence, although fragmented, points to the possible negative relationship between RD and individual orientation toward prosocial activities.

This study explores the association between RD and prosocial behavior in the Korean context, using nationally representative samples and a broad range of measures encompassing prosocial attitudes and conducts. Specifically, we conducted two separate analyses: an experimental study that manipulates participants' perception of RD in an online experiment (Study 1) and an econometric analysis of population-based longitudinal data (Study 2). In the first study, we induced feelings of RD with a fictitious message that the participant's discretionary income was significantly lower (or slightly higher) than the income of similar others in the reference group and examined its effect on prosocial intentions. Study 2 used 15 years of data drawn from the Korean Welfare Panel Study (KoWePS) to estimate the longitudinal association between RD and prosocial behaviors. Our measures of prosociality were based on willingness to engage in altruistic behaviors, such as helping others, donating money to charities, volunteering, and accepting unwanted public facilities in the neighborhood (Study 1), or self-reported history of donating and volunteering (Study 2). These measures were designed to match the core domains of the prosocialness scale developed by Caprara et al. (2005) and the CAF World Giving Index (Charities Aid Foundation, 2011), so that we could form inferences about declining prosocial behaviors in Korea.

This study complements and extends previous research in several ways. First, unlike most previous studies conducted in Western countries (Callan et al., 2017; Gheorghiu et al., 2021; Kim et al., 2017), our study is based on Korean samples. This unique cultural context helps us examine whether the relationship between RD and prosocial behavior observed in individualistic Western societies replicates across more collectivistic cultures, where social interconnectedness plays a central role in individual identity (Hong et al., 2003). Second, we used complementary research designs involving experimental manipulation of RD coupled with the econometric analyses of a representative longitudinal sample. Using both experimental and longitudinal designs strengthens our claim that we successfully identified the causal impact of RD on prosociality and offers an additional layer of confidence in the generalization of findings into the Korean adult population. Third, our outcome variables encompass behavioral intentions examined in the experimental setting, as well as actual behaviors self-reported in the secondary data. Examining intentions and behaviors in a unified framework allows us to offer a more comprehensive explanation of how RD affects prosociality and test whether behavioral intentions translate into actual behaviors.

The rest of this paper is structured as follows. Section 2 introduces the theoretical background of the RD hypothesis and reviews the literature relating RD to individual prosocial behavior. Section 3 identifies the gap in the literature and presents testable hypotheses. Sections

4 and 5 present our data, measures, methods, results, and discussions for Study 1 (experimental manipulation of RD) and Study 2 (analyses of longitudinal data). Finally, Section 6 concludes with a general discussion of the study findings and suggestions for future research.

2. Background

2.1. Relative deprivation theory

The notion of RD emerged from the observation of American soldiers in World War II who voiced frustration over promotions compared to peers in other units, despite promotions being more frequent in their group (Stouffer et al., 1949). Runciman (1966) developed the concept into a holistic theory and suggested that the recognition of interpersonal or intergroup disadvantage determines individual attitudes and behaviors, as well as collective actions and outgroup prejudices. Based on this conceptualization, the feeling of being relatively deprived is predicated on several conditions, such that a person (a) does not have X, (b) sees that someone else has X, and (c) wants X. The essence of the RD theory is its attention to individual perception of disadvantage, which extends beyond views that human behaviors and attitudes are determined by objective conditions (Webber, 2007).

The subsequent conceptualizations of RD emphasized cognitive and affective experiences in which perceptions of relative disadvantage invoke feelings of dissatisfaction, anger, and resentment (Crosby, 1976; Smith et al., 2012). The summary of RD theory proposed by Smith et al. (2012) specified three elements of RD: (a) comparisons with others, (b) cognitive appraisals that culminate in the perception of disadvantage, and (c) interpretation of disadvantage as unfair. The antecedent of RD is the social comparison process, which requires a person to evaluate his/her status and make comparisons at the individual or group levels. According to the social comparison theory (Festinger, 1954), individuals determine their personal and social worth based on how they measure up against others. Related research showed that people tend to compare themselves to others with similar characteristics (Gerber et al., 2018).

Smith et al. (2012) identified five types of social comparisons, three of which concern interpersonal comparisons (comparison with past/future self, with ingroup members, with outgroup individuals) and two that involve intergroup comparisons (comparison of ingroup with outgroup, comparison with ingroup's past/future). Social comparisons occurring at the interpersonal levels lead to individual (or egoistic) RD, while intergroup comparisons lead to group (or fraternal) RD (Runciman, 1966). Individuals who feel that their group is relatively disadvantaged (group RD) tend to show group-serving attitudes and behaviors, including

prejudice to other groups, protest, and voting for political extremism (Pettigrew et al., 2008; Walker & Mann, 1987). Those who feel deprived at the interpersonal level (individual RD) develop aversive states, such as anxiety disorders, depression, and suicidal ideation and behaviors (Gero et al., 2017; Kuo & Chiang, 2013; Lyu & Sun, 2020; Pak & Choung, 2020).

In order for RD to occur, the process of cognitive appraisal of a person's conditions relative to others must lead the individual to the perception that he or she is at a disadvantage. This subjective experience of disadvantage is different from an objective disadvantage because individuals in objectively deprived conditions do not necessarily feel that they are disadvantaged. For instance, a poor person may not recognize his/her disadvantage until a richer person moves into their neighborhood. Similarly, a blue-collar public utility worker who repairs infrastructure in an affluent neighborhood may not view wealthy homeowners as a relevant comparison group. Runciman (1966) clarified the concept of two reference groups: normative (i.e., the source of the individual's norms, attitudes, and values) and comparative (i.e., the standard of comparison for self-appraisal) and suggested that what leads to RD is an unfavorable comparison against one's comparative reference group, i.e., a group one strives to be like.

Lastly, the perception of relative disadvantage must procure feelings of entitlement and deservingness, often called "justice-related affect" (Smith et al., 2012). Individuals who recognize themselves to be disadvantaged need to believe that their disadvantaged status is unfair and that they deserve better. This perception of unfair treatment is a key psychological mechanism that invokes aversive feelings and constitutes an important difference between RD and other psychological theories that predict behavioral responses based on comparison to a particular reference point, e.g., Helson's (1964) adaptation-level theory, Kahneman & Tversky, 1982 anchoring and adjustment theory, or Kahneman's (1992) prospect theory. The perception of unfair material disadvantage is also crucial to the prediction that anger will detract from prosocial attitudes or behaviors. Literature provides examples where anger, in the absence of unjust disadvantage, can actually increase charitable activities. For example, Silber (2011, 2012) observed that "civic anger" stemming from perceptions of government incompetence and ineffectiveness may lead to an increase in philanthropy among wealthy donors.

RD could be measured directly with subjective reports or inferred indirectly from one's objective living conditions. Measurements of RD using self-reports capture subjective RD defined by the original theory, as they directly assess anger and resentment resulting from the cognitive comparison and appraisal of relative disadvantage (Smith et al., 2012). On the other hand, epidemiologists compare one's income or economic status to the equivalent metrics of

reference groups to construct a measure of objective RD (Gero et al., 2017; Kuo & Chiang, 2013; Lyu & Sun, 2020; Pak & Choung, 2020). In this case, the reference group is approximated with the measures of objective living conditions such as age, gender, race, and education, reflecting Runciman's (1966) claim that individuals compare themselves to similar others. While such an approach offers the benefits of broad applicability, it is limited in that it does not directly assess subjective perceptions of RD and the related emotional consequences. Smith et al. (2012) reviewed prior research on RD and found that the self-reported measure of RD had higher predictive validity than those measured indirectly with objective characteristics. We use both types of RD measures to show converging evidence on the RD-prosociality link.

2.2. Individual relative deprivation and prosociality

It was shown that individual RD is negatively related to the willingness to contribute to others' welfare. For example, Zitek et al. (2010) found that the recollection of unfair treatment or losing a computer game for an unfair reason led participants to decline a request for help. Similarly, John et al. (2014) observed that the awareness of co-workers' earnings among those who earned relatively low pay led to increased cheating. Zhang et al. (2016) showed that individual RD was negatively related to prosocial values, prosocial aspirations, and volunteer behaviors, and that this association was partially mediated by the tendency to put self-interest over others' needs. Xiong et al. (2021) observed reduced prosociality among rural-to-urban migrants in China who may have experienced discrimination, social exclusion, and RD during adjustments to urban life. Callan et al. (2017) found a negative association between self-reported individual RD and prosocial beliefs and behaviors. Gheorghiu et al. (2021) demonstrated that, when asked to make upward social comparisons in the workplace, participants showed reduced generosity and desire to help others.

Feelings of RD could reduce prosocial behavior through a number of pathways. First, the experience of victimhood gives rise to a sense of entitlement and selfish compensatory behaviors. The fact that one cannot achieve the desired outcome that others do could motivate a belief that he/she is victimized by inequality. People experiencing such feelings may think that they do not need to sacrifice for others or are allowed to pursue self-interest (Zick et al., 2010). Once victimhood entitlement sets in, people engage in behaviors that compensate for their relative disadvantages, such as gambling and luxury good purchases (Callan et al., 2008, 2011; John et al., 2014; Mishra & Novakowski, 2016) and become less involved in activities to improve others' welfare (Zhang et al., 2016).

In addition, the emotional consequences of RD might be incompatible with generosity

towards others. Individuals in the RD condition often feel that the system is not designed to reward those who deserve benefits, and thus the social norm of fairness is violated (Kawachi & Subramanian, 2014). This perception of unfair treatment leads to anger and resentment toward those who enjoy seemingly undeserved advantages (Greitemeyer & Sagioglou, 2017). These negative emotions lead to behaviors that are detrimental to those in the position of unfair advantage (Greitemeyer & Rudolph, 2003; Iyer et al., 2007; Lemay et al., 2012) and crowd out caring and concern for others (Zhang et al., 2016).

Finally, people experiencing RD might internalize the norms of power and domination, instead of the norms of caring and fairness. Arsenio and Gold (2006) showed that childhood exposure to inequality alters how children develop the cognitive schemas of justice and fairness; it induces the belief that social interactions are governed by power and domination, not by rules of reciprocity. It was also found that the salience of competition typically found in more unequal environments acts to undermine reciprocity, sympathy, and concern for others (Daly, 2016). The criminology literature points to the association of RD with affective hostility, aggression, and criminal outcomes among adults (DeCelles & Norton, 2016; Greitemeyer & Sagioglou, 2017; Mishra & Novakowski, 2016), a link found to be contagious through social networks (Greitemeyer & Sagioglou, 2019).

How RD influences one's generosity might differ by gender. Research in psychology suggests that women care more about social cues than men when determining an appropriate course of action (Gilligan, 1982). In the economic experiments testing altruism (e.g., dictator game, ultimatum game, and public good game), women and men showed no differences in trusting behavior and reciprocity overall (Schwieren & Sutter, 2008), but women were generally more responsive to the contextual setting of experiments. For instance, women tended to give more in return for others' offers (Ben-Ner et al., 2004) and showed greater aversion to unequal distribution of resources (Andreoni & Vesterlund, 2001; Selten & Ockenfels, 1998). Some researchers explained this gender gradient using differences in emotional regulation between men and women (Espinosa & Kovarik, 2015), arguing that women experience emotions more strongly than men and hence exhibit greater inequality aversion (McRae et al., 2008). Given the lack of firm theoretical guidance regarding the role of gender on the link between RD and prosocial behaviors, this aspect of our analysis is exploratory.

3. Hypotheses

Given the theoretical mechanisms and empirical evidence reviewed above, we expect

to observe that relative deprivation, whether induced through experimental manipulation or calculated from secondary socio-economic microdata, is related to a decline in prosocial attitudes and behaviors. However, the salience of the effect of RD is conceptually ambiguous when tested with Korean adults. Korean culture is heavily influenced by the Confucian tradition that stresses personal cultivation, self-improvement, spiritual discipline, and also harmonious relationships among individuals based on acceptance of "natural" hierarchical roles (e.g., ruler and subordinate, husband and wife, father and son, etc.). Social values such as harmony, cooperation, consensus, and social solidarity among members of the society constitute the core of Confucian philosophy, which contrast sharply with the Western emphasis on competition. Given that Confucian ethics emphasize one's duty to a larger entity over individualism, the relative material disadvantage experienced by Koreans who adhere to such values might not manifest as perceived unfairness and thus would not lead to anti-social behaviors so as not to disrupt social harmony. Moreover, similar to all Asian cultures, Koreans assign value to the concept of face ("chaemyoun" in Korean). The importance of stoic appearance that people want to project to others requires Koreans to control their dissatisfaction and anger. Thus, even if individuals perceive themselves to be unfairly materially disadvantaged, they may disguise their frustration by maintaining prosocial attitudes and behaviors.

Conversely, in a collectivistic culture like Korea, a person's status is determined by others through the lens of social order (Kim et al., 2014). Therefore, Koreans are justifiably concerned about how they are viewed by others and their relative position in the social hierarchy. In such a cultural environment, an unfavorable social comparison that leads to a perceived unjust disadvantage should entail greater anxiety, frustration, and anger. This mechanism, of course, would lead to a pronounced effect of RD in terms of undermined behaviors or intentions to engage in prosocial activities.

To test the effect of RD empirically, we used the triangulation approach combining experimental and econometric analyses. Our literature review revealed that most existing research on RD and prosociality was correlational and/or conducted with small convenience samples. To overcome these limitations, we used the randomized experiment (Study 1) and the analysis of nationally representative secondary data (Study 2). In Study 1, we tested for the causal relationship between individual RD and prosocial intentions among Korean adults by setting up an online experiment in which we examined how participants reacted to the message that they earned less than comparable others. We tested the following hypotheses:

- Hypothesis 1: Experimentally incurred perceptions of RD are negatively associated with

prosocial intentions (willingness to donate, willingness to volunteer, willingness to help others, and willingness to accept unwanted public facilities).

Study 2 complements Study 1 by using nationally representative longitudinal data that allowed us to track how Korean adults' behavior changed over time. Taking advantage of within-person variation, we examined whether and to what extent individuals' involvement in prosocial activities evolved when their income rank in the reference group changed. We measured prosocial behaviors with the indicators of donating or volunteering, the amount of donation, and the number of volunteering activities over the last 12 months. RD was assessed with three proxy measures of relative income position within a relevant reference group. The previous studies and the underlying theory lead to the following hypotheses:

- Hypothesis 2: Lower income position within a reference group is negatively associated with prosocial behaviors (participation in donation or volunteering, amount of donation, and number of volunteering activities).

4. Study 1

The objective of Study 1 was to test the prediction that feelings of RD negatively affect prosocial intention. Using the survey protocol validated by Callan et al. (2008, 2011), we manipulated participants' perception of RD and examined its association with willingness to donate, volunteer, help, and accept unwanted public facilities. The perception of RD was induced by randomly assigning participants to one of the two groups; participants in one group were presented with a message that their earnings compared favorably to that of their peers, and those in the other group were presented with the message that they earned slightly less.

4.1. Method

4.1.1. Participants

A total of 1,050 Korean adults aged 25 to 59 participated in a 10- to 15-minute online survey for a monetary incentive of 100 KRW per minute (about 0.1 USD). The participants were recruited through the Embrain panel of Macromill-Embrain, Inc., to reflect the gender, age, and geographic distribution of the Korean population.[1] We used a quota sampling method for the combination of gender, age, and geographic area and collected a balanced sample of Korean adults. Data collection began on January 5, 2021 and ended on January 10, 2021. As

[1] The study protocol was approved by the Institutional Review Board of Sungkyunkwan University on December 7, 2020 (SKKU 2020-12-003).

the elicitation of RD required us to use labor income relative to a fictitious reference point, we excluded participants without labor income (i.e., no job or not in the labor force) from the sample. The final sample comprised 821 participants. Given the positive earnings restriction, the size of analytical sample was not precisely predetermined. We chose to interview 1,050 participants to obtain roughly 90% power to detect a 0.01 increase in multiple regression R^2 with the baseline value of 0.5 and the number of covariates corresponding to the tests presented later in the paper. This number of interviews, assuming 80% sample usability, would imply about 99.2% power to detect bivariate correlations of $r = .15$ (i.e., small-to-medium effect sizes; two-tailed test, alpha=.05).

4.1.2. Procedures

Participants were informed that they would be asked a series of questions on financial capability and inequality as part of a research project concerning the identification of population income and inequality across gender and age groups in Korea. They were first asked to report their demographic characteristics, including living arrangements, labor supply, and region of residence. Then, they were directed to a scale that included a nine-item assessment of financial capability and attitudes (e.g., "I set aside rainy day funds to prepare for unexpected emergencies," "I do have a pretty good understanding of financial instruments for saving or borrowing"). This section of the questionnaire served as a decoy designed to enhance the study's credibility.

In the next section, participants were asked to report how much they earned on average in the previous six months and how they spent their income for six categories of goods (housing and utility, food, clothing and miscellaneous living cost, transportation, insurance, and mortgage). The sum of these expenditures was subtracted from their income to create a monthly "discretionary income," which was entered by participants. We then introduced the participants to the concept of the "comparative discretionary income index" (a person's standing measured in discretionary income relative to that of other people with similar backgrounds) and explained that a positive comparative discretionary income (CDI) indicates higher income than similar others, while a negative CDI indicates lesser income. Then, the participants clicked the "next" button, which they believed would prompt the computer to access the database and calculate the participant's CDI index. Once pressed, the animated progress bar was displayed on the screen for 10 to 20 seconds with the message "The system is identifying participants with similar characteristics and making comparisons in terms of discretionary income. The calculation might last up to 20 seconds depending on the number of participants with similar

characteristics." Regardless of the participant's characteristics, the return value was set to −654k KRW (about −600 USD) for the RD condition (N = 412) and 109k KRW (about 100 USD) for the non-RD condition (N = 409). To ensure that this manipulation created enough discomfort for those earning less, the negative index value was set to be six times greater (in absolute terms) than the positive index value. When the return value popped up, the following message was presented: "This indicates that your comparative discretionary income based on the average after-tax income is 654k KRW less (or 109k KRW more) than those with similar characteristics." After the manipulation message was presented, participants were immediately directed to four questions related to their attitudes to prosocial activities.

4.1.3. Dependent variable

The four questions on prosocial intention resemble similar questions included in the Korean Welfare Panel Study (the data used in Study 2). The original questions concerned participants' past engagement in the prosocial activity. Because an experimental manipulation of RD cannot be related to past outcomes, these questions were rephrased into attitudinal questions regarding willingness to engage in prosocial behavior. The four questions read as follows: "Are you willing to donate your money or assets for the well-being of others or the public?", "Are you willing to participate in volunteer activities for the well-being of others or the public?", "Are you willing to offer help if others in your community are in trouble (e.g., loss of house due to fire, loss of a spouse due to traffic accident)?" and "Are you willing to accept unwanted public facilities like a crematory, schools for special education, or public housing for the disabled if they re-locate into your community?" Answers were provided on a seven-point Likert scale ranging from "very willing" (1) to "not at all willing" (7). We then reverse-coded these responses and conducted a polychoric principal component analysis to construct an index of prosocial intention. The first principal component was used to define a prosocial index, with higher values signifying greater willingness to engage in prosocial behaviors. The Cronbach's alpha for the four questions was 0.81.

4.1.4. Analysis

We estimated linear regressions of the prosocial index on exposure to RD, adjusted for demographic and socioeconomic covariates as well as dummies for possible response bias. The regressions control for age, gender, educational background (college graduate, less than college), marital status (married, separated, divorced, widowed, or not married), number of household members, employment status (work for wages, self-employed), discretionary

income, homeownership, region fixed effects, support for government intervention for the poor (on a 1–7 Likert scale), political ideology (on a 1–5 Likert scale), and indicators of serial response. Support for government intervention for the poor was measured using participants' agreement with the statement "Government needs to cut public spending for the poor" and political ideology was measured using the question "How do you assess your political ideology between progressive and conservative?" These questions measured participants' predispositions regarding welfare policy and political ideology, which might be correlated with prosocial intentions. Additionally, we defined a set of binary indicators for a serial response over the four questions on prosociality (e.g., all item responses set to "not at all willing") to alleviate concerns about the confounding effect of measurement error.

4.2. Results

The descriptive statistics of the study sample are provided in Table 1. The first column presents figures concerning the control group ("not exposed to RD" condition), and the second column presents figures related to the treatment group ("exposed to RD" condition). The last column presents statistics for the full sample of 821 observations.

The mean age of the participants was 42 years, and 42% of the sample identified as female. Approximately 74% of the participants completed college, and 59% were in a marital relationship. The mean discretionary income was 1670.3k KRW, and 91% of the participants had either a full-time or part-time job. The participants were generally neutral in terms of volunteering or reaching out to people in trouble.

[Insert Table 1 about here]

Table 2 presents estimates for the association between exposure to RD condition and prosocial intentions. (Coefficient estimates on the control variables were omitted from the table for brevity.) We estimated four sets of regressions, gradually expanding the model specification with demographic, economic, and ideological factors that could capture incremental variation in prosocial intentions. For each set of estimated models, we used both the aggregate measure (prosocial index) and the individual measures (each question to create an index) as outcome variables.

The estimates from the baseline models show a significant negative effect of RD exposure on the prosocial index ($\beta = -0.204,\ p < 0.01$). Compared to the prosocial index sample mean, this estimate represents about a 4.3% reduction ($= -0.204/4.7$). The corresponding coefficient estimate adjusted for demographic factors ($\beta = -0.194,\ p < 0.05$)

and demographic and economic factors ($\beta = -0.191,\ p < 0.05$) remained statistically significant at the 5% level. The fully adjusted model shows that RD exposure is responsible for a 0.195 point decrease or 4.1% reduction ($= -0.195/4.7$) in the prosocial index, which is significant at the 1% level. The subsequent columns show that this negative effect of RD exposure comes primarily from a shift in willingness to donate ($\beta = -0.220,\ p < 0.05$), willingness to volunteer ($\beta = -0.178,\ p < 0.05$), and willingness to accept unwanted public facilities ($\beta = -0.178,\ p < 0.05$). The interaction effect of gender was not significant at the 5% level ($\beta = 0.021,\ p = 0.89$).[2]

[Insert Table 2 about here]

4.3. Discussion

This study demonstrated the causal effect of RD on prosocial intentions among Korean adults. Across empirical analyses, participants who were exposed to the treatment condition (i.e., message that their discretionary income was lower than the comparable others) exhibited a significantly lower willingness to engage in prosocial activities, compared with those in the control group. Further analysis showed no evidence of gender altering the association between experimentally manipulated RD and prosocial intentions. In the next study, we examined whether this association would be generalizable to actual behaviors at the population level.

5. Study 2

In Study 2, we conducted an econometric analysis of multi-wave panel data in which we evaluated the longitudinal association between RD and prosocial behaviors. This analysis was based on objectively measured RD (instead of subjectively measured RD) and examined actual engagement in prosocial activities (not just willingness to engage in such actions). This approach improved upon Study 1 by examining actual behaviors and providing generalizable evidence on the long-term relationship between RD and prosocial behaviors.

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[2] We conducted a separate survey to ascertain whether our manipulation incurred (a) concerns about personal deservingness and (b) feelings of anxiety. The survey was fielded between December 28, 2021 and January 3, 2022 using the same method as the main data collection, with 821 participants participating. To measure deservingness and anxiety, we used the five-item scale of personal deservingness from Callan et al., 2008 and Zhang et al. (2019) and the 20-item Spielberger State Anxiety Inventory from Forgays et al. (1998), respectively. We found statistically significant differences in the deservingness and anxiety scores between the treatment and control groups, leading to the conclusion that our manipulation successfully invoked such responses.

5.1. Method

5.1.1. Sample description

The sample for Study 2 was obtained from the Korean Welfare Panel Study (KoWePS), conducted jointly by the Korean Institute of Social and Health Affairs and the Social Welfare Research Institute of Seoul National University. The KoWePS is a nationally representative longitudinal study of the Korean population based on a stratified multistage sampling design. It began with 18,856 participants from 7,072 households in 2006 and tracked their socioeconomic characteristics and welfare needs annually since then. Data were collected in person by trained interviewers at participants' households using structured questionnaires. All participants provided informed consent before the survey; therefore, Study 2 is not subject to a separate human subject review. Details of the sampling design and survey protocol are available at https://koweps.re.kr/.

To ensure consistency with Study 1, the sample was restricted to respondents aged 25 to 59 during the study period (2006–2020). It was further limited to respondents who reported positive labor income (those who worked for wages full-time or part-time and the self-employed). After observations with missing values were removed, the final sample comprised 67,725 observations from 11,078 persons.

5.1.2. Measures of relative deprivation

Yitzhaki (1979) operationalized RD as the average shortfall amount of income between a person and the person's higher-income reference group. This empirical definition follows Runciman's (1966) conceptualization that people feel RD via upward social comparison. For person *i* with income *y* who belongs to a reference group with *N* people, the Yitzhaki index is defined as follows:

$$\text{Yitzhaki}_i = \frac{1}{N}\sum_j (y_j - y_i) I_{ij} \quad I_{ij} = \begin{cases} 1, & \text{if } y_j > y_i \\ 0, & \text{if } y_j \le y_i \end{cases}$$

Dividing by *N* makes the index invariant to the size of the reference group. It is higher for a person in the lower tail of the income distribution and lower for a person in the upper rank. Income *y* is the equivalized household income, which is household income divided by the number of persons in the household.

Following the literature (Adjaye-Gbewonyo & Kawachi, 2012), we assumed that people form a reference group composed of those with similar characteristics. Specifically, we defined the reference group to match the respondents' ages (20–39, 40–49, 50–59), gender

(female, male), educational background (less than high school, high school graduate, college graduate), and region of residence (Seoul, Incheon, Gyeonggi; Busan, Daegu, Ulsan, Gyeongsang; Daejeon, Chungnam; Gangwon, Chungbuk; Gwangju, Jeolla, Jeju). Groups with fewer than 30 people were merged with the adjacent groups, producing 88 reference groups in total. The regression results were robust to using alternative categorizations of reference groups (see Tables A1-A4).

As a robustness check, we also constructed a Deaton index (Deaton, 2001), which is the Yitzhaki index normalized by the mean income of the reference group. The Deaton index adjusts for the fact that, when making social comparisons, individuals may consider the proportion of the aggregate income earned by those positioned higher in the income distribution instead of the absolute amount. This reformulation leads to a unit-free score of 0 to 1, with a higher score representing greater RD in income. Finally, we defined a rank measure indicating an individual's relative position in income within the reference group. The rank measure reflects the fact that individuals may not know the exact amount of others' income but may have a reasonably accurate understanding of how they rank relative to others. The rank measure is defined as an individual's percentile position in the income distribution of the reference group. It was reverse-coded so that 0 represents the highest rank and 1 represents the lowest.

5.1.3. Measures of prosocial behavior

Participants were first asked if they had made donations or participated regularly in volunteering activities in the preceding year. Those who answered in the affirmative were further probed about the total amount of donations and the number of times they had volunteered in the previous year. Using responses to these questions, we defined a binary indicator of prosocial behavior (any experience of donation or volunteering), as well as variables for the donation amount and the number of volunteering activities conditional on a positive response to the first question. The amount of donation was transformed by $log(x + 1)$ to reduce its skewness.

5.1.4. Empirical specification

We exploited within-individual variation over the surveys to identify the longitudinal association between RD and prosocial behaviors. Specifically, we used individual fixed effects linear regression to model the binary indicator of any prosocial behavior and the log of donation amount, and employed individual fixed effects negative binomial regression to model the count of volunteer activities. As the data were de-meaned at the person level, all time-invariant factors

were reduced to zero and excluded from regressions. Following our empirical approach in Study 1, regression models were gradually expanded with income and region/year fixed effects, demographic factors, and socioeconomic factors. Our preferred specification is the model that controls for all covariates, including region and year fixed effects, which we use to evaluate hypothesis 2. Since we used three outcome variables and three measures of RD, a total of nine regressions were estimated with different sets of covariates. After evaluating the main regression results, we re-estimated the regressions with the interaction term between RD and gender. These additional analyses aimed to show whether the association between RD and prosocial behaviors differed by gender. We used two-sided tests for all procedures, and coefficients with p-values < 0.05 were considered statistically significant.

5.1.5. Covariates

Regressions were adjusted for age, age squared, gender, educational background (college graduate, less than college), marital status (married, separated, divorced, widowed, or not married), number of household members, health satisfaction (1–5), employment status (work for wages, self-employed), equivalized household income, total net worth, region fixed effects, and year-of-survey fixed effects. Health satisfaction was measured on a five-point Likert scale to capture possible variations in prosocial behaviors due to health-related limitations. Total net worth was measured as the sum of all liquid and non-liquid household assets (including primary residence, real estate, and business equity) less debt. All monetary values were converted to 2020 KRW using the Korean consumer price index for all items.

5.2. Results

We report the average descriptive statistics of the sample in Table 3. The mean age of the sampled respondents was 42.55, and 41% were female. The sample participants were predominantly married (70%), employed (84%), and college-educated (58%). Those who reported any donations or volunteering activities in the preceding year comprised 18% of the sample. Among them, the mean amount of donation was 496.4k KRW, and the mean number of volunteering activities was 4.5.

[Insert Table 3 about here]

Table 4 presents the regression results. Similarly to the analyses in Study 2, the regressions were gradually augmented with more control variables across specifications. We began with the most parsimonious model, which controlled for household income and year fixed effects, and further expanded the model with demographic and economic covariates. For

each specification, we presented three sets of regression models by alternating between the Yitzhaki index, Deaton index, and income rank. The regressions for the log of donation and the number of volunteer activities were conditioned on both outcomes being positive; therefore, these estimations are based on the subsets of the study sample.

Two results stand out from the analyses. First, the measures of RD were negatively associated with participation in any donation or volunteering and the logged amount of donation. Across all specifications, from the baseline to the most comprehensive model, RD was negatively related to participation or donation amount at the one percent significance level. These associations were robust to controlling for demographic and economic confounders, as well as alternative measures of RD. Second, there was no consistent evidence that RD was related to the number of volunteer activities. Some of the estimated coefficients were marginally significant at the 10% level, but the sign of the estimates was mixed and not in support of our hypothesis. It is possible that our estimations that utilize the number of volunteering episodes as the dependent variable capture the economic disincentive to volunteering that rises with the opportunity cost of earnings. Since RD in Study 2 is operationalized using the actual income of working-age adults, and those earning higher income would have to give up more in earnings to increase the number of times they volunteer, the opportunity cost mechanism seems to overwhelm the effect of relative deprivation in these estimations.

[Insert Table 4 about here]

Lastly, in Table 5 we sought to test the heterogeneity of the effect of RD variables by gender. Following Study 1, we added to the fully adjusted regressions the interaction terms between the measures of RD and the indicator of the respondent being a female. The estimated interaction effects were generally small in magnitude and did not carry the expected sign. Hence, we conclude that gender does not appear to play an important role in shaping the relationship between RD and prosocialness.

[Insert Table 5 about here]

5.3. Discussion

The longitudinal analyses of the KoWePS sample showed that increased RD was related to reduced participation in prosocial activities and diminished donations to charities among Korean adults aged 25 to 59 from 2006 to 2020. Similar to Study 1, we observed no gender gradient in the association between RD and prosocial behaviors. All regression models were conditioned on absolute income, suggesting that reduced relative standing in the income

distribution is a primary mechanism underlying a shift away from prosocial behaviors.

6. Conclusion

A growing body of literature suggests that people behave less generously when they feel relatively deprived. This study contributes to this line of research by presenting causal evidence that RD leads to reduced prosocial intentions and by confirming the longitudinal association between RD and prosocial behaviors in the Korean context. Drawing on the RD and social comparison theory, we hypothesized that feelings of anger and resentment resulting from RD may lead people to care less about others' welfare, which, in turn, reduces their prosocial intentions and behaviors. We observed converging evidence procured via the experimental and descriptive approaches in support of this proposition.

In Study 1, we randomly manipulated the impressions of participants' discretionary income to be lower or higher than the incomes of their implied reference peers. The results showed that those induced to believe that they earned less than their peers exhibited reduced willingness to donate, volunteer, and accept unwanted public facilities. Study 2 examined the longitudinal association between RD in income and prosocial behaviors among Korean adults aged 25 to 59 from 2006 to 2020. The results showed that RD in income was negatively related to the likelihood to donate money or volunteer, as well as the amount of donation. RD was not, however, associated with a greater number of volunteering episodes. The results were adjusted for the individual- and household-level characteristics representing participants' objective living conditions, leaving RD as the most likely explanation for declining prosocial intentions and behaviors.

Our findings support the theoretical proposition that RD is an important predictor of prosocial behaviors. The causal pathway underlying our results is the feelings of anger and resentment arising from the realization that one is in a disadvantaged social position compared to similar others (Callan et al., 2008; Kim et al., 2018). Prosocial behaviors are often motivated by concern for others (Batson, Shaw, 1991; Batson, Batson, 1991), a mechanism that loses relevance when people realize their relative disadvantage and start pursuing self-interest. Our results can be understood as part of a broader psychosocial process in which upward social comparison activates aversive inner states and leads people to prioritize self-interest over others' welfare.

The analysis of heterogeneity of the RD effect by gender indicated no gender difference in the hypothesized associations. This result might be interpreted as women being no more or less socially-oriented than men in response to experiences of an economic

disadvantage. Such an observation is consistent with Croson and Gneezy (2009), who showed that women tend to be more responsive to social stimuli but do not necessarily give more (or less) in charitable donations when they face relative disadvantage or unfair treatment by others. Similarly, Zhang et al. (2016) could not find a significant moderating effect of gender on the association between RD and prosocial aspirations.

More broadly, the fact that RD reduces one's willingness to help suggests that RD might be an individual-level mechanism that gives rise to the amply-documented detrimental effects of inequality. The theoretical model by Yitzhaki (1979) indicated that the aggregate RD of a society depends on the mean income of this society and its Gini coefficient—a measure of income inequality. Given that the mean income of the society is held fixed, this model predicts that an increase in income inequality could lead to a widening economic distance between individuals, and hence greater RD among those disadvantaged. Previous research demonstrated robust associations between income inequality in society and varying degrees of political turmoil and unrest (Acemoglu & Robinson, 2005; Houle, 2009). Moreover, citizens in countries with higher inequality were more likely to display antisocial behaviors (DeCelles & Norton, 2016), racial bias (Connor et al., 2019), and reduced trust in others (Oishi et al., 2011). The related theory and empirical evidence point to RD as the likely mediating factor that links income inequality to individual antisocial conduct. Future research might test this claim empirically using a framework that encompasses both macro and micro-level analyses.

We acknowledge several limitations in this study. First, our prosocial outcomes were limited to donating, volunteering, and helping. Prosocial behavior is a multifaceted construct that consists of a variety of helping behaviors and emotional empathy. For instance, the prosocial orientation scale developed by Caprara et al. (2005) was based on 16 survey items related to willingness to give help, sharing emotions, perspective-taking, and sensibility to others' feelings. Future research needs to employ more valid measures of prosocial behavior and re-examine our findings.

Second, self-reporting of prosocial behavior could be confounded by social desirability bias. Surveys that are framed in socially favorable contexts are known to induce an overreporting of "good behaviors," especially if the responses are observed by other survey participants (Lee & Woodliffe, 2010). The fact that people often differ in their tendency to engage in socially desirable responses is of particular concern in empirical research due to its negative effect on scale validity. If prosocial outcomes were measured with errors, the overall error of the estimated regressions could be inflated, and the test statistics associated with the coefficient estimates could be underestimated.

Third, most of the participants have not engaged in any donation or volunteering. Future research may consider analytic methods that separately model the decision to participate in donation or volunteering and the amount of donation or the number of volunteering activities conditional on participation. Lastly, due to data limitations, our estimation did not control for the occupation of study participants, which might be an important component of social comparisons.

[Insert Table A1 about here]

[Insert Table A2 about here]

[Insert Table A3 about here]

[Insert Table A4 about here]

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Tables

Table 1. Average descriptive statistics, primary survey data

	Control (*N*=409)	Treatment (*N*=412)	Full sample (*N*=821)
Prosocial index	4.78	4.62	4.70
AQ1: Willingness to donate (1-7)	4.12	3.92	4.02
AQ2: Willingness to volunteer (1-7)	4.37	4.21	4.29
AQ3: Willingness to help people in trouble (1-7)	4.72	4.62	4.67
AQ4: Willingness to accept public facilities (1-7)	4.52	4.37	4.44
Age (25-59)	42.82	41.90	42.36
Female (0,1)	0.42	0.43	0.42
College graduate (0,1)	0.73	0.75	0.74
Married (0,1)	0.57	0.60	0.59
No. of household members	2.96	3.00	2.98
Employed (0,1)	0.92	0.90	0.91
Discretionary income (10k KRW)	165.59	168.46	167.03
Homeowner (0,1)	0.58	0.58	0.58
Long-term rented house (0,1)	0.42	0.42	0.42
Seoul or Gyeonggi province (0,1)	0.52	0.52	0.52
IQ1: support for intervention for the poor (1-7)	4.38	4.45	4.42
IQ2: Political ideology (1-5)	2.85	2.88	2.86

Notes: AQ, attitudinal question; IQ, ideological question. Discretionary income is the mean of monthly income in the preceding 6 months.

Table 2. Association between treatment exposure and prosocial attitudes

Outcome:	Prosocial index (1)	AQ1 (2)	AQ2 (3)	AQ3 (4)	AQ4 (5)	Prosocial index (6)
Baseline model[a]:						
Treated	-0.204***	-0.234**	-0.194**	-0.147*	-0.185**	
	(0.076)	(0.096)	(0.089)	(0.086)	(0.090)	
Demographic factors adjusted model[b]:						
Treated	-0.194**	-0.222**	-0.186**	-0.142	-0.165*	
	(0.075)	(0.093)	(0.087)	(0.087)	(0.090)	
Demographic and economic factors adjusted model[c]:						
Treated	-0.191**	-0.219**	-0.182**	-0.143*	-0.165*	
	(0.075)	(0.094)	(0.088)	(0.087)	(0.090)	
Demographic, economic, and ideological factors adjusted model[d]:						
Treated	-0.195***	-0.220**	-0.178**	-0.151*	-0.178**	-0.204**
	(0.074)	(0.093)	(0.087)	(0.085)	(0.087)	(0.097)
Treated × Female						0.021
						(0.150)

Notes: AQ, attitudinal question (AQ1: willingness to donate; AQ2: willingness to volunteer; AQ3: willingness to help people in trouble; AQ4: willingness to accept unwanted public facilities). Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for discretionary income and bias indicators.

[b] Adjusted for age, gender, education background, marital status, number of household members, discretionary income, and bias indicators.

[c] Adjusted for age, gender, education background, marital status, number of household members, employment status, home ownership, region fixed effects, discretionary income, and bias indicators.

[d] Adjusted for age, gender, education background, marital status, number of household members, employment status, home ownership, region fixed effects, support for government intervention for the poor, political ideology, discretionary income, and bias indicators.

Table 3. Average descriptive statistics, 2006-2020 KoWePS

	Rank ≥ median (*N*=33,925)	Rank < median (*N*=33,804)	Full sample (*N*=67,729)
Participated in donation or volunteering (0,1)	0.22	0.13	0.18
Amount of donation (10k KRW)	57.18	33.19	49.64
Number of volunteering activities	4.10	5.37	4.50
Yitzhaki index (10k KRW)			643.70
Deaton index			0.27
Income rank			0.45
Age (25-59)	42.71	42.34	42.55
Female (0,1)	0.41	0.41	0.41
College graduate (0,1)	0.56	0.61	0.58
Married (0,1)	0.70	0.70	0.70
No. of household members	3.15	3.74	3.40
Health satisfaction (1-5)	3.72	3.64	3.69
Employed (0,1)	0.85	0.84	0.84
Equivalized household income (10k KRW)	330.3	152.8	253.7
Net worth (10k KRW)	21035.6	8238.7	15515.6
Seoul or Gyeonggi province (0,1)	0.52	0.53	0.52

Notes: Amount of donation is the total amount donated in the preceding calendar year. Number of volunteering activities is the number of times a respondent participated in volunteering activities in the preceding calendar year. All monetary values are adjusted to 2020 KRW using the Korean consumer price index for all items.

Table 4. Association between relative deprivation indices and prosocial behavior

Outcome:	Any prosocial (1)	Log of donation (2)	No. of volunteer (3)	Any prosocial (4)	Log of donation (5)	No. of volunteer (6)	Any prosocial (7)	Log of donation (8)	No. of volunteer (9)
Baseline model[a]:									
Yitzhaki index	-0.041***	-0.269***	-0.061						
	(0.005)	(0.060)	(0.058)						
Deaton index				-0.008***	-0.065***	0.005			
				(0.001)	(0.015)	(0.015)			
Income rank							-0.006***	-0.041***	0.006
							(0.001)	(0.010)	(0.010)
Demographic factors adjusted model[b]:									
Yitzhaki index	-0.040***	-0.241***	0.098						
	(0.005)	(0.063)	(0.059)						
Deaton index				-0.008***	-0.058***	0.027*			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.007***	-0.036***	0.019*
							(0.001)	(0.010)	(0.010)
Demographic and economic factors adjusted model[c]:									
Yitzhaki index	-0.040***	-0.241***	0.089						
	(0.005)	(0.063)	(0.060)						
Deaton index				-0.008***	-0.058***	0.025*			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.007***	-0.036***	0.018*
							(0.001)	(0.010)	(0.010)
N	67,729	10,240	6388	67,729	10,240	6388	67,729	10,240	6388

Notes: AQ, attitudinal question. Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for equivalized household income, region fixed effects, and year fixed effects.

[b] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, equivalized household income, region fixed effects, and year fixed effects.

[c] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.

Table 5. Testing for the heterogeneity of relative deprivation effect by gender

Outcome:	Any prosocial (1)	Log of donation (2)	Any prosocial (3)	Log of donation (4)	Any prosocial (5)	Log of donation (6)
Yitzhaki index	-0.041***	-0.202***				
	(0.006)	(0.078)				
Yitzhaki index × Female	0.004	-0.097				
	(0.009)	(0.112)				
Deaton index			-0.009***	-0.035*		
			(0.002)	(0.020)		
Deaton index × Female			0.002	-0.053*		
			(0.002)	(0.028)		
Income rank					-0.007***	-0.022*
					(0.001)	(0.013)
Income rank × Female					0.001	-0.031*
					(0.001)	(0.018)
N	67,729	10,240	67,729	10,240	67,729	10,240

Notes: Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively. All regressions adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.

Appendix

Table A1. Association between relative deprivation indices and prosocial behavior, reference group by gender

Outcome:	Any prosocial (1)	Log of donation (2)	No. of volunteer (3)	Any prosocial (4)	Log of donation (5)	No. of volunteer (6)	Any prosocial (7)	Log of donation (8)	No. of volunteer (9)
Baseline model[a]:									
Yitzhaki index	-0.024***	-0.280***	0.211***						
	(0.006)	(0.073)	(0.064)						
Deaton index				-0.005***	-0.063***	0.047***			
				(0.001)	(0.016)	(0.014)			
Income rank							-0.005***	-0.047***	0.035***
							(0.001)	(0.011)	(0.010)
Demographic factors adjusted model[b]:									
Yitzhaki index	-0.033***	-0.263***	0.143**						
	(0.006)	(0.076)	(0.067)						
Deaton index				-0.007***	-0.059***	0.032**			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.006***	-0.045***	0.026**
							(0.001)	(0.011)	(0.010)
Demographic and economic factors adjusted model[c]:									
Yitzhaki index	-0.033***	-0.264***	0.134**						
	(0.006)	(0.076)	(0.068)						
Deaton index				-0.007***	-0.059***	0.030**			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.006***	-0.045***	0.025**
							(0.001)	(0.011)	(0.010)
N	67,729	10,240	6388	67,729	10,240	6388	67,729	10,240	6388

Notes: AQ, attitudinal question. Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for equivalized household income, region fixed effects, and year fixed effects.

[b] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, equivalized household income, region fixed effects, and year fixed effects.

[c] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.

Table A2. Association between relative deprivation indices and prosocial behavior, reference group by gender × education

Outcome:	Any prosocial (1)	Log of donation (2)	No. of volunteer (3)	Any prosocial (4)	Log of donation (5)	No. of volunteer (6)	Any prosocial (7)	Log of donation (8)	No. of volunteer (9)
Baseline model[a]:									
Yitzhaki index	-0.031***	-0.254***	-0.139**						
	(0.005)	(0.065)	(0.066)						
Deaton index				-0.006***	-0.062***	0.001			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.005***	-0.043***	0.002
							(0.001)	(0.010)	(0.010)
Demographic factors adjusted model[b]:									
Yitzhaki index	-0.039***	-0.233***	0.112*						
	(0.006)	(0.070)	(0.064)						
Deaton index				-0.008***	-0.057***	0.029*			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.006***	-0.040***	0.023**
							(0.001)	(0.011)	(0.010)
Demographic and economic factors adjusted model[c]:									
Yitzhaki index	-0.040***	-0.232***	0.104						
	(0.006)	(0.070)	(0.064)						
Deaton index				-0.008***	-0.057***	0.027*			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.006***	-0.040***	0.022**
							(0.001)	(0.011)	(0.010)
N	67,729	10,240	6388	67,729	10,240	6388	67,729	10,240	6388

Notes: AQ, attitudinal question. Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for equivalized household income, region fixed effects, and year fixed effects.

[b] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, equivalized household income, region fixed effects, and year fixed effects.

[c] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.

Table A3. Association between relative deprivation indices and prosocial behavior, reference group by gender × age

Outcome:	Any prosocial (1)	Log of donation (2)	No. of volunteer (3)	Any prosocial (4)	Log of donation (5)	No. of volunteer (6)	Any prosocial (7)	Log of donation (8)	No. of volunteer (9)
Baseline model[a]:									
Yitzhaki index	-0.032***	-0.316***	0.203***						
	(0.005)	(0.070)	(0.063)						
Deaton index				-0.007***	-0.068***	0.049***			
				(0.001)	(0.016)	(0.014)			
Income rank							-0.006***	-0.048***	0.035***
							(0.001)	(0.010)	(0.010)
Demographic factors adjusted model[b]:									
Yitzhaki index	-0.031***	-0.289***	0.119*						
	(0.005)	(0.073)	(0.066)						
Deaton index				-0.008***	-0.062***	0.030**			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.007***	-0.044***	0.024**
							(0.001)	(0.011)	(0.010)
Demographic and economic factors adjusted model[c]:									
Yitzhaki index	-0.031***	-0.291***	0.109						
	(0.006)	(0.073)	(0.067)						
Deaton index				-0.008***	-0.062***	0.028*			
				(0.001)	(0.017)	(0.015)			
Income rank							-0.006***	-0.044***	0.022**
							(0.001)	(0.011)	(0.010)
N	67,729	10,240	6388	67,729	10,240	6388	67,729	10,240	6388

Notes: AQ, attitudinal question. Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for equivalized household income, region fixed effects, and year fixed effects.

[b] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, equivalized household income, region fixed effects, and year fixed effects.

[c] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.

Table A4. Association between relative deprivation indices and prosocial behavior, reference group by gender × education × age

Outcome:	Any prosocial (1)	Log of donation (2)	No. of volunteer (3)	Any prosocial (4)	Log of donation (5)	No. of volunteer (6)	Any prosocial (7)	Log of donation (8)	No. of volunteer (9)
Baseline model[a]:									
Yitzhaki index	-0.040***	-0.273***	-0.028						
	(0.005)	(0.062)	(0.059)						
Deaton index				-0.007***	-0.065***	0.016			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.006***	-0.040***	0.013
							(0.001)	(0.010)	(0.010)
Demographic factors adjusted model[b]:									
Yitzhaki index	-0.039***	-0.245***	0.123**						
	(0.005)	(0.065)	(0.060)						
Deaton index				-0.008***	-0.058***	0.032**			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.006***	-0.036***	0.023**
							(0.001)	(0.011)	(0.010)
Demographic and economic factors adjusted model[c]:									
Yitzhaki index	-0.039***	-0.245***	0.115*						
	(0.005)	(0.065)	(0.060)						
Deaton index				-0.008***	-0.058***	0.030**			
				(0.001)	(0.016)	(0.015)			
Income rank							-0.006***	-0.035***	0.021**
							(0.001)	(0.011)	(0.010)
N	67,729	10,240	6388	67,729	10,240	6388	67,729	10,240	6388

Notes: AQ, attitudinal question. Standard errors in parentheses. Significance levels are indicated by *, **, and *** for 10, 5, and 1% significance level, respectively.

[a] Adjusted for equivalized household income, region fixed effects, and year fixed effects.

[b] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, equivalized household income, region fixed effects, and year fixed effects.

[c] Adjusted for age, gender, education background, marital status, number of household members, health satisfaction, employment status, net worth, equivalized household income, region fixed effects, and year fixed effects.