Collective reputation and externalities in agriculture: Lessons from Fukushima nuclear accident

1. Introduction

In commodity markets, collective reputation crises, driven by information friction, can disrupt supply chains and influence consumer behaviors. Collective reputation, an aggregation of individual reputations, plays a crucial role in sectors like agriculture, where geographical indicators impact marketing. Farmers using a geographical indicator may face repercussions, despite their own quality standards, due to issues with other products from the same area. In summary, negative externalities stem from collective reputation, and measuring these effects poses challenges. This study is the first to identify and explore the reputational impact on farmers' decision-making in the face of such challenges.

While collective reputation has been extensively studied in various sectors such as the vehicle industry, garment industry, and food industry (Bachmann et al., 2022; Bai et al., 2022; Jin & Leslie, 2009; Koenig & Poncet, 2022; Matsumoto & Hoang, 2020), The growing empirical literature focuses primarily on its effects on output measures. Empirical research on the relationship between collective reputation and input decisions is limited and remains understudied.

This study has two main contributions. First, we show that collective reputation affects suppliers' decision-making, leveraging a difference-in-differences approach and a large panel household dataset. Second, our results demonstrate that collective reputation with information friction can have important implications for high value-added industries.

2. Background on Fukushima nuclear accident and rice market in Japan

On March 11, 2011, the Great East Japan Earthquake struck, causing a tsunami that hit the Fukushima nuclear power plant and resulted in a meltdown of the reactors. This incident led to a significant release of radioactive material, raising nationwide concerns about nuclear safety. While the middle and coastal areas of Fukushima prefecture experienced partial contamination, the western part remained unaffected. Despite government inspections confirming the safety of rice shipments from the western part after the accident, concerns persisted about potential contamination of agricultural products in that region.

In Japan, one of the most famous rice brands is *Koshihikari*. Among *Koshihikari* brands, *Koshihikari* from Niigata prefecture and *Koshihikari* from Fukushima prefecture are one of the most popular brands in Japan. Figure 1 shows the geography of east part of Japan and Fukushima and Niigata prefectures are nearby.

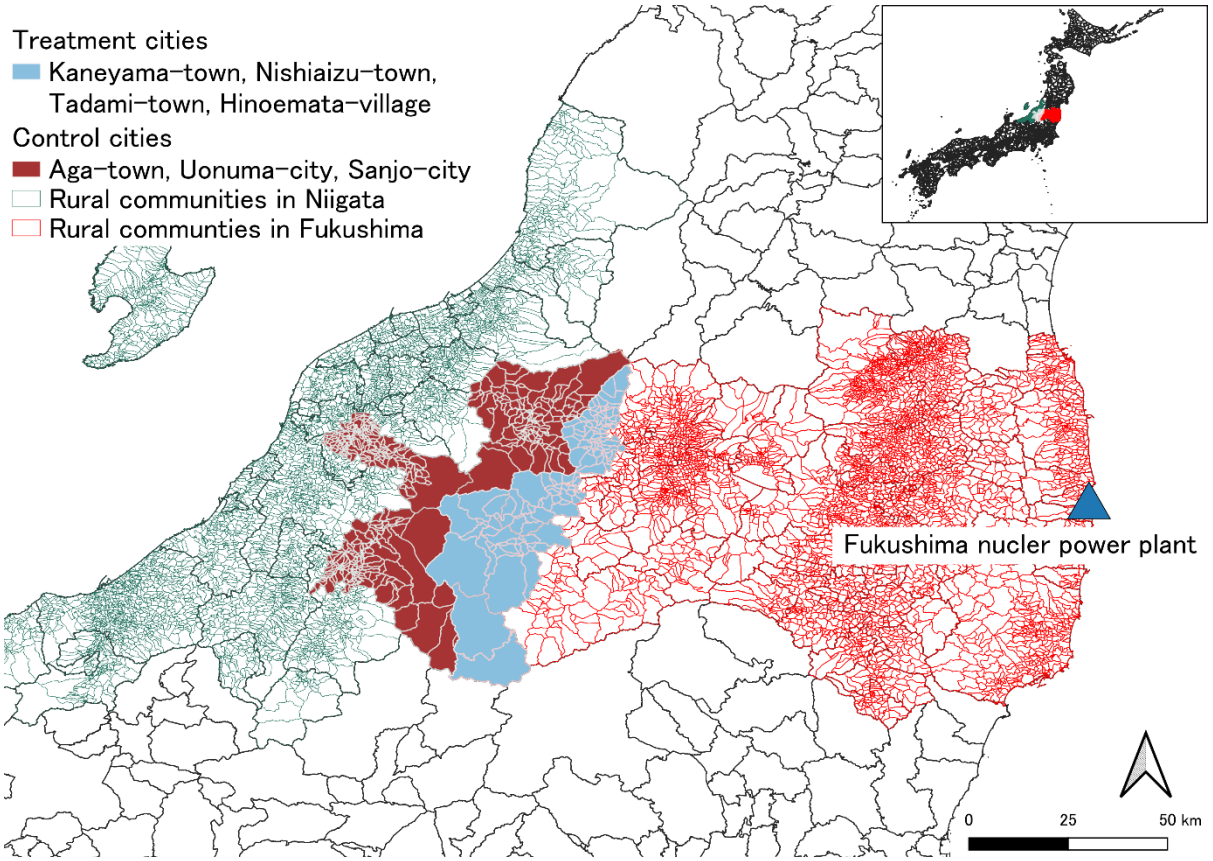

Figure 1 Geographical relationship between Fukushima and Niigata prefectures.

3. Methodology and results

This study utilizes data from the Agricultural Census of Japan conducted in 1995, 2000, 2005, 2010, and 2015. The treatment groups consist of rice farmers in four municipalities in Fukushima prefecture, presumed to be affected by both the collective reputation and the accident. Meanwhile, the control groups comprise farmers in three municipalities in Niigata prefecture, assumed not to be affected by the collective reputation and the accident, as illustrated in Figure 2.

To examine the reputational effects on farmers, we outline the difference in difference approach (known as Two-way Fixed Effect (TWFE)).

$$y_{it} = \gamma \times Fukushima_{it} + \beta \times X_{it} + \alpha_i + \delta_t + \epsilon_{it}$$

where y_{it} is the outcome variables of household i in year t. $Fukushima_{it}$ is an indicator variable. X_{it} is vector of covariates. α_i and δ_t are respectively household and year fixed effects. ϵ_{it} is an error term. The model requires and parallel trend assumption. Our additional analysis, event study design, confirms the parallel trend assumption, regarding the results of Column (1), (2), and (6).

Table 1 reveals that the accident led to a 3.9 percentage point reduction in paddy fields for Fukushima farmers compared to those in Niigata (Column (1)). Additionally, Column (2) indicates a 6.7% decrease in cultivated paddy fields due to the accident. These findings highlight the significant and economically impactful influence of reputational damage on

farmers' input-related decision-making. Despite government assurances on product quality, collective reputational damage persists. Furthermore, Column (6) displays a statistically significant coefficient of -0.046 for Fukushima, indicating a 4.6% decline in environmentally friendly agricultural practices due to the accident's collective reputation damage from information friction.

4. Conclusions and policy implications

Our study yields two policy implications. Firstly, reputational damage from information friction influences suppliers' decisions, even with government quality assurances, highlighting the economic significance of collective reputation as an externality. Secondly, the study emphasizes that incentives for investing in high-value-added practices are significantly impacted by collective reputation, urging policymakers to reconsider promotion of such practices through strategic consideration of collective reputation.

Table 1 Reputational effects after Fukushima nuclear accident (TWFE)

	(1) Paddy field	(2) Cultivated paddy field	(3) Rice revenue	(4) Total leased farmland	(5) Paddy fields leased to others	(6) Environmentally friendly agriculture
Fukushima	-0.039*	-0.067**	-0.107**	0.015**	0.015**	-0.046**
	(0.020)	(0.027)	(0.542)	(0.007)	(0.006)	(0.022)
Household FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Control variables	Y	Y	Y	Y	Y	Y
Observations	39,558	39,558	39,558	39,558	39,558	28,501

Note: Two-way cluster standard errors at household and rural community-level in parenthesis. *, **, and*** denote significance at the 10%, 5%, and 1% level, respectively. Outcome variables from (1) to (5) are log-transformed, Column (6) is a dummy variable. Control variables include age and sex of household head, household size, dummy variables of incorporated farmers, farmers who gain non-farm income, and self-sufficient farmers.

References

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