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Perceived barriers to food packaging recycling: Evidence from a choice experiment of US consumers

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ABSTRACT

To increase recycling rates, packaging companies, policymakers, and food and beverage companies have promoted recycling of packaging through media and packaging labels. Yet, how effective such information is at enhancing recycling behavior remains subject to debate. This study contributes to the literature on product recycling by examining how particular packaging characteristics foster or hinder recycling. An online survey administered to a representative sample of 1500 American households is used to examine consumer perceived barriers to recycling food packaging. Using a between-subject choice experiment design, we investigate the effectiveness of message targeting and media delivery, including infographic and video treatments, on consumer stated recycling behavior of a plastic or boxboard sandwich container. We find that respondents viewed having to clean packaging, a requirement for many food products, as a barrier to recycling, but not the type of packaging material or the number of steps involved in recycling the product. Individuals drawn to recycling for energy conservation reasons were less likely to view cleaning as a barrier. The information treatments did not significantly affect consumer recycling behavior, however, they altered preferences for packaging material.

1. Introduction

Recycling has been shown to have several positive effects on the environment, including lowering greenhouse gas emissions (US EPA, 2011). Since recycling programs began in the U.S., household recycling rates have steadily increased. Yet, in 2013 household recycling rates were still relatively low at 34% (US EPA, 2013), in comparison to countries such as the United Kingdom (43%) or Switzerland (51%) (OECD, 2015). Total household trash generated in the United States is at an all-time high (US EPA, 2013), partly due to an increase in the amount of packaging each household consumes. As the amount of packaging consumed increases, companies are pressured to take responsibility for the entire life cycle of their product packaging.

Companies have responded by promoting recycling of packaging material. For example, Coca-Cola released a specific green leaf recycling logo for their products in an effort to promote recycling behavior. However, since there is no universal recycling program in the United States, there has been confusion on how to label packaging since a product could be recyclable in one county, but not the next. Many American consumers assume that if a product is not clearly labeled recyclable, the product is not recyclable (Mintel, 2014). Even though there has been an increase in the overall amount of packaging recycled, the percent of packaging that is recycled has stagnated in recent years.

This study identifies drivers and barriers to recycling product-specific packaging. An online survey administered to a representative sample of 1500 American households is used to examine consumer perceived barriers to recycling food packaging materials. Using a between-subject choice experiment design, we investigate the effectiveness of message targeting and media delivery, including infographic and video treatments, on consumer stated recycling behavior. This paper contributes to the literature on product recycling by examining how particular packaging characteristics hinder recycling. Our results indicate that information campaigns are ineffective at promoting recycling of product packaging. However, in the context of sandwich packaging, they were found to alter consumer preferences for plastic and paperboard packaging materials. The findings of this study can aid policymakers and the packaging industry to better identify barriers, and help promote packaging recyclability by alternating product-specific characteristics.

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Previous research has mainly focused on cumulative recycling habits, with relatively little research available on product-specific recycling. Several studies evaluate consumer preferences for recycling, including motives and perceived barriers to recycling. Using a questionnaire from before and after a recycling scheme, Perrin and Barton (2001) found that the main reasons for recycling were convenience, concerns for future generations, the environment, and personal satisfaction. The study also found that the main reasons for not recycling were inconvenience, storage problems, and distance to recycling centers. Using panel data of county-level recycling rates in Minnesota, Sidique, Joshi & Lupi (2010a) reviewed several policies (e.g. mandatory recycling regulations and increasing recycling education expenditures) and their effects on recycling rates over a period of eight years. They found that a variable pricing strategy, such as charging more for larger trash containers, had the biggest increase in recycling rates. Their study concluded that higher income, older age, and larger household size were better predicting factors of usage of a recycling center than gender or marital status.

In another study, researchers observed a natural experiment that distributed recycling bins to select participants and followed up with a questionnaire (Guagnano, Stern, & Dietz, 1995). Households who were given a recycling bin were found to increase their recycling rates more than the control households. Several reasons for this change in behavior were proposed, including changed perception of social norms, increased convenience, or reduced cost of recycling. Gamba and Oskamp (1994) found that having specific knowledge about recycling was the strongest predictor of high recycling rates, followed by higher family income and the number of people living in the household. Halvorsen (2008) used an in-person survey in Norway to study consumers' opportunity cost of time spent recycling. The study concluded that increasing consumer opportunity cost of time negatively affected household recycling efforts. Building on these studies, we examine which specific packaging characteristics are perceived as barriers to recycling, and investigate how information treatments and motives affect consumer perceptions of such barriers.

2. Theoretical framework

Choice experiments (CEs) are one type of stated preference tools used to study consumer behavior. They facilitate the estimation of willingness to pay (WTP), which is the maximum amount that consumers value a specific good or service, or a specific trait within a good or service. The advantage of estimating consumer WTP is that it provides pricing information that is meaningful for industry leaders and policymakers. In a CE, consumers are asked to choose from alternative bundles of attributes instead of ranking or rating them (Adamowicz, Boxall, Williams, & Louviere, 1998). In a typical CE, participants assess various levels of attributes across several options, similar to what a consumer faces when making decisions in a real world scenario. In doing so, it elicits stated preferences for a non-market good.

Random utility theory has been widely applied to value consumer preference for products with multiple attributes (Manski, 1977). This theory assumes that individuals maximize their expected utility, given the budget and available choice set. The individual's utility is a random variable because the researcher has incomplete information (Manski, 1977). An individual will evaluate each alternative as represented by U_j,: $j = 1$ …, J alternatives. An individual decision maker's rule is that they will compare U_1, U_2, …., U_J and choose the alternative which provided them with maximum utility. Individual i will choose product j from J alternatives in situation t if and only if:

$$U_{ijt} > U_{ikt}, \quad \forall j \neq k \forall\ k \in J \tag{1}$$

Specifically, utility U_{ijt} is a combination of both a deterministic and stochastic term:

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} \tag{2}$$

The utilities associated with each alternative are not directly observable and include an error component. Therefore, the probability of selecting alternative j is:

$$P(j) = P(v_{ij} + \varepsilon_j \geq v_k + \varepsilon_k),\ j \neq k \forall j \in J \tag{3}$$

Assuming the distribution of coefficients over decision makers in the population can be represented with the probability density function f, the resulting probability of individual i choosing alternative j is given by:

$$P_{ijt} = \int \frac{e^{V_{ijt}}}{\sum_j e^{V_{ijt}}} f(\theta) d\theta \tag{4}$$

Although several model specifications can be used to estimate Equation (4), the random parameters logit (RPL) model is implemented since it is more flexible and accounts for heterogeneity (or differences) among individuals (McFadden & Train, 2000). In this model, indirect utility is assumed to be linear and can be expressed as

$$V_{ijt} = \beta_t' X_{ijt} + \varepsilon_{ijt} \tag{5}$$

where X_{ijt} is a vector of attributes for the jth alternative. β_i is a vector of individual-specific taste parameters and ε_{ijt} is a stochastic component of utility that is independently and identically distributed across individuals and alternative choices. This stochastic component of utility captures unobserved variations in tastes and errors in consumer perceptions and optimization, and follows a type-I extreme value (or Gumbel) distribution.

In order to operationalize the RPL model, the researcher must specify the distribution of the random parameters. The traditional approach is to specify the distribution of non-price coefficients as normal, holding the price coefficient constant. Specifying the distribution of the price parameter as normal would be problematic since this would allow positive values for the price parameter. This does not follow standard convention since economic theory predicts that individuals obtain negative utility from an increase in price. Also, a normally distributed price parameter could result in deriving distributions of WTP measures with infinite variances. Because of these reasons most researchers assume a fixed price coefficient.

In line with the previous literature, distribution of the random parameters is normally distributed for all variables, except for price, which is constant. Specifying utility as separable in price, p, and a vector of non-price attributes X_{ijt}, we can rewrite Equation (2) as:

$$U_{ijt} = -\alpha p_{jt} + \beta X_{ijt} + \varepsilon_{ijt} \tag{6}$$

Following model estimation, average WTP for each attribute X is derived as shown in Equation (7).[1]

$$WTP_X = -\frac{\beta}{\alpha} \tag{7}$$

[1] To eliminate the potential confounding effects between the intercept and certain attribute levels, the data was effects coded and WTP estimates were adjusted accordingly.