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Disentangling the Happiness Effects of Natural Disasters: The Mitigating Effects of Charitable Donations

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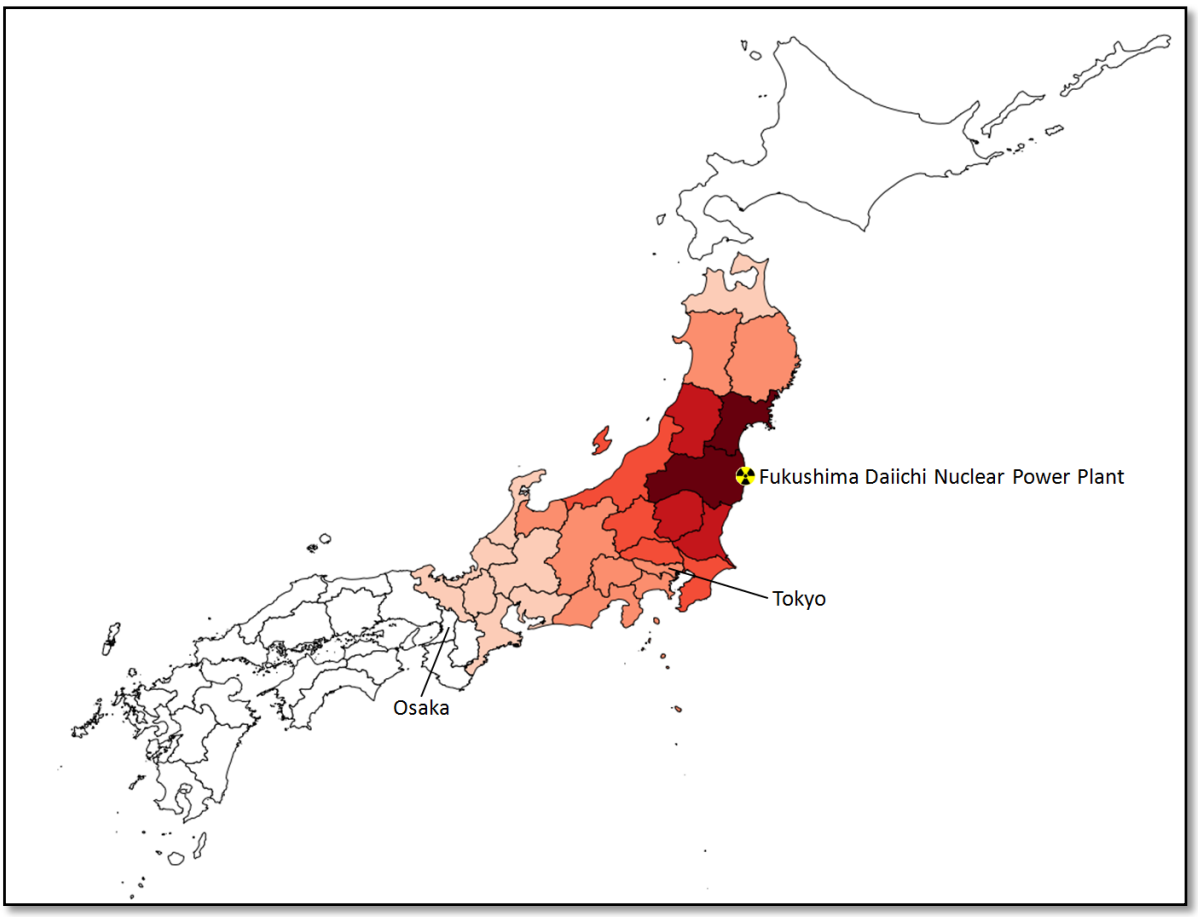

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Abstract

In happiness economics the negative effect of natural disasters on subjective well-being (SWB) tends to be underestimated by ignoring the fact that disasters also induce charitable donations which are positively related to SWB. Using data from recent Japa-nese Government Surveys on the triple disaster of March 11 (3-11) our analysis con-firms this. We find that as much as one third of the negative effects of 3-11 on SWB are mitigated by the positive effects of charitable donations. A spatial analysis further reveals that the mitigating effects of charitable donations are especially prominent in medium to close distance to the disaster area.

JEL Classifications: Q54, I31, H84, D64

Keywords: Happiness, Disaster, Donations, Subjective Well-Being, Mediation

Disentangling the Happiness Effects of Natural Disasters: The Mitigating Effects of Charitable Donations

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1. Introduction

In happiness economics numerous studies report that natural disasters have a negative effect on people's subjective well-being (SWB) (Luechinger and Raschky, 2009). However, these studies have two short comings. First, when identifying the negative SWB effects of natural disasters they do not account for possible mitigating effects caused by prosocial behavior arising in the aftermath of disasters. By omitting donations in SWB equations, the coefficient of the disaster variable will underestimate its direct negative effect. Second, most studies have so far ignored spatial differences in the SWB effects of disasters. The aim of the present study is to fill these gaps.

2. Literature

In happiness economics a number of studies analyzes the relationship between SWB and frequently occurring disasters such as war and terrorism (Romano et al., 2012) or floods and forest fires (Kountouris and Remoundou, 2011; Luechinger and Raschky, 2009). There are also several studies investigating the effects on SWB of specific events such as Hurricane Katrina (Kimball et al., 2006), the terror attacks of 9-11 (Metcalfe et al., 2011), the Chernobyl Accident (Berger, 2010) and more recently the triple disaster of March 11, 2011 (3-11) in Japan (Rehdanz et al., 2013; Tiefenbach and Kohlbacher, 2014). All of the studies report negative effects of natural disasters on SWB. For the case of 3-11 Rehdanz et al. (2013) and Tiefenbach and Kohlbacher (2014) account on an aggregate level for spatial differences in the SWB effects of the disaster, but they do not break these effects down on a regional level.

Apart from their effects on SWB disasters also lead to increased prosocial behavior in terms of charitable donations (Brown et al., 2012; Glynn et al., 2003). Finally, happiness research provides strong evidence for the positive impact of prosocial donations on SWB (Aknin et al., 2013; Dunn et al., 2008).

3. Data

The present study uses cross-sectional data from the *National Survey on Lifestyle Preferences* (NSLP) of the years 2010 to 2012 in Japan. The NSLP is an annual national-representative survey commissioned by the Japanese Cabinet Office. As dependent variable and proxy for SWB we use the current happiness level of the respondents. The happiness question in the NSLP reads: "How happy are you currently?" (0-10 scale). Donations are measured by asking whether the respondents did donate to any of 13 pre-coded areas of volunteer organizations. Since the effect of 3-11 can cannot be directly measured, we use a one-group pretest-posttest design by coding the year dummy of 2012 as "post 3-11" (Remler and Van Ryzin, 2011).[1] Finally, we include a number of socio-demographic, time and regional control variables commonly used in happiness economics. Since we are interested in estimating the indirect SWB effects of 3-11, we exclude all respondents from the three disaster-affected areas to avoid any bias in the results from respondents who have been directly affected by the disaster.

4. Analysis and Results

In a first step we estimate the following baseline model:

$$(1) \qquad \mathrm{H}_i = \alpha + \beta_1 t_i + \gamma' X_i + \varepsilon_i$$

where *H* indicates the reported happiness level of respondent *i*; *t* denotes the time dummy of March 11 and X_i denotes a range of control variables. The results are reported in Table 1.

[1] Note that the NSLP is conducted each year in March. In 2011 719 of 3,578 questionnaires were collected after March 11. However, according to Tiefenbach and Kohlbacher (2014) the "pre" and "post" March 11 group in 2011 do not significantly differ in their observables. The present analysis treats all observation in 2011 as "pre March 11". However, we conducted the same analysis (i) excluding all post March 11 observations in 2011 as well as (ii) treating them as post March 11. In either case we gained qualitatively similar results.

Table 1: Happiness after 3-11

	(1) OLS	(2) OLS	(3) IV
Post 3-11 (year 2012)	-0.131*	-0.180**	-0.253***
	(0.074)	*(0.075)*	*(0.079)*
Year 2010	0.034	0.041	0.051
	(0.052)	*(0.052)*	*(0.052)*
Donations		0.208***	0.517***
		(0.054)	*(0.125)*
Controls	yes	yes	yes
Observations	7,672	7,672	7,672
Adj. R-squared	0.115	0.117	0.117

Level of significance: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors in parentheses. Controls include: household income, age, age squared, gender, cohabitation with spouse, number of children, children under age of 6, student, homemaker, not working, unemployment rate on the prefectural level and prefecture controls.

Model 1 shows that respondents in 2012 are on average -0.13 points (on a 0-10 scale) less happy compared to respondents in 2011. No such difference is found when comparing respondents in 2010 with the control group in 2011. While model 1 reports the total effect of 3-11, model 2 includes donations in the controls, indicating that the direct effect of 3-11 is about 40% larger (-0.18).To account for endogeneity bias associated with donations and happiness, model 3 shows the estimates of an IV-model with generated instruments.[2] Not only the donation coefficient, but also the effect of 3-11 increase considerably.

In a next step, we include a variable measuring the inverse distance (1/km) to the Fukushima Daiichi Power Plant (d_p) and it's interaction term with the 3-11 time dummy ($t_i * d_p$) in our baseline specification:[3]

[2] Since our data does not provide an adequate instrument for donations, we rely on Lewbel's generated instruments approach using the Stata command ivreg2h, see Lewbel (2012) and Baum and Schaffer (2012).

[3] For a similar approach establishing a hyperbolic (inverse) relationship between the distance to Fukushima and Happiness see Rehdanz et al. (2013) and Tiefenbach and Kohlbacher (2014).

$$(2) \qquad \mathrm{H_i} = \alpha + \beta_1 t_i + \beta_2 d_p + \beta_3 t_i * d_p + \gamma' X_i + \varepsilon_i$$

The inverse distance is measured on the prefecture level (*p*) between the centroid of each of Japan's 47 prefectures and the exact location of the Fukushima Daiichi Nuclear Power Plant. The results are reported in Table 2.

Table 2: Spatial Happiness Effects of 3-11

	(4) OLS	(5) IV
Post 3-11 (year 2012) (conditional effect)	0.055 *(0.118)*	-0.057 *(0.121)*
Inverse Distance (conditional effect)	-206.311 *(322.625)*	-204.105 *(323.924)*
Inverse Distance * Post 3-11 (interaction effect)	-58.062** *(28.777)*	-60.997** *(28.713)*
Donations		0.513*** *(0.125)*
Controls	yes	yes
Observations	7,672	7,672
Adj. R-squared	0.115	0.117

Level of significance: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors in parentheses. Controls as in Table 1.

The spatial interaction effect (t_i * d_p) is significant in both models 4 (omitting donations) and 5 (including instrumented donations). These results indicate that people who live in prefectures in close proximity to the Fukushima Daiichi Nuclear Power Plant are less happy. This shows that the nation-wide drop in happiness after 3-11 reported in Table 1 can clearly be related to the distance to the Fukushima Daiichi Power Plant.

To show that donations increase after 3-11 we estimate equation (1) and (2) with linear probability models (LPM) replacing the dependent variable with charitable donations (C_i). Results are reported in Table 3.

Table 3: Effects of 3-11 on general donations and disaster-related donations

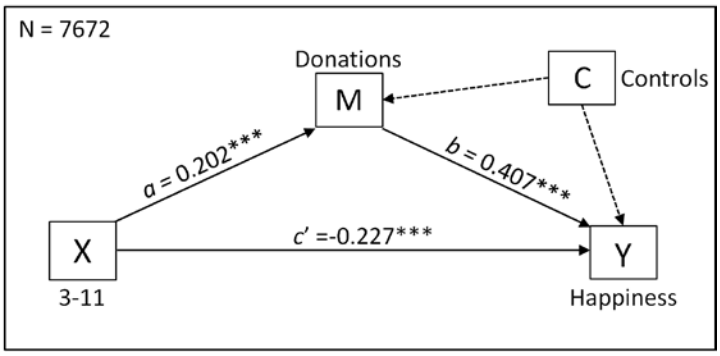
Variables	(6) LPM Donations	(7) LPM Disaster-related donations	(8) LPM Donations	(9) IV Donations
Post 3-11 (year 2012)	0.202***	0.274***	0.184***	0.207***
	(0.022)	(0.018)	(0.030)	(0.023)
Inverse Distance			-17.497	
			(41.143)	
Inverse Distance * Post 3-11			5.525	
			(6.640)	
Happiness (instrumented)				0.056
				(0.069)
Controls	yes	yes	yes	yes
Observations	7,690	7,690	7,690	7,690
Adj. R-squared	0.111	0.149	0.110	0.111

Level of significance: *** p<0.01, ** p<0.05, * p<0.10. Robust standard errors in parentheses. Controls as in Table 1 and including a linear time trend.

Model 6 shows that donations in general rise significantly after 3-11. Taking "disaster-related donations" as dependent variable model 7 shows that the increase in general donations after 3-11 is clearly related to the disaster. Model 8 includes the spatial interactions of equation 2, but –unlike happiness– donations are not related to the distance to Fukushima. To account for endogeneity bias associated with donations and happiness model 9 shows the estimates of an IV-model with generated instruments. However, the happiness coefficient is not significant, which indicates that endogeneity is not a problem here.

To complete our analysis we build a mediation model with donations as mediator of the effects of 3-11 on happiness. We estimate model (3) and (6) in a system of seemingly unrelated regressions. Results are reported in Figure 1.

Figure 1: Donations as Mediator between 3-11 and happiness.

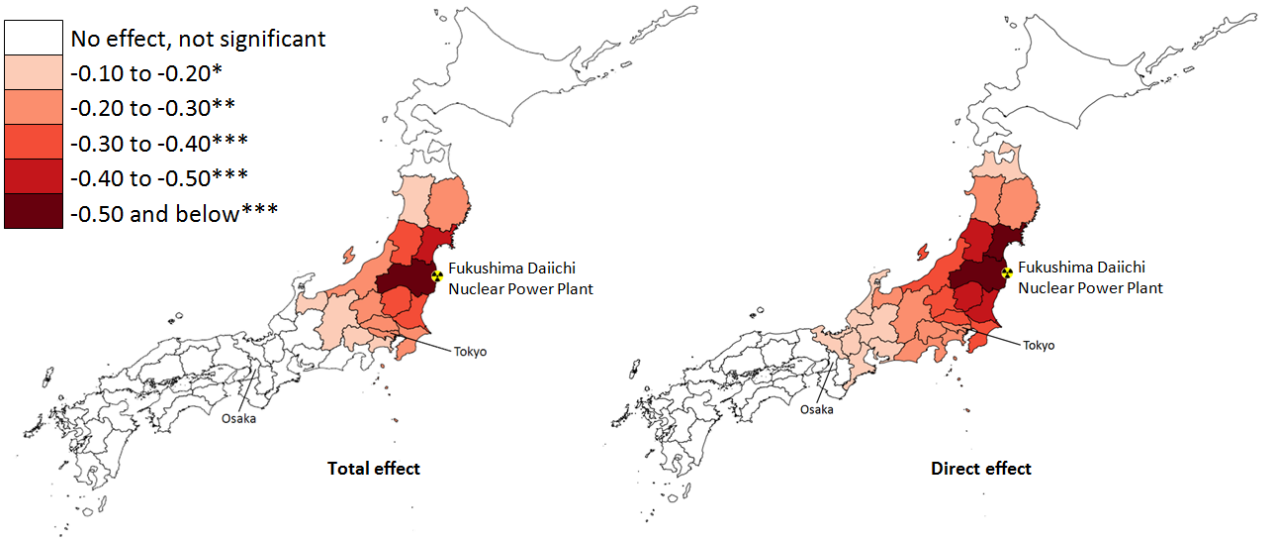


Level of significance: *** p<0.01, ** p<0.05, * p<0.10.
Bootstrapped standard errors (5000 replications). Controls as in models (3) and (7).

The mediation model shows that on an aggregate level for whole Japan 3-11 had a total effect on happiness of -0.14 points. This effect is composed of a direct effect (c') of -0.22 and a positive indirect effect (*a* * *b*) mediated by donations of +0.08 points. Hence, about 36% of the negative effects of 3-11 on SWB are mitigated by the positive effects of charitable donations.

In a last step, we extend our mediation model by accounting for the spatial interaction. We estimate models (5) and (6) in a system of seemingly unrelated regressions. Since we want to identify the *regions of significance* of the spatial interaction, we estimate 47 models centering d_p around the inverse distance of each of the 47 prefectures (Hayes and Matthes, 2009). The graphical results are plotted in Figure 2 (left: total effect; right: direct effect).

Figure 2: Total and direct happiness effect of 3-11 in spatial relationship to Fukushima



Level of significance: *** p<0.01, ** p<0.05, * p<0.10.
N.B.: Okinawa is not shown.

Figure 2 shows that: (i) the happiness effects of 3-11 vary greatly depending on the distance to the Fukushima Power Plant, (ii) not accounting for donations clearly underestimates the direct happiness effect of 3-11, (iii) the mediating role of donations is especially prominent in medium to close distance to the disaster area.

5. Conclusion

The results above confirm our initial hypothesis that conventional SWB analysis of natural disasters tend to underestimate their negative direct effect. This is because a substantial part of the negative SWB effects of disasters are mitigated by positive SWB gains associated with charitable donations. Although this result can be established on an aggregate level, a deeper analysis reveals that the mediating role of charitable donations is especially prominent in medium to close distance to the disaster area.

These findings also bears important implications for public policy. Our analysis suggests that ample incentives should be provided for individuals to engage in disaster-related donations. Governments could, for example, match every private

donation by a certain quota. Increasing the supply of opportunities to donate as well as providing 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.

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