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German Institute for Japanese Studies (DIJ)

Disasters, donations, and tax law changes: Disentangling effects on subjective well-being by exploiting a natural experiment

Tim Tiefenbach and Florian Kohlbacher
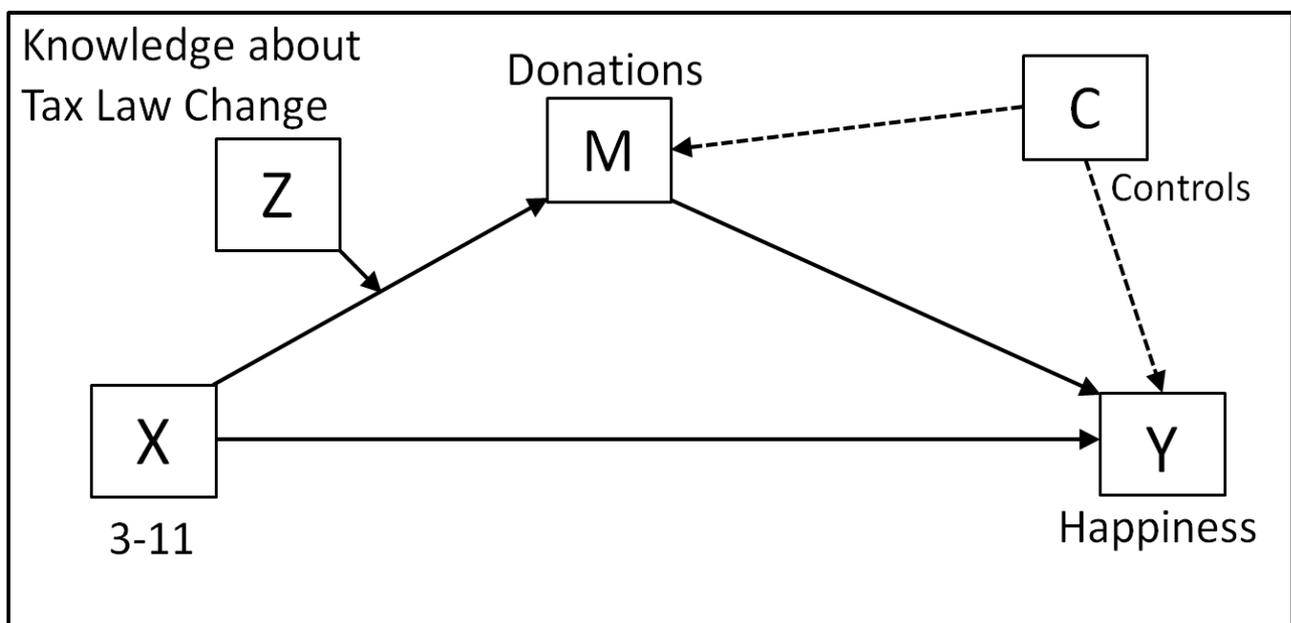
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Abstract

This paper sets out to investigate (i) whether an increase in donations in the aftermath of disasters can mitigate the negative effects on subjective well-being (SWB), and if so, (ii) whether policy measures such as tax law changes can amplify this mitigating effect by providing further incentives for donations. To analyse these questions we use data on a recent, impactful disaster: the triple disaster that occurred on March 11, 2011 in Japan (3-11). Coincidentally, only three month after the disaster, a long planned change in tax law was put into effect which allows higher tax deductions for charitable donations. Applying a moderated mediation analysis to a unique dataset, we are able to disentangle the total rise of donations into positive effects that are caused by the disaster itself, and positive effects that are caused by the recent change in the Japanese tax law. The results of our study are twofold: First, we show that about 40% of the direct negative effect of 3-11 on SWB is mediated and mitigated by donations. Second, we show that the change in taxation law could have further mitigated the negative SWB effects of 3-11, if more people had been aware of it. However, since a large majority of the Japanese public had not even been aware of the tax law change, potential mitigating effects by increased donations have not been realized. As for policy implications, our results show that governments can create incentives for donations that not only support disaster reconstruction, but also mitigate the negative SWB effects of disasters.

Disasters, donations, and tax law changes: Disentangling effects on subjective well-being by exploiting a natural experiment

Contact Author: Dr. Tim Tiefenbach (DIJ)

tiefenbach@dijtokyo.org

1. Introduction

This paper sets out to investigate (i) whether an increase in donations in the aftermath of disasters can mitigate the negative effects on subjective well-being (SWB), and if so, (ii) whether policy measures such as tax law changes can amplify this mitigating effect by providing further incentives for donations.

The two research questions are derived by bringing together different strands of literature revolving around the intertwined relationship between disasters, donations, SWB and tax subsidies regarding donations.

Although several studies have provided evidence for negative SWB effects of disasters *(Kimball, Levy, Ohtake, & Tsutsui, 2006; Metcalfe, Powdthavee, & Dolan, 2011)* as well as for positive SWB effects of donations (Aknin, Dunn, Whillans, Grant, & Norton, 2013), those findings have not yet been analysed together. Empirical evidence of an increase in charitable donations after disasters (Brown, Harris, & Taylor, 2012) provides a strong rationale for looking at both effects in connection. I.e. that there are both positive and negative effects of disasters: A negative direct effect on SWB, a positive direct effect on donations, and a positive indirect effect on SWB via donations. In other words, this means that disasters not only entail negative, but also positive effects on SWB through an increase in prosocial activities such as donations. However, by omitting donations in SWB equations, existing studies have systematically underestimated the direct negative SWB effect of disasters.

In order to correct for this bias and fill the gap in the literature, we analyse the SWB effects of a recent, impactful disaster: the triple disaster that occurred on March 11, 2011 in Japan (3-11). The initial disaster, known as the *Great East Japan Earthquake*, triggered a large-scale tsunami causing more than 15,000 casualties, which in turn triggered the meltdown of the Fukushima Daiichi Nuclear Power Plant (Okada, Ye, Kajitani, Shi, & Tatano, 2011).

As a second contribution to the literature, we account for a recent change in Japanese tax law, allowing higher tax deductions for charitable donations. While several studies have provided mixed findings regarding the effect of tax law changes on charitable donations (see Adena, 2014 for a review of the literature), the effect of tax law changes in the aftermath of disasters has not yet been explored.

Applying a moderated mediation analysis using a unique dataset, we are able to disentangle the total rise of donations into positive effects that are caused by the

disaster itself, and positive effects that are caused by the recent change in the Japanese tax law.

The results of our study are twofold: First, we show that about 40% of the direct negative effect of 3-11 on SWB is mediated and mitigated by donations. Second, we show that the change in taxation law could have further mitigated the negative SWB effects of 3-11, if more people had been aware of it. However, since a large majority of the Japanese public had not even been aware of the tax law change, potential mitigating effects by increased donations have not been realized.

From a methodological point of view, we show how methods such as moderated mediation analysis can help to measure the impact of policy measures.

As for policy implications, our results show that governments can create incentives for donations that not only support disaster reconstruction, but also mitigate the negative SWB effects of disasters. However, if they do so, policy makers are advised to follow the motto "*do good and talk about it*". Without effectively communicating new incentive schemes to the public, they might not be worth the effort in the first place.

2. Literature and Hypotheses

Within the burgeoning field of happiness economics (Dolan, Peasgood, & White, 2008), there is a small but growing strand of research on the SWB effects of disasters. Most studies report negative effects on the population in the respective country or area (Carroll, Frijters, & Shields, 2009; Kimball et al., 2006; Kountouris & Remoundou, 2011; Luechinger & Raschky, 2009). Recent studies have also found that distantly remote disasters can have negative effects on populations in other countries (Metcalfe et al., 2011), even when a similar disaster seems geographically impossible in that country (Goebel, Krekel, Tiefenbach, & Ziebarth, 2013). One recent disaster of exceptional magnitude and scope as well as with global repercussions is 3-11 in Japan.

Although there are a number of studies available on the effects of 3-11 in Japan, they report inconclusive results: Using an online sample of younger people, Uchida *et al.* (2014) find no statistically significant effect on people's happiness on average. However, differentiating between persons who did and those who did not think

about the earthquake when responding to the happiness question, they find that the former show significantly higher levels of happiness after 3-11. Ishino et al. (2012) analyse retrospectively perceived changes in happiness levels after 3-11. Nation-wide they find that 60% of the respondents do not report a change, while 35% report an increase and only 5% report a decrease in their happiness level. Nevertheless, their regression analysis still shows a significant tendency that those living in the disaster area as well as in the Kanto area around Tokyo are more likely to report a decrease in individual happiness. Ohtake and Yamada (2013) collected data on SWB two to seven weeks after 3-11 and found a robust and large geographical heterogeneity between the disaster area and non-disaster areas in unhappiness. They concluded that "contrary to expectations", their findings suggest that, "overall, Japanese society was not mired in unhappiness" (Ohtake & Yamada, 2013, p. 4). Nevertheless, they do find that news coverage of the earthquake was negatively related to happiness in Sendai, a city within the disaster area. In a similar vein, Tiefenbach and Kohlbacher (2014) analyse the immediate SWB effects of 3-11. However, they find no nation-wide drop in happiness in the direct aftermath of the disaster. Comparing panel data from Jan 2011 and Jan 2012 Rehdanz *et al.* (2013) also find no nation-wide drop in happiness, but their spatial analysis shows that the proximity to Fukushima is negatively correlated with happiness after 3-11, whereas no such correlation can be observed before the event.

Given that the emerging literature on 3-11 in Japan reports inconclusive findings – which may be partly due to different methodologies and/or samples used – we assume that the disaster may indeed have negative and positive effects on SWB at the same time. Overall however, we expect its *direct* effect to be negative. We base our hypothesis on (i) the body of international studies that provide unequivocal evidence that disasters are associated with drops in SWB, as well as studies (ii) that find negative SWB effects of 3-11 in countries far remote from Japan (Goebel et al., 2013; Welsch & Biermann, 2014).

H1:   3-11 has a direct negative effect on SWB.

Another important effect of disasters is that they tend to lead to increased prosocial behaviour in terms of charitable donations (Brown et al., 2012). This is due to two reasons. First, from an economics point of view, disasters can be considered as exogenous shocks on the demand-side of prosocial behaviour: they generate the need for donations in the first place. Second, disasters receive a lot of media

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coverage which directly affects the supply-side of prosocial behaviour by raising the awareness and thus enticing people to donate (Brown & Minty, 2008; Lobb, Mock, & Hutchinson, 2012; Martin, 2013). Brown *et al.* (2012) analyse the donation behaviour following the 2004 Indian Ocean tsunami disaster using 2005 data from the U.S. *Panel Study of Income Dynamics*. While they find a general increase in donations after the disaster, there was no evidence for a crowding-out effect due to these unplanned contributions. In other words, "donating to the victims of the tsunami does not divert future household expenditure away from donating to other charitable causes" (Brown et al., 2012, p. 108).

Extrapolating the above findings to 3-11 we expect the *general level* of donations in Japan to increase after March 11.

H2: 3-11 has a positive effect on the general level of donations.

Apart from disasters, studies on an international scale report a positive correlation between SWB and donations (Aknin, Barrington-Leigh et al., 2013; Aknin, Dunn, & Norton, 2012; Aknin, Dunn et al., 2013; Dunn, Aknin, & Norton, 2008). Based on survey data from 136 nations as well as experimental studies, Aknin *et al.* (2013) report that prosocial spending has a positive impact on happiness, and they even go so far to suggest that this relationship can be considered as a "psychological universal" of human beings (Aknin, Barrington-Leigh et al., 2013, p. 646).

Based on the findings in the international literature, we expect to observe similar positive effects of donations on happiness in the case of Japan:

H3: Making donations has a positive effect on SWB.

Considering the results of the literature on disasters and their positive effect on prosocial behaviour as well as the literature relating prosocial behaviour with higher levels of SWB, we assume that the happiness effects of 3-11 are mediated and mitigated by the effects of prosocial behaviour in the form of donations. Overall however, we still expect the negative effect of the disaster to be stronger, since only a certain percentage of the population has the resources and willingness to donate.

H4: 3-11 has an indirect positive effect mediated by donations on SWB.

H5: The total (= direct negative plus indirect positive) effect of 3-11 on SWB is negative.

A change in taxation law regarding the deduction of charitable donations was put into effect in June 2011 (three month after the disaster), which made the entangled relationship between 3-11, donations and SWB even more complicated. Until the tax law change charitable donations exceeding 2,000 JYP (about 17 USD) were deductible up to 40% from the *total amount of taxable income*. The tax law change adds to this "income deduction" an alternative option allowing individuals to instead deduct charitable donations exceeding 2,000 JYP directly from the *total amount of income tax* (up to 25%). Depending on the individual income class, this change increases the tax benefits from donations by two to eight times compared to the traditional "income deduction".[1] Although previous studies report mixed findings regarding the effects of tax deduction on charitable donations (Auten, Sieg, & Clotfelter, 2002; Barrett, 1991; Clotfelter, 1985; Khanna, Posnett, & Sandler, 1995; Randolph, 1995; Steinberg, 1990), to the best of our knowledge, there is no research on donation-related tax deduction schemes in the aftermath of disasters. But inferences may be made from related research such as Yörük (2014) who shows that tax subsidies for charitable donations have positive spill-over effect on health. In a similar vein, and because of the timely enactment after the disaster, we expect that the change in tax law provided substantial incentives to donate, at least for those individuals who knew about the change. Therefore we assume that the relationship between the occurrence of 3-11 and charitable donations is moderated by the tax law change; i.e. in the aftermath of the disaster respondents who knew about the tax law change were more likely to donate.

H6:   The Change in taxation law moderates the positive impact of the disaster on donations.

We assume that 3-11 did indeed have a direct negative effect on SWB in Japan. Previous research has ignored both (i) the potential mediating effects of prosocial behaviour on the relationship between disaster occurrence and SWB as well as (ii) the moderating effect of the tax law change on the relationship between disaster occurrence and donations. This is what may have –at least partly– caused the inconsistent findings regarding 3-11 in the literature. Including the above mentioned mediating and moderating effects into the analysis will help to reveal the direct

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[1]   Eight times for low income earners with 300,000 JPY (about 25,000 USD) a year. Two times for high income earners with 700,000 JPY (about 60,000 USD) a year. See https://www.npo-homepage.go.jp/kifu/kifu_zei_yugu.html (accessed on 5th Feb 2015) for more information.

impact of 3-11 on SWB in Japan and at the same time show the usefulness of incentivizing donations in the aftermath of disasters.

3. Data

3.1 The National Survey on Lifestyle Preferences

The present study uses data from the National Survey on Lifestyle preferences (*kokumin seikatsu senkodo chosa*) of the years 2010 to 2012 in Japan. The Japanese Cabinet Office commissions independent research agencies on a rotating basis to conduct the survey. Following a pilot study in 1971 the first official survey was conducted in 1972. After a period of 12 years in which the survey was conducted on a three years basis it has been changed to an annual survey in 1984. Although questions on happiness and life satisfaction have already been included on a three year basis since the 1970's, the survey's focus has been officially placed on individual happiness and its determinants since 2010. Since the survey was discontinued after 2012, our analysis is limited to the final three waves.

The population of the cross-sectional survey includes men and women in Japan between 15 to 80 years of age and the sample is generated via a 2-stage randomized stratified procedure. The questionnaire is explained in person to the respondents in their homes. They are then left a few days to complete the survey, before the questionnaires are finally collected from them. For the years 2010, 2011 and 2012 the sample size is 4000, 5000 and 4000 persons respectively. Pooling the three datasets from 2010 to 2012 yields 9288 completed questionnaires (observations) available for analysis. Since questionnaire items and their coding have been subsequently changed over the years, pooling the data comes with the downside of limiting the number of control variables.

Although the dataset comes with a number of limitations, this is the only available dataset that allows us to account for both the mediating effects of increased donations as well as the recent change in Japanese tax law.

3.2 Variables and Sample Selection

3.2.1 Happiness

As dependent variable and proxy for the concept of SWB we use the current happiness level of the respondents. The happiness question in the NSLP reads: "How happy are you currently?". Respondents can then choose an integer from 0 to 10 on an 11 point scale with "0" being not happy at all and "10" being very happy.

3.2.2 Donations

We use charitable donations as dependent and mediating variable. Charitable donations are measured by asking the respondents whether they are donating to any of 13 pre-coded groups of activities.[2] Respondents who donated in at least one field were considered as "donating in general".

3.2.3 "post 3-11" time dummy

The independent variable in our study is the effect of 3-11. As the effect cannot be measured directly, we use a time dummy variable labelled 'post 3-11'. Viewing the disaster as a natural experiment, the survey data allows us to use a one-group pretest-posttest design (Remler & Van Ryzin, 2011) in which we code respondents of the survey years 2010 and 2011 as 'pre 3-11' and the respondents of the survey year 2012 as 'post 3-11'.

Regarding this division of the sample, it is important to note that the collection period of the 2011 survey has been interrupted by the disaster with the effect that a small part of the questionnaires in 2011 was collected on March 12 or later. In Appendix A we provide (i) details on the exact structure of the sample, (ii) tests that show that neither the whole sample from 2010 to 2012 nor the 2011 sample are biased on the observables, and (iii) a number of arguments which show why we chose to treat all respondents from the year 2011 as 'pre 3-11'. In a nutshell we argue that the aim of this analysis is to assess the long-term effects of 3-11 in terms

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[2] The 13 fields are (1) Education, (2) Child rearing / parenting, (3) Community development, (4) Crime and disaster prevention, (5) Care and welfare, (6) Health promotion, (7) Promotion of science, sports, culture and arts, (8) Environmental protection and global warming countermeasures, (9) Disaster relief and international cooperation, (10) Promotion of information technology, (11) Development of human resources, (12) Protection of consumer interest, (13) Others.

of SWB as well as its impact on donation behaviour. Since the whole magnitude of the disaster wasn't clear in its direct aftermath, no short-term effects have been reported, therefore it is reasonable to split the 'pre 3-11' and 'post 3-11' groups after the 2011 survey. This coding scheme leads to 6,478 (70%) responses before and 2810 (30%) responses after 3-11.

3.2.4 Identification

Given that the disaster could have an influence on the willingness to participate in the survey after 3-11 this might violate the exogeneity assumption. Respondents might not have handed-in their questionnaire, because of the traumatic experiences by the actual loss of family members, friends or property. Note however, that it is not our intention to measure the effects on disaster victims in the narrow sense (e.g. those who suffered injuries or losses), but rather to capture the negative externalities on the personal happiness level, which are not geographically limited to the disaster area. We are particularly interested in the national impact of the nuclear meltdown in Fukushima, which had (and still has) the potential to affect more or less all parts of Japan (unlike the earthquake and tsunami which were locally limited in their impact). Therefore, when estimating the effects of 3-11 we exclude all respondents from the three disaster-affected areas (Iwate, Miyagi and Fukushima) to avoid any bias in the results from respondents who have been directly affected.

We further provide evidence that the sample excluding the disaster area from 2010 to 2012 is well-balanced on the observable variables, indicating no significant bias (see Appendix A). Finally, we conduct a variety of robustness checks especially regarding variations in the sample structure which show no qualitatively different results from our baseline model.

3.2.5 Knowledge about the tax law change

A major challenge of this paper is to disentangle the effects on donations of the tax law change from the effects of the actual disaster. This is possible, since respondents in the years 2011 *and* 2012 were asked whether they knew about the tax law change. While respondents in 2011 were asked whether they knew about the tax reform *proposal* (taking effect in June 2011, three month after the survey),

respondents in 2012 were asked whether they knew that the tax law amendment had actually been enacted. Exploiting the cross-sectional survey design, this allows us to disentangle the effect of people knowing about the future tax law change and people actually donating money being aware that a new tax deduction scheme is in effect. It is important to note, that we are only able to disentangle those effects, because of the cross-sectional design of the survey. In a panel study the same respondents would have been asked in subsequent years, and therefore they would have known about the tax law change in 2012 from the previous survey

3.2.6 Other control variables

Finally, we introduce a number of control variables in line with standard happiness economics. Apart from income and basic demographic variables (age, age squared, gender) we also control for family relations (cohabitation with spouse, number of children, children under 6 years dummy), employment relations (student, housewife, without work) as well as for regional (prefectures) and time (year) dummies.

3.3 Descriptive Statistics

Looking at the raw happiness data reveals that the average happiness after 3-11 (6.40) is slightly smaller than the average happiness before 3-11 (6.48). However, this does not necessarily indicate that 3-11 had a negative impact on happiness, since there might be other differences in the characteristics of the two groups. A further look at the raw data of donations shows that the percentage of people reporting to make donations in general went from 13.7% before 3-11 to 32.5% after 3-11. Looking only at donations to disaster relief activities (including disaster relief for 3-11) the numbers show an even large increase: Disaster relief related donations rose from 5.7% to 26.6%. Finally, the knowledge about the change in taxation law was only captured in the years 2011 and 2012. Although the significant rise in donations after 3-11 would suggest that not only more people are interested in donating, but that they also care about effective ways of tax deduction, the descriptive statistics say otherwise. The number of respondents who knew about the tax law amendment was 12% in 2011 and 13% in 2012.

Descriptives of other major independent variables are reported in Table B1 in the Appendix B.

4. Empirical Analysis and Results

4.1 Mediation

4.1.1 Empirical method

In a first step, we apply a standard mediation analysis to the above described data from 2010-2012 (Hayes, 2013). Our conceptual model is described in Figure 1.

Figure 1: Conceptual model of '3-11 mediation analysis'
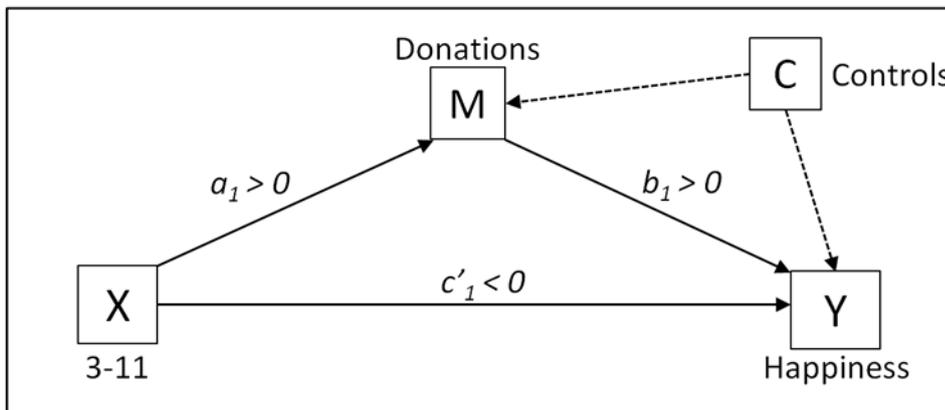
We expect that 3-11 (X) positively affects ($a_1>0$) donations (M), which in turn positively affect ($b_1>0$) the individual happiness level (Y). At the same time we expect 3-11 to have a negative effect ($c'_1<0$) on happiness.

Methodically we estimate the mediation analysis in a system of simultaneous equations using a three-stage least squares estimator (Greene, 2012). We follow previous studies in the field by applying linear estimation techniques to ordinal (happiness) and dichotomous (donations) variables (Ferrer-i-Carbonell & Frijters, 2004). To account for endogeneity we instrument donations in the first regression stage using Lewbel's generated instruments approach with the *Stata* command *ivreg2h* (Baum & Schaffer, 2012; Lewbel, 2012).[3]

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[3] We rely on a generated instruments approach, since it is difficult to find adequate instruments that are highly correlated with donation behavior, but not directly correlated with the error term in the happiness equation.

Our system of equations takes the following form:

$$(1) \quad M_i = \alpha_M + a_1 X_i + \gamma' C_{m,i} + \delta' Z_{m,i} + \varepsilon_{m,i}$$
$$(2) \quad Y_i = \alpha_Y + c'_1 X_i + b_1 M_i + \gamma' C_{y,i} + \varepsilon_{y,i}$$

where M indicates the individual donation behaviour and Y indicates the reported happiness level of respondent i; X_i denotes the post 3-11 time dummy; $Z_{m,i}$ is a vector of generated instrumental variables and $C_{m,i}$ and $C_{y,i}$ denote an almost identical range of control variables as specified above.[4]

We are especially interested in the following three effects: the indirect effect of 3-11 on happiness mediated by donation behaviour ($a_1 * b_1$); the direct effect of 3-11 on happiness conditional on the covariates as well as on the mediator (c'_1) and the total direct effect of 3-11 on happiness ($c_1 = a_1 * b_1 + c'_1$).

4.1.2 Results

The results of our baseline model are presented in Figure 2. The full results together with further robustness checks are reported in Table C1 in Appendix C.

Figure 2: Results of 3-11 mediation analysis
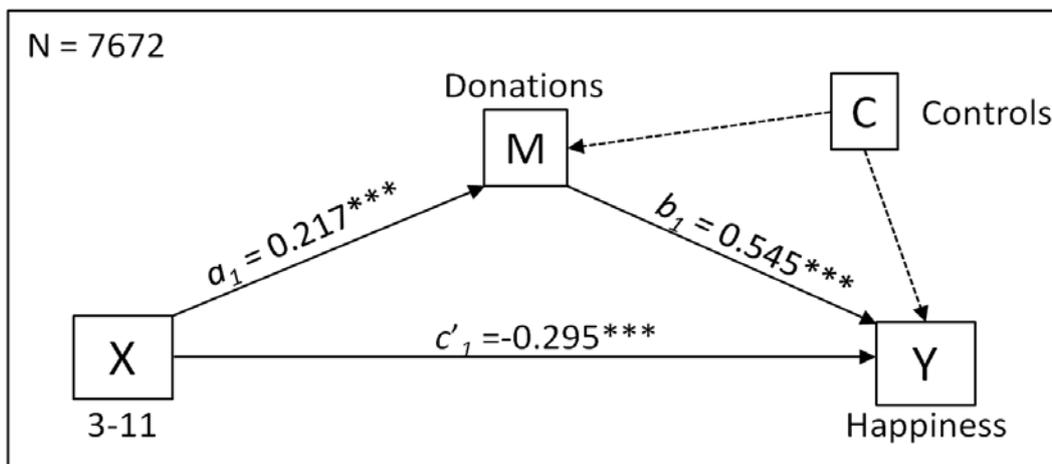
Note: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10. Unstandardized coefficients are reported.
Full results are reported in Table C1, Appendix C, model 1.

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[4] Since the relation between age and happiness is u-shaped, but the relation between age and donations is linear, $C_{y,i}$ includes age and its quadratic interaction term, while $C_{m,i}$ only includes age, see Ferrer-i-Carbonell and Frijters (2004) and Kitchen (1992).

As reported in Fig. 2 after 3-11 donations increase by 21.7 percent points (a_1). Given that the pre 3-11 level of general donations was 13.7% this implies a rise by almost 258%. Further we find that people who make – any kind of – donations are on average 0.545 points happier (b_1) – measured on a scale from 0 to 10. Accordingly, the indirect effect of 3-11 on happiness mediated by donations ($a_1 * b_1$) is 0.118 points (p < .001). Controlling for donations, the direct effect of 3-11 on happiness is -0.295 points (c'_1). In terms of effect size, both coefficients are of substantial size and range somewhere between being without work (-0.12) and cohabitation with one's spouse (0.39). Adding both indirect and direct effect together shows that the total effect of 3-11 on happiness is -0.177 points (p < .001).

Summing up, our results show that (i) 3-11 had a substantial direct negative effect on SWB in Japan, (ii) this negative effect is mediated by the positive effect on donations by about 40% (1 - (-0.177/-0.295)), which (iii), still leads to an overall negative impact of -0.177 points experienced after 3-11. The bottom line is that (iv) not taking donations into account leads to an underestimation of the negative SWB effects of 3-11.

Further robustness checks (Table C1 in Appendix C) show that our results are not affected by variations in the sample structure. Re-estimations of our baseline model by (a) dropping respondents after March 11 in 2011 (model 2), (b) dropping all observations of the year 2011 (model 3), or (c) dropping all observations of the year 2010 yield qualitatively similar results. The mediation rate of donations in terms of SWB stays stable between 34% and 40%.

4.2 Moderated Mediation

4.2.1 Empirical method

In a next step, we investigate the effect of the change in tax law on donations. Our conceptual model is presented in Figure 3.

This time we extend our baseline model to a moderated mediation (Hayes, 2013) by adding the 'knowledge about tax change' variable (V) and its interaction term with 3-11 (VX) in the mediating equation.

Figure 3: Conceptual model of moderated mediation
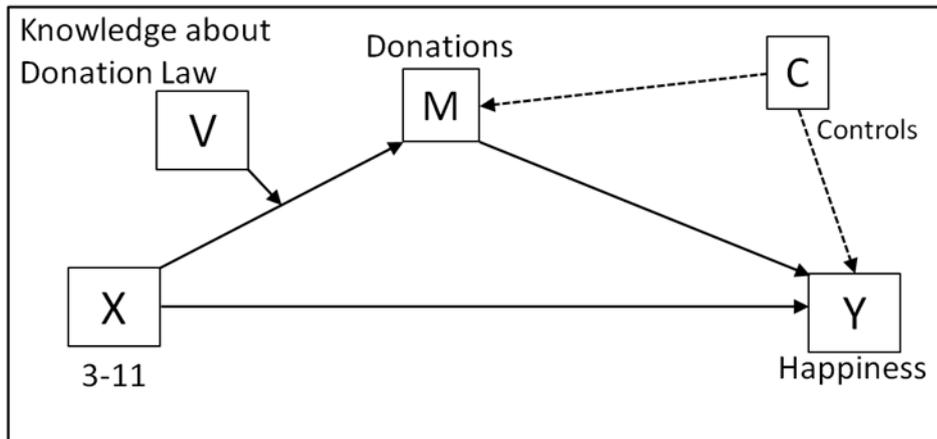
Since there is the possibility that people who donate are more willing to search for ways of tax deduction, we first test for reverse causality using an IV approach. We predict the knowledge about the tax law change (V) based on charitable donations (M) and an array of standard controls (C). To identify the causal influence of M on V we instrument M with the 'post 3-11 time dummy' (X). The rationale behind this approach is that 3-11 is equivalent to an exogenous shock which is – apart from its influence on donations – not related to the knowledge about the tax law change. [5] As the results reported in table C2 in Appendix C show, the instrumented donations variable is not statistically significant, indicating that there is no sign of reverse causality. This result is also consistent with the descriptive statistics that show a large increase in donations from 2011 to 2012, but almost no change in the percentage of people with knowledge about the donation law. After excluding the possibility of reverse causality, we build the moderated mediation model taking the following form:

$$(3) \quad M_i = \alpha_m + a_{21}X_i + a_{22}V_i + a_{23}VX_i + \gamma'C_{m,i} + \delta'Z_{m,i} + \varepsilon_{m,i}$$

$$(4) \quad Y_i = \alpha_y + c'_3X_i + a_3V_i + b_2M_i + \gamma'C_{y,i} + \varepsilon_{y,i}$$

where a_{21} denotes the simple effect of 3-11 on donations when V_i equals zero, that is, when respondents did not know about the change in tax law; a_{22} denotes the simple effect of the knowledge about the tax law change on donations before 3-11 and a_{23} denotes the interaction effect of the knowledge about the tax law change on

donations after 3-11. Since V_i is likely to be correlated with the individual level of education –and since education is one determinant of individual happiness that we cannot control for in the NSLP– we include V_i also in Eq. (4).

In this analytical step our main focus is on exploring the *conditional indirect effect* of 3-11 (*X*) on happiness (*Y*) through donations (*M*) as function of the knowledge about the change in donation law (*V*) (Hayes, 2013, p. 337).

$$(5) \qquad \theta_{X \to M} b_2 = (a_{21} + a_{23} V_i) b_2$$

To evaluate the efficiency of the tax law change regarding its amplification of the mitigating role of donations, we calculate and compare the conditional indirect effect of respondents who knew about the tax change ($V_i = 1$) versus respondents who didn't know about the change ($V_i = 0$).

4.2.2 Results

The results of our moderated mediation model are presented in Figure 4. The full results together with further robustness checks are reported in Table C3 in Appendix C.

Although knowledge about the tax law change has a significant impact on donations *independent* of 3-11 ($a_{22} = 0.097$; p < .001), the effect of knowledge about the tax law amendment after its implementation in the aftermath of the disaster leads to an even further increase about the same size ($a_{23} = 0.114$; p < .001).

Next, we estimate to what extent the indirect positive effects of the disaster differ between people who did know and who did not know about the tax change. The conditional indirect effect of 3-11 on happiness through donations for respondents who didn't know about the tax law change is 0.098 (*p* < .001; (a_{21} + $a_{23}V$) * b_2; with *V* = 0). Accordingly, donations mediate and mitigate the negative effect of the disaster by 34.2% (0.098/0.287), leading to a total effect of 3-11 of - 0.188 points (*p* < .001). The conditional indirect effect of 3-11 on happiness through donations for respondents who did know about the tax law change is 0.154 (*p* < .01; (a_{31} + $a_{33}V$) * b_3; with *V* = 1). Accordingly, donations mediate and mitigate the negative effect of the disaster by 53.7% (0.154/0.287), leading to a total effect of 3-11 of -0.133 points (*p* < .01).

Figure 4: Results of moderated mediation
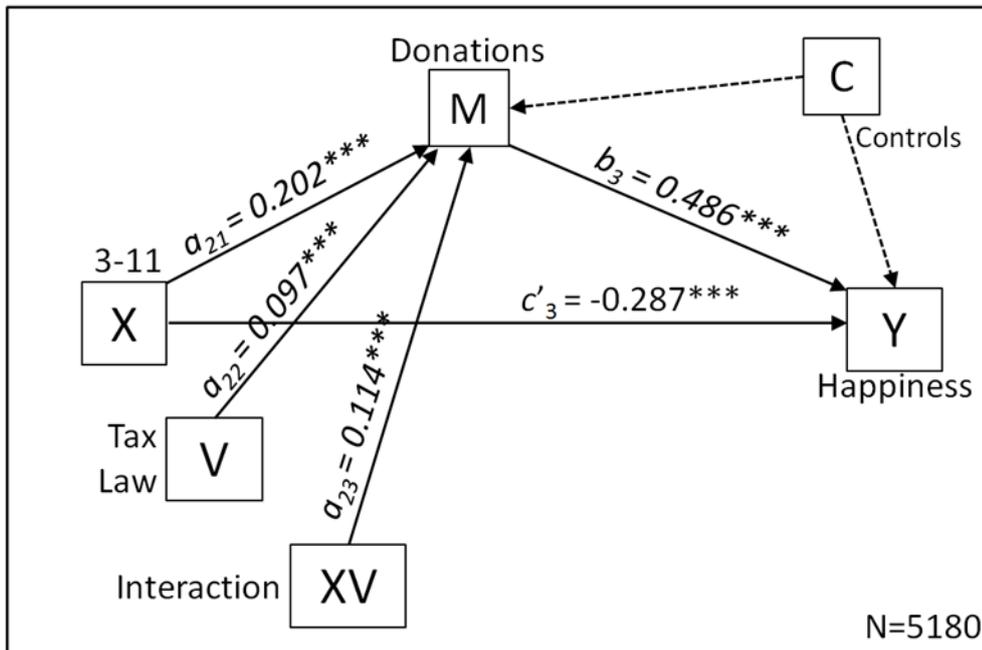
Note: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10. Unstandardized coefficients are reported.
Full results are reported in Table C3, Appendix C, model 1.

Further robustness checks (Table C3 in Appendix C) show that our results are not affected by variations in the sample structure. Re-estimations of our baseline model by (a) dropping respondents after March 11 in 2011 (model 2), (b) including respondents of the three disaster areas (model 3), or (c) including respondents of the three disaster areas while dropping respondents after March 11 in 2011 (model 4) yield qualitatively similar results.

5. Discussion

The results of our analysis confirm our initial hypotheses. We find that (H1) 3-11 had a substantial direct negative effect on SWB, but that at the same time (H2) it had a positive influence on charitable donations. Our data further confirms (H3) the positive relationship between charitable giving and happiness for the case of Japan, lending support to the claim that the relationship can be considered as a psychological universal (Aknin, Barrington-Leigh et al., 2013). Our mediation analysis revealed that (H4) the positive effects of the disaster on charitable donations had a sizable effect on happiness. However, as expected (H5) the mediation is only partial,

and the negative direct effects outweigh the indirect positive effects. Only about 40% of the negative SWB effects were mitigated by increasing donations. This suggests that findings of previous studies reporting negative effects of disasters on SWB are likely to be biased to a certain extent as they do not control for the mediating effects of prosocial behaviour. Re-examining the same data while taking the positive indirect effects of disasters into account should reveal higher direct negative effects of disasters on SWB. In a nutshell, our analysis demonstrates that large-scale disasters do not only have a negative impact on SWB, but they can also indirectly make people happier by encouraging them to donate.

Finally, we also found support that (H6) the change in taxation law moderates the positive impact of the disaster on donations: People who knew about the change in tax law showed a higher positive correlation between disaster occurrence and donating behaviour. This result suggests that government incentives in the form of tax deductions can not only increase donations in the aftermath of disasters, but they can also further mitigate the negative SWB effects. Although we find that the tax law change moderates the relationship between disaster occurrence and donations, its actual impact is rather limited. In our first analysis we show that *in total* donations increase after 3-11 by 21.7 percent points (Figure 2). In our second analysis we then show that within this increase 20.2 percent points were due to the disaster itself (Figure 4). This leaves only 1.5 percentage points (21.7 – 20.2) that can be attributed to the tax law change. The reason for this is the gap between the potential and the actual increase in donations. According to our analysis, the tax law change had a *potential* impact of 11.4 percent points on donations (Figure 4). This would have been about 50% of the effect of the disaster itself (11.4 / 20.2 = 56%). However, since only 13% of the respondents knew about the tax incentives, the *actual* impact of the tax law change was much smaller (13% * 0.114 = 0.015). This suggests that the tax law change was not properly communicated to the public. Accordingly, not only potential donations, but also potential gains in SWB have not been realized. In terms of happiness, 40% of the negative SWB effects of the disaster have been mediated by donations. Without the tax law change only 34% of the negative happiness effect would have been mitigated. However, the tax law change had the potential to increase the mitigating effects up to 53.7% percent, which leaves a gap of 13.7 percent points that have not been realized.

With regard to the literature on the SWB effects of 3-11 our results can help to better understand the inconclusive findings reported by previous studies. For example, Ishino *et al.* (2012) find that there are three different groups of people: one group being happier after 3-11, one group reporting to be unhappier and a last group which shows no changes in happiness after the disaster. Analyzing the determinants and characteristics of each group Ishino *et al.* (2012) report that donation behaviour has a statistically significant effect on the likelihood of belonging to either the "happier" or "unchanged" group. This is basically in line with our mediation analysis. Similarly, Uchida *et al.* (2014) find not only that those people who were thinking about the earthquake when responding to the survey were happier, but that they were also more likely to make in-kind donations or engage in voluntary work. However, contrary to Uchida *et al.* (2014) we find a nation-wide drop in happiness. One reason for this might stem from the different types of samples that have been used; while our data are based on a national, representative sample Uchida et al. are using an online sample restricted to respondents between the age of 20 and 39 years, which may be subject to various kinds of bias.

When comparing the results with other studies, the difference in the amount of time that has passed since the disaster is an important issue. Ohtake and Yamada (2013) did not report any substantial increase in unhappiness in the first 2 months after 3-11 and Tiefenbach and Kohlbacher (2014) did not find a nation-wide drop in happiness immediately in the month after the disaster. However, in our case the points of reference lie one year apart from each other. It may thus be possible that there are no immediate nation-wide happiness effects of disasters in the short run, but that they come into existence in the medium-term. Analyses from Matsubayashi *et al.* (2013) seem to corroborate this as they find in the case of severe natural disasters that suicides increase not only in the direct aftermath but also several years later. It is possible that the negative SWB effects of disasters prevail much long than their positive effects. One study that uses similar points of reference is Rehdanz et al. (2013) who compare data from January 2011 and January 2012. While they do not find a nation-wide drop in happiness, they show that the distance to the Fukushima Daiichi Nuclear Power Plant is negatively correlated with the happiness level of the respondents. Since they do not control for donations, a possible and likely explanation is that the negative SWB effects are related to the

distance to Fukushima, while the indirect positive effects of donations equally affect the whole of Japan.

The results of our study also corroborate the findings of Brown et al. (2012) who use the case of the 2004 Indian Ocean tsunami disaster to show that "unplanned contributions to charity do not have a crowding out effect on planned charitable donations" (ibd., p. 108). Our study finds that the general level of charitable donations increases after natural disasters. The huge increase in donations after 3-11 shows that even if non-disaster related donations are to some extent crowded-out, the positive effects outweigh the crowding-out effects by far.

Although the effect of tax deduction on charitable donations has been questioned in the literature (see for example Steinberg, 1990), our analysis of 3-11 lends further evidence to the claim that tax incentives can indeed positively affect donations, at least in the aftermath of disasters. It is important to note, that we cannot predict, whether the tax law change would have had SWB effects in a world in which no disaster occurred. However, our finding that the tax law change has a measurable impact on SWB is in line with Yörük (2014) who shows –in a non-disaster context– that tax subsidies for charitable donations have positive spill-over effects on health.

6. Policy Implications

Our results are not only relevant from an academic point of view, but also bear important implications for public policy. Large-scale disasters, such as 3-11, cannot be fully foreseen, because they literally exceed our worst case scenarios. In their aftermath, governments are only left with the decision on *how* to manage the recovery process. The standard approach here for developed countries is to mainly rely on government investments in disaster relief. However, our analysis suggests that rather than relying on direct government investments, ample incentives should be provided for individuals to engage in disaster-related donations, so that a significant amount of the disaster relief will be funded privately. The government could, for example, provide tax subsidies or match every private donation by a certain quota.[6] Increasing the supply of opportunities to donate, as well as providing

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[6] Regarding the effectiveness of matching donations with certain quotas see Huck and Rasul (2011) and Karlan, List, and Shafir (2011).

incentives to respond to these opportunities, would not only increase the direct (physical) disaster relief, it would also help to mitigate the negative (mental) SWB effects of disasters. However, as our analysis revealed, it is important that tax incentives are properly communicated to the wider public to ensure that their potential positive effects are fully realized.

Finally, our suggested policy measure of incentivising private donations has to be considered in light of its alternative: direct government investments in disaster relief. Existing research shows that government grants crowd-out private donations (Andreoni & Payne, 2003, 2011; Eckel, Grossman, & Johnston, 2005; Payne, 1998). Therefore, incentivising private donations instead of directly investing into disaster relief would not only lead to positive SWB effects, but would also lead to a reduction of existing crowding-out effects which are usually in place when government-based funds "compete" with private donations.

7. Conclusion

This study is the first to have analysed the relationships between disasters, donations, tax law changes and SWB together, decomposing the total SWB effect of disasters into its direct and indirect components, and accounting for the moderating role of knowledge about tax law changes in the relationship between disaster occurrence and donations. We thus fill an important gap in the literature, and at the same time shed new light on the debate of the effects of 3-11 on SWB in Japan. Our findings are twofold. First, we show that about 40% of the direct negative effect of 3-11 on SWB is mediated and mitigated by donations. Second, we show that the change in taxation law could have further mitigated the negative SWB effects of 3-11, if more people had been aware of it. Our study further exemplifies how moderated mediation analysis can be leveraged in economics in order to inform policy making. Based on our findings we argue for incentivising private donations instead of relying solely on public spending in the form of direct investments in disaster relief.

Acknowledgements

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Appendix A: Sample Structure of the NSLP

The NSLP was usually collected each year in March in a period of around ten days. As stated above, a characteristic of the 2011 survey is that it was planned for the period between March 3 and March 13 in 2011. When the disaster happened on March 11 it delayed the collection process with the result that the last two questionnaires were collected on March 29. Of 3578 valid responses in 2011, 719 were collected after the disaster (i.e. on March 12 or later). However, it is important to note that most of the questionnaires were collected in the first few days after the disaster (90% until March 13, 96% until March 14). Although we have information on the exact collection date of the survey conducted in March 2011, we still decided to split the "pre 3-11" and "post 3-11" groups *after* the 2011 survey, coding respondents of the survey in 2012 as "1" and all respondents of the years 2010 and 2011 as "0". We chose this split-up scheme for the following reasons. In the 2011 sample there is neither an aggregate drop in happiness nor a significant increase of donations reported after 3-11 (Tiefenbach & Kohlbacher, 2014). This is probably due to the fact that 96% of the questionnaires were collected until March 14, where the whole magnitude of the disaster wasn't clear yet.[7] Further, the collection date of the questionnaire is not necessarily the date the questionnaire was filled in by the respondents. Given that the original schedule was to collect all questionnaires until March 13, there is a high probability that most of the questionnaires were already filled in and ready for pick-up at the time when the disaster happened. Since the aim of this analysis is to assess the long-term effects of 3-11 in terms of SWB as well as its impact on donation behaviour, it is reasonable to split the "pre 3-11" and "post 3-11" groups after the 2011 survey. This coding scheme leads to 6,478 (70%) responses before and 2810 (30%) responses after 3-11.

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[7] It took until April 12 that the Japanese government raised the severity of the Fukushima accident as INES level 7, that is a "[m]ajor release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures", http://spectrum.ieee.org/tech-talk/energy/nuclear/fukushima-accident-upgraded-to-severity-level-7 (retrieved on Feb 5th, 2015).

Balancing properties

Table A1 shows the mean values of the major control variables for the two groups "pre 3-11" (year 2010 and 2011) and post "3-11" (year 2012). Table A2 contains the same information for the 2011 sub-sample, here the sample is divided on the exact date of March 11, 2011. According to Imbens and Wooldridge (2009) a normalized difference of greater than 0.25 is indicative of an imbalance in the respective covariate. Since this is not the case for any of our control variables, we conclude that the sample is well-balanced on the observables.[8]

Table A1: Balancing properties between the "pre 3-11" and "post 3-11" group, 2010-2012.

	Mean "Pre 3-11"	Mean "Post 3-11"	Normalized Difference
Income			
Household income	502.38	529.54	0.06
Demographics			
Age	48.93	49.16	0.01
Women	0.51	0.51	0.00
Family status			
Cohabitation	0.73	0.74	0.02
Number of children	1.47	1.44	0.02
Children under 6 years	0.13	0.12	0.04
Employment status			
Student	0.06	0.06	0.01
Without work	0.13	0.15	0.04
Housewife	0.15	0.25	0.17
Prefectures	omitted	omitted	omitted
N	**5,266**	**2,424**	-

Note: The "normalized difference" is calculated by the following equation:
$\Delta s = \bar{s}_1 - \bar{s}_0 / \sqrt{\sigma_1^2 + \sigma_0^2}$, where $\bar{s}_1$ and $\bar{s}_0$ denote the average covariate values for "post 3-11" and "pre 3-11" group, respectively, and σ denotes the variance. Note that the mean values and normalized differences of the 47 prefecture dummy control variables have been omitted. However, none of them exceeded the value of 0.25. More detailed results are available upon request.
Source: NSLP, 2010-2012, own calculations.

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[8] Note, however, that the sample still might be unbalanced on unobserved variables.

Table A2: Balancing properties between the "pre 3-11" and "post 3-11" group, 2011.

	Mean "March 3 to 11, 2011"	Mean "After March 12 to 29, 2011"	Normalized Difference
Income			
Household income	505.53	520.77	0.04
Demographics			
Age	50.25	47.46	0.13
Women	0.52	0.46	0.07
Family status			
Cohabitation	0.76	0.73	0.05
Number of children	1.56	1.42	0.09
Children under 6 years	0.13	0.13	0.00
Employment status			
Student	0.05	0.05	0.01
Without work	0.15	0.11	0.10
Housewife	0.16	0.10	0.13
Prefectures	omitted	omitted	omitted
N	**2,259**	**549**	-

Note: The "normalized difference" is calculated by the following equation:

$\Delta s = \bar{s}_1 - \bar{s}_0 / \sqrt{\sigma_1^2 + \sigma_0^2}$, where $\bar{s}_1$ and $\bar{s}_0$ denote the average covariate values for "post 3-11" and "pre 3-11" group, respectively, and σ denotes the variance. Note that the mean values and normalized differences of the 47 prefecture dummy control variables have been omitted. However, none of them exceeded the value of 0.25. More detailed results are available upon request.

Source: NSLP, 2011, own calculations.

Appendix B: Descriptive Statistics

Table B1: Descriptives of the major variables of interest

Variables	Obs.	Mean	SD	Min	Max
Dependent					
Happiness	9254	6.45	2.01	0	10
Donations (yes/no)	9288	0.21	0.41	0	1
Independent					
Post 3-11	9288	0.30	0.46	0	1
Knowledge about Tax Law Change	6332	0.13	0.33	0	1
Controls					
Income					
Household income (in 10,000 JPY per year)	8488	500.22	313.83	50	1500
Demographics					
Age	9280	48.62	17.24	15	80
Women	9280	0.52	0.50	0	1
Family status					
Cohabitation	8831	0.71	0.45	0	1
Number of children	9187	1.39	1.14	0	9
Children under 6 years	9187	0.12	0.32	0	1
Employment status					
Student	9245	0.07	0.26	0	1
Without work	9245	0.15	0.36	0	1
Housewife	9245	0.17	0.38	0	1

Table B2: Interest in the search term "deduction of charitable contributions"

Google Trend (web searches)	Interest in the search term **"寄附金控除"** ("deduction for charitable contributions")		
time period	**2011 27 Feb to 2 Apr**	*time period*	**2012 26 Feb to 31 Mar**
27 Feb to 5 Mar	20	26 Feb to 3 Mar	67
6 Mar to 12 Mar	24	4 Mar to 10 Mar	84
13 Mar to 19 Mar	100	11 Mar to 17 Mar	50
20 Mar to 26 Mar	56	18 Mar to 24 Mar	13
27 Mar to 2 Apr	33	25 Mar to 31 Mar	15
Total	**233**	**Total**	**229**

Note: Data were generated with Google Trends, https://www.google.com/trends/.
The numbers reflect how many searches have been done for the particular term, relative to the total number of searches done on Google over time. They don't represent absolute search volume numbers, because the data is normalized and presented on a scale from 0-100.

Appendix C: Regression Results and Robustness Checks

Table C1: Results of 3-11 Mediation Analysis

	Model 1: 2010-2012				**Model 2: 2010-2012[a]**			
	Donations	*Happiness*			*Donations*	*Happiness*		
		Direct	Indirect	Total		Direct	Indirect	Total
Post 3-11	0.217***	-0.295***	0.118***	-0.177***	0..220***	-0.283***	0.096***	-0.187***
	(0.001)	(0.059)	(0.028)	(0.052)	(0.010)	(0.062)	(0.028)	(0.055)
Donations		0.545***				0.438***		
		(0.127)				(0.124)		
Controls	yes	yes			yes	yes		
Obs	7672	7672			7123	7123		
RSME	0.347	1.849			0.346	1.843		
R-sq	0.280	0.119			0.295	0.122		
Chi2	2979.7***	1076.7***			2985.1***	999.9***		
Mediation		40.00%				33.92%		

	Model 3: 2010 and 2012				**Model 4: 2011 and 2012**			
	Donations	*Happiness*			*Donations*	*Happiness*		
		Direct	Indirect	Total		Direct	Indirect	Total
Post 3-11	0.257***	-0.285***	0.098**	-0.187***	0.216***	-0.294***	0.115***	-0.179***
	(0.011)	(0.063)	(0.030)	(0.055)	(0.011)	(0.063)	(0.034)	(0.053)
Donations		0.381**				0.533***		
		(0.117)				(0.154)		
Controls	yes	yes			yes	yes		
Obs	4870	4870			5217	5217		
RSME	0.342	1.853			0.378	1.839		
R-sq	0.369	0.122			0.256	0.116		
Chi2	2845.0***	679.3***			1799.1	717.3		
Mediation		34.39%				39.12%		

Note: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10; standard errors are bootstrapped with 5,000 replications.

(a) Model 2 uses data from 2010-2012, but does not include respondents after March 11 in 2011.

Table C2: Reverse Causality Test

VARIABLES	**Model 1)** *Knowledge about tax law change*	**Model 2** *Knowledge about tax law change*	**Model 3** *Knowledge about tax law change*	**Model 4** *Knowledge about tax law change*
Donations	0.056 (0.043)	0.030 (0.046)	0.057 (0.042)	0.029 (0.046)
Controls	yes	yes	yes	yes
Observations	5,193	4,648	5,406	4,847
R-squared	0.068	0.067	0.067	0.066
Wald chi2	320.735***	295.689***	329.515***	304.605***
First Stage F-Test	F(53, 5139) = 12.68***	F(52, 4595) = 11.65***	F(56, 5349) = 12.20***	F(55, 4791) = 11.19***

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table C3: Results of 3-11 Moderated Mediation Analysis

	Model 1: 2011-2012				**Model 2: 2011-2012[i]**			
	Donations	*Happiness*			*Donations*	*Happiness*		
		Direct	Indirect	Total		Direct	Indirect	Total
Post 3-11	0.202***	-0.287***	0.098***[a]	-0.188***[c]	0.206***	-0.271***	0.078**[a]	-0.193***[c]
	(0.011)	(0.063)	(0.030)	(0.053)	(0.012)	(0.065)	(0.032)	(0.056)
Donations		0.486***				0.381**		
		(0.147)				(0.153)		
Donation Law	0.097***	0.076			0.104***	0.107		
	(0.022)	(0.079)			(0.024)	(0.083)		
Donation Law * Post 3-11	0.114***		0.154**[b]	-0.133**[d]	0.106***		0.119**[b]	-0.152**[d]
	(0.029)		(0.049)	(0.056)	(0.032)		(0.015)	(0.058)
Controls	yes	yes			yes	yes		
Obs	5180	5180			4635	4635		
RSME	0.372	1.832			0.377	1.825		
R-sq	0.280	0.118			0.284	0.122		
Chi2	2014.8***	715.2***			1834.7***	648.2***		
Mediation (V = 1)		53.66%				43.91%		
Mediation (V = 0)		34.15%				28.78%		

	Model 3: 2011-2012[ii]				**Model 42011-2012[iii]**			
	Donations	*Happiness*			*Donations*	*Happiness*		
		Direct	Indirect	Total		Direct	Indirect	Total
Post 3-11	0.201***	-0.269***	0.088**[a]	-0.181***[c]	0.203***	-0.251***	0.067*[a]	-0.183***[c]
	(0.011)	(0.061)	(0.030)	(0.052)	(0.012)	(0.064)	(0.031)	(0.055)
Donations		0.439**				0.329*		
		(0.146)				(0.150)		
Donation Law	0.101***	0.081			0.107***	0.109		
	(0.021)	(0.079)			(0.023)	(0.082)		
Donation Law * Post 3-11	0.103***		0.133**[b]	-0.136**[d]	0.096**		0.099*[b]	-0.152**[d]
	(0.030)		(0.046)	(0.055)	(0.032)		(0.046)	(0.057)
Controls	yes	yes			yes	yes		
Obs	5393	5393			4834	4834		
RSME	0.372	1.839			0.37709	1.829		
R-sq	0.278	0.121			0.2809	0.125		
Chi2	2073.2***	763.1***			1888.64***	694.6***		
Mediation (V = 1)		49.44%				39.44%		
Mediation (V = 0)		32.47%				26.69%		

Note: *** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.10$; standard errors are bootstrapped with 5,000 replications. (a) is calculated by multiplying the 'Post 3-11' coefficient in the donation equation with the 'Donations' coefficient in the happiness equation; (b) is calculated by multiplying the sum of the 'Post 3-11' and the 'Donation Law *Post 3-11' coefficient in the donation equation with the 'donation' coefficient in the happiness equation; (c) is calculated by adding (a) to the 'Post 3-11' coefficient in the happiness estimation; (d) is calculated by adding (b) to the 'Post 3-11' coefficient in the happiness estimation. (i) and (iii) do not include respondents after March 11 in 2011. (ii) and (iii) include respondents from the disaster areas (Fukushima, Miyagi and Iwate).

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