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Exploring spillover effects of Mobility Management: A case study on changes in electricity consumptions by the Great East Japan Earthquake

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ABSTRACT

This study explores spillover effects of Mobility Management (MM) by investigating (1) whether a specific environmental education policy, MM, can stimulate a different aspect of pro-social behavior (electricity consumption in this study), and (2) whether MM intervention group shows the different behavioral modifications by the Great East Japan Earthquake (GEJE) compared to the no intervention group. We first give a theoretical explanation on the learning mechanism of altruistic attitudes and behavior, and then conduct an empirical analysis by using a panel data collected by JCOMM (Japanese Conference On Mobility Management) Executive Committee. There are two important findings. First, MM intervention group shows lower electricity consumption in both before and after the GEJE, but our results also indicate that MM may have such spillover effects only based on individual self-selection. Second, MM intervention group has a higher intention to reduce electricity consumption after the earthquake, but it is not really reflected in their electricity usage behavior, i.e., the amount of the reduction.

1. Introduction

This study investigates the properties of environmental education policies enhancing altruistic attitudes and behavior (for both ordinary and emergency situations), especially by looking at the behavioral modifications by the Great East Japan Earthquake (GEJE). The importance of taking altruistic behavior in both ordinary and emergency situations has been repeatedly emphasized (Van Liere and Dunlap, 1980; Scott and Willits, 1994; Fujii and Taniguchi, 2006; Darnton, 2008; Moser, 2010; Chen et al., 2011). There are, however, still many challenges which need to be further addressed: Can the improvement of altruistic attitudes induce behavioral changes in other aspects? If such "spillover" effects exist, how should we design educational policies as a whole? And, even if matured altruistic attitudes could reduce energy consumption considerably, what are the intrinsic differences from the energy reduction achieved by other measures? In this study, we attempt to provide some basic information and discussions for these questions.

1.1. The Great East Japan Earthquake and altruistic behavior

Soon after the GEJE, a number of Japanese citizens have modified their attitudes and behaviors even in non-disaster areas. NHK Broadcasting Culture Research Institute (NHK Broadcasting Culture Research Institute, 2011) reported that, as of September 2011, 87.3% of the Japanese people donated for affected people and 7.5% of them participated in volunteer activities, which may come as a result of altruistic attitudes which may be enhanced by the earthquake (Ishino et al., 2011). Mizuho Information & Research Institute, Inc. (Mizuho Information and Research Institute, 2011) reported that, in the summer of 2011, 96% (85%) of respondents voluntarily saved electricity by reducing their use of lights (air conditioning systems), and 69–96% of them (which vary depending on the type of action) intend to conduct the energy saving behaviors in the summer of 2013 as well. Such altruistic behaviors may be important to build a more resilient society with high adaptability to disasters, since we may not be able to eliminate all possible damages from natural disasters at least in near future.

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A critical question here then is how we can stimulate such altruistic attitudes and behavior. Broadly speaking, there are two different conceptual explanations on altruism: evolutionary altruism and vernacular altruism (Sober, 1988; Piliavin and Charng, 1990). Sober (1988) noted that the evolutionary altruism can occur in organisms that don't have minds and thus essentially looks at the consequences of behaviors, while the vernacular altruism has to be done with motives for acting with the goal of benefitting others and do not always have to be a beneficial result for others. Thus, from the former viewpoint, altruism can be viewed as a kind of biological trait of human, while altruistic attitudes may be formulated through social learning from the latter viewpoint. Although both mechanisms could exist as Piliavin and Charng (1990) mentioned, Rushton (1982) emphasized the importance of the view of vernacular altruism as follows:

> Although evolutionary theory suggests that the basic (genetic) nature of Home sapiens is altruistic, it must be emphasized that much of human behavior is acquired through social learning. This is particularly necessary to emphasize when we consider the question of individual differences in altruism...we are altruistic primarily because we have learned to be so, being genetically programmed to learn from our environments (p. 429).

Thus, we may be able to learn altruistic attitudes and behavior, implying that there is a certain space for policy interventions enhancing altruistic motives through the improvement of learning environment.

1.2. Altruistic behavior and learning

Learning altruistic attitudes and behavior may not be a superficial thing. It may involve the updating of normative and mental state, and it might be different from simply learning about how we should behave in a given situation. Such difference between mental and behavioral learning was conceptualized by Vare and Scott (2007). They introduced two different educational approaches in the context of environmental education for sustainable development. The first type of education for sustainable development (ESD 1) is to promote behavioral changes by teaching pre-determined skills and behaviors that are socially accepted. The second education approach (ESD 2) is to build capacity to think critically about what experts say and explore the contradictions inherent in sustainable living. The difference between these two approaches can be further understood by looking at the difference between single and double loop learning (Darnton, 2008). The single and double loop learning was originally proposed to theorize organization learning (Argyris and Schon, 1978; Argyris, 1992). Single loop learning (corresponding to ESD 1) occurs whenever behavior is modified without questioning or altering the underlying values of the system, while double loop learning (corresponding to ESD 2) occurs when behavior is modified by first examining and altering the governing variables and then the actions. Thus, the critical difference between two education approaches is that the ESD 2 involves the updating of individual's mental model, while ESD 1 does not. Although both approaches can enhance altruistic behavior, Vare and Scott (2007) emphasized the importance of ESD 2 because of the following two reasons. First, ESD 2 involves the development of learner's abilities to make sound choices in the face of the complexity and uncertainty of the future. This might be essentially important because the needs of altruistic behavior may vary depending on situations, which may be difficult to be pre-specified before things happen. Recently, such idea has intensively discussed under the concept of "adaptive capacity" or "resilient learner" in the field of environmental educations for social–ecological resilience (Berkes et al., 2003; Lundholm and Plummer, 2010; Krasny and Roth, 2010; Sterling, 2010). Second, Vare and Scott underscored that too much successful ESD 1 in isolation would reduce our capacity to manage change ourselves, potentially causing less adaptive behaviors which is difficult to be pre-specified. On the other hand, though it seems to be paradoxical, they also underscored:

> ESD 1 and 2 are complementary because people need to hear what the sustainability lobby and governments are telling us to do (thorough ESD 1) in order to have relevant subject matter to debate and test in our own contexts. ESD 2, although open-end, cannot exist in a vacuum devoid of content (p. 196).

Thus, people may acquire basic knowledge through ESD 1, while ESD 2 arises when people internalize the learning. This is quite suggestive in the formulation of environmental education policies in several ways. First, it may facilitate attention on to whom and how policy maker should provide learning opportunities. For example, a certain type of compulsory learning may not be appropriate for some learners, since internalization may not occur if they do not have a sufficient will to learn. In such case, it may be better to allow people to make a decision on participating in the learning program based on individual self-selection. Second, when learning on a specific matter improves their mental model, there is a possibility to induce attitudinal and behavioral changes in other aspects. For example, when learning on reducing car usage can improve learners' mental model, they may start to think about the risk of environmental damage in a broader context. If such spillover effects are unignorable, we may have to identify to what extent the spillover effects occur and put a series of educational policies as a long-term measure.

1.3. Learning and Mobility Management

Like other fields, a number of educational policies have been implemented in transportation field such as traffic safety education program and environmental education program. In this study, we focus on Mobility Management (MM) which is an environmental educational policy (Fujii and Taniguchi, 2006; Taniguchi et al., 2007). MM focuses on motivating individuals to voluntarily change to more sustainable transport modes by providing detailed travel information and incentives through interactive communication. MM was initially implemented in 1999 in Japan, and has then been widely introduced across Japan (Fujii, 2008). Although the details of MM vary across projects, broadly speaking, there are three different types of MM depending on the locations where MM implemented: residential areas, schools, and workplaces (Taniguchi et al., 2007).

Key common feature of MM is not only to inform *what* kind of travel behavior is more environmentally-friendly but also to let them know *why* we should do so. Although health related information is also often provided and may cause some behavioral changes, people are basically promoted to altruistically behave for the benefit of others in terms of reducing environmental impacts. Therefore, MM potentially involves ESD 2. Actually, the impacts of MM have been conceptualized based on Schwartz's Norm Activation Theory (Schwartz, 1977) (e.g., Taniguchi and Fujii, 2007) which involves consistent discussions with ESD 2. Concretely, from the viewpoint of the Norm Activation Theory, ESD 1 may correspond to the activation of social norms, and ESD 2 may correspond to the activation of personal norms. When social norms are internalized, they become personal norms (Schwartz, 1977, p. 268), just like a relationship between ESD 1 and ESD 2. Thus, it can be said that MM has been implemented with due consideration of ESD 2. On the other hand, it has not been well identified how updating mental model affects other behavioral aspects. If such spillover effects considerably exist, the impacts of MM are