WHY DO MUNICIPALITIES RECYCLE: USING BAYESIAN PANEL SPATIAL AUTOREGRESSIVE PROBIT MODEL

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Abstract:

In Japan, a recycling-based society has been promoted in order to prolong the life of landfill sites for waste disposal as well as to recycle during the past decade. The municipality and national aims for waste management are slightly different. For example, a municipality is responsible for disposing and cleaning up household waste within its borders. Therefore, securing scarce landfill sites takes a higher priority over saving energy or reducing CO_2 through waste incineration and resource recycling. If municipalities collect paper or plastic containers for recycling, combustion efficiency of incineration facilities will decrease. Because of this, some municipalities even add fuel such as kerosene. Depending on such municipalities' specific circumstances, types of recyclables collected and the rules for that are difference from one municipality to another.

In previous studies, Keeler and Renkow (1994) is first study to clarify optimal disposal strategies using theoretical model in terms of technology of municipal solid waste disposal. However the quantitative researches on municipalities' collection of recyclables have not been done thoroughly. To our knowledge, the empirical study is Kinnaman (2005), who empirically investigated why municipalities continue to operate recycling programs using aggregated state-level panel data in the U.S. His primary concern is to clarify the municipal decision of the state waste policy.

We focus on the different aims of disposing waste among the national government, local government, and its adjacencies. In particular, we use the data of municipality's behavior including to start recyclable collection of different types of recyclables, such as paper containers, plastic containers, and glass bottles because they have different impacts on the environment. For example, for municipalities having incineration facilities, paper and plastic containers serve not only as combustion improver, but also as fuel to produce electricity, which might keep them from implementing collection and separation. On the other hand, as for plastic containers and wrapping, recycling is more desirable than incineration or power generation from the standpoint of reduction of CO_2 emission (Ministry of the Environment, 2009b). However, if a municipality has enough space in landfill sites, it is not necessary to collect glass bottles separately from incombustible waste. Then, whether or not municipalities possess incineration facilities, or whether or not they have spare space in their landfill sites, may affect their decision of collection and separation of recyclables, when other factors are kept constant.

This paper analyzes the determinants of the municipality's decision to (or not to) implement collection and separation of recyclables by using the Panel Spatial Autoregressive Probit Model. More specifically, we will examine the following hypotheses about a municipality's decision to implement recycling. Firstly, the type of possession of landfill sites could affect the possibility that a municipality introduce collection and separation of recyclables. Secondly, we expect that the probability to introduce collection and separation of paper and plastic containers can be lower for the municipalities that possess incineration facilities than those that do not. Thirdly, municipalities might be subject to the restriction of their budget situation in

implementing collection and separation of recyclables. In terms of method, Panel Spatial Autoregressive Probit Model enables us to consider the spatial effects, such as adjacent municipalities' implementation status of recycling. To our knowledge, out study is one the first attempt to take neighbor effects into account in this area.

We find that municipal decision of collection cannibalizes recyclable waste which was supposed to recycle as materials: 1) municipalities that have an RDF (Refuse Derived Fuel) facility were less likely to collect and separate recyclable containers because they used paper or plastic containers to do energy recovery in their facilities; and 2) the decision to implement collection and separation activities is likely to be dependent on landfill scarcity, in particular probability of introducing recyclable collection by sharing with other municipalities are weaker than owning solely because of weak signal of prolong the life of landfill site. We also find the spatial correlation has significant impact on municipality's implementation of recyclable collection or separation.

With regard to policy recommendations, it may be needed to give something financial incentive to municipality if Japan government wants municipality to introduce recyclable collection. Because there is important evidence that municipality starts recyclable collection for its own reasons even if controlling policy mimic effect by our econometric model.