Extended Abstract

Developing interest in carbon labeling on changing consumer behavior, and reducing carbon emissions, has led to a wealth of research opportunities. Currently, many countries have options through third-party and government carbon-labeling entities available for market use (Liu, Wang & Su 2015). As a result, the evaluation of impact of these labels, as well as what leads to variation of impact, actual impact on resulting carbon emissions, economic implications of carbon labeling, and increasing widespread use of these methods are all developing research topics (Zhao, Wu, & Patti, 2020).

Liu, Wang and Su (2015) conducted a review of the development of carbon-labeling and its subsequent emergence across different countries. They note that, of course, different countries have different standards and practices for carbon labeling, but that in general the calculation of carbon impact is done through a Life Cycle Assessment (LCA). This assessment considers factors of production and distribution of products, which are then calculated into its overall carbon footprint. The outcome is a type of label, which can sometimes be accessed through 3rd parties or government agencies. The labels inform consumers about the environmental impact a product has in terms of Co2 emissions.

The implementation of widespread use for carbon labels, nevertheless, faces some challenges. For example, some concerns stem from how product labeling might change industry behavior towards increasing production and distribution in countries with less stringent carbon-labeling practices (Cohen and Vandenbergh, 2012). Other concerns stem from agricultural standards and practices, and how the increased demands for low-carbon products might create a strain on agricultural workers (Liu, Wang & Su, 2015).

Generally speaking, the interest in carbon labeling is through the attempt to reduce global carbon emissions at the consumer level. Some obvious questions that arise are whether or not carbon labeling results in significant change in consumer behavior, where consumers increase purchasing of low-carbon labeled products. There is also the question as to whether or

not this change in consumer behavior actually results in reduced carbon emissions. When taken together, it's clear that carbon labeling, its economic and environmental outcomes, are still an understudied initiative.

Vanclay, et. al. (2011) conducted a study to evaluate the impact of carbon-labeling on purchasing behavior in a grocery store in a small city in Australia. For their study, the researchers targeted product types with a relatively high degree of turnover for this specific store. They then labeled those items with a three-scheme labeling system to distinguish carbon-output for these products. The labels were green (low Co2), yellow (medium Co2), black (high Co2). They evaluated the impact of these labels on purchasing rates by determining gross % purchased of product type by months.

The researchers found that the labels had a significant, multi-directional, impact on the percentage of products purchased over a 3 month period of time (Vanclay, et. al., 2011). Specifically, they found that products labeled with a black (high Co2) label, generally reduced the number of products purchased over the span of 3 months. They mention that by the third month, sales dropped by 6%. Products in the yellow category did not result in significant impact of change. Whereas products with a green label resulted in increased sales of 4% over a three month period.

Carrero, Valor, Díaz, and Labajo (2021) extended this line of research by evaluating altering dimensions of labeling (such as size, content type, shape) as having further implications for influencing consumer behavior. In their study, they conducted structured interviews with respondents in regards to varying carbon labels. They altered dimensions of standard carbon labels by changing the size, color, shape, and location of where the labels were. They also included ‘warning’ elements, pertaining to the health and safety of a product based on its carbon dimensions. They found that participants responded to different dimensions based on noticeability and impact. For example, a common trend was that labels that were brightly colored, large, and placed on the front of a product increased its noticeability. The color of the

labels also tended to elicit emotional responses, particularly in regard to the health and hazard of a product (i.e. red means ‘danger’).

The current research aims to further studies examining the relationship between carbon labeling and intent to purchase under conditions of carbon labeling and labeling saliency. Specifically, this study aims to extend on previous literature by confirming the relationship between 3-scheme carbon labeling (i.e. high-, medium-, low-Co2) on intent to purchase for targeted products. It is also the purpose of this study to examine whether or not the saliency of the labels represented in size also lead to higher rates of intent to purchase for low-Co2 products, and lower rates of purchasing for high-Co2 products.

Method

The current study used an online grocery store model similar to the one used by Panzone, Ulph, Hilton, Gortemaker and Tajudeen (2021). The grocery store contained a total of 700 items generally found in local grocery stores. Participants used an online account to access the grocery store, where they could click on an item, examine it, then put it into a digital grocery bag for purchasing. Participants were allowed to edit, remove, and add items to their bag at any time during this study. They were given one hundred digital dollars to spend in the grocery store on any item they wanted, and could access the grocery store anytime from 8 a.m. to 9 p.m. Monday through Sunday.

Participants were recruited from a local university to partake in this study (n = 203). Participants were required to create a username and password unique to them to access the online grocery store. This also allowed researchers to keep track of purchasing intent for each participant. The span of the study lasted 3 weeks. During the first week, baseline data on intent to purchase was collected for all participants. During this phase, participants were able to log in and access the online grocery store at any point during the first week to purchase items. There were no restrictions on the types of products they purchased, as long as they spent within the spending limit for that week. No carbon labels were present during this phase of the study. Intent

to purchase was calculated by quantifying the number of low-Co2 and high-Co2 products by the total number of products purchased. This was gathered at the end of each shopping phase, and used to evaluate changes across experimental conditions.

Experimental Design

After week 1, the baseline phase, participants were assigned to one of two experimental groups. Both groups went into week 2 with the implementation of carbon labels, with no adjustments to the saliency of the labels. A Life Cycle Assessment (LCA) was used to calculate the hypothesized carbon value of each product in the store, and items within the store were labeled as either low-Co2, medium-Co2, and high-Co2 valued products. When participants accessed the online grocery store, labels could be viewed only when participants selected and viewed a product. Intent to purchase was then calculated by determining the number of low-, medium-, and high-Co2 products from the overall store and representing them in percentage of category by total products purchased.

During week 3, the saliency of the carbon labels were manipulated for each group. Group 1 were exposed to large carbon labels. Here, the carbon labels were the same as in week 2, only they were half an inch larger than the original labels. Group 2 were assigned to the small carbon labels. Here carbon labels were also the same as in week 2, excepting that they were a half-inch smaller than the original labels. Intent to buy was calculated for both groups using the same calculations as previous conditions.

Results

Results indicate that there was a strong relationship between carbon labeling and intent to purchase there was a significant interaction between carbon label type and intention to purchase ($F = 125.9$, $p < .001$) with low-Co2 label having a higher percentage of intention to buy ($M = 56$) than for medium ($M = 30$) and high Co2 labeled products ($M = 22$, $F = 25.1$, $p<.001$). On average, there was a 26% increase in intention to buy low-carbon products once they were labeled. There was a marginal increase of sales for medium-Co2 labeled products representing

5% of items intended to be purchased. Whereas high-Co2 labeled products resulted in a decrease of sales by 10% compared to baseline. When we included saliency by size, there was a significant interaction (F(carbon label x size) = 5.9, p = .04). In general, participants in the large carbon-label group purchased a significantly larger number of low-Co2 products than participants in the small carbon-label group. It should be noted though that participants in both groups still purchased a larger amount of low-Co2 labeled products than high-Co2 products.

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