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ANALYSIS

Ignorance Is Bliss? Experimental Evidence on Wine Produced from Grapes Irrigated with Recycled Water

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ABSTRACT

Agricultural industries are heavy users of water, which can be especially concerning in times of drought. One way to address agriculture's impact during droughts is to use recycled water for irrigation, but little is known about how consumers will respond to information disclosing that a food product was produced with recycled water. On the positive side, irrigation with recycled water is environmentally friendly. On the negative side, there is an "ick" factor that might repel consumers. We conducted a framed field experiment to evaluate consumers' responses to California and French wines made from grapes produced with recycled, conventional, and an unspecified type of water for irrigation. We find that consumers prefer not to know; their willingness to pay is greatest when the wine is made from grapes irrigated with an unspecified type of water. There is a discount for conventional irrigation water for both California and French wines, but it is statistically significant only for the California wines.

1. Introduction

Traditional water sources are increasingly suffering from the effects of climate change and overuse (Aeschbach-Hertig and Gleeson, 2012). California, in particular, suffered from an unusually severe and extended drought (Aghakouchak, 2015) that has severely restricted the supply of fresh water for irrigation. A potential solution to the state's lack of irrigation water is to develop alternative sources such as recycled wastewater, which is highly treated wastewater from various sources such as domestic sewage, industrial wastewater and storm water runoff (California Department of Water Resources (DWR), 2018).

Using recycled water for irrigation is already popular in some countries. For example, 85% of effluent in Israel was reused in 2012 (Israeli Water Authority, 2015), significantly abating their deficit of fresh water (Becker and Ward, 2015). However, using recycled water for irrigation is a new technology, and few U.S. producers have adopted it despite its value as a cost-effective way to grow crops sustainably (Gleick, 2010).[1] Their reluctance is related, at least in part, to concerns about how U.S. consumers will react to food produced with recycled water (Po et al., 2005; Rozin et al., 2015) even though water recycling is highly regulated by government agencies. Consumers' aversion can be further amplified when they are exposed to phrases such as "toilet to tap" (Dingfelder, 2004) adopted by a number of media sources (Hui and Cain, 2017).

Labeling has a significant effect on consumer responses to numerous products. Positive labels such as "organic" and "eco-friendly" can generate a premium in consumer willingness to pay (WTP) for a product while negative labels such as "genetically modified" can diminish consumer valuations (for a review of studies of these effects, see Messer et al., 2017). Such labeling can also influence public perceptions of the product in general, thus influencing unlabeled products as well (Costanigro and Lusk, 2014; Liaukonyte et al., 2013). What happens, then, when some products in a category are labeled with controversial information?

Use of recycled water to irrigate crops is one such type of information. Agricultural uses accounted for 80% of total U.S. water consumption and > 90% of the water consumed in many western states (U.S. Department of Agriculture Economic Research Service, 2016). The large amount of water required for irrigation of crops is a significant concern in California, which has experienced a severe and extended drought.

Using recycled water in agricultural irrigation can benefit the

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[1] In 2012, California reused approximately 0.75 million acre-feet of water, from which 40% was used in agricultural irrigation (Lassiter, 2015). At the same time, DWR estimates water use withdrawals for agricultural irrigation at 33 million acre-feet (DWR, 2018).

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environment and mitigate the effects of crop production on droughts. Therefore, it can provide the basis for positive eco-labeling and potentially lead to greater consumer WTP (Loureiro et al., 2002; Loureiro and Lotade, 2005; Vlaeminck et al., 2014; Van Loo et al., 2015; Takahasi et al., 2018). On the other hand, there is a repulsive "ick" factor[2] associated with recycled water that tends to decrease consumer WTP for products produced using it (Po et al., 2005). The net effect on WTP and on the labels producers would be interested in using depends on the relative importance consumers attach to the two factors. For consumers, if the public environmental benefits outweigh the private "ick" factor, use of "recycled" irrigation water could generate a premium relative to use of "conventional" irrigation water. However, if the "ick" factor outweighs the environmental benefit, there would be a disincentive to label products associated with recycled water and a perhaps an incentive to label products associated with conventional water. Of course, it could be that consumers do not want to think about the source of irrigation water when making their purchases decisions. So what are good strategies when communicating with consumers? We conducted a framed field experiment (Harrison and List, 2004) to shed light on this issue for researchers, policymakers, and agricultural industries.

The experiment was conducted at a large annual food, wine, and spirits festival[3] in the mid-Atlantic of the United States and was designed to examine wine consumers' perceptions of use of recycled irrigation water on grapes used for wine and how their preferences change in response to several information treatments. We recruited 230 wine consumers at the festival who ranged in age from 21 to 76 years. In the experiment, participants were presented with opportunities to purchase bottles of wine that varied in two dimensions: origin (California and France) and the type of water used when irrigating the grapes (conventional, recycled, and unspecified). This experimental design allowed us to answer two primary research questions: (1) Which type of irrigation water commands the greatest WTP? (2) How does WTP change in response to information treatments regarding the origin of the wine and the source of the irrigation water? The data also allowed us to investigate if some consumer demographic characteristics are significant in explaining WTP.

Wine was chosen as the experimental product for several reasons. First, as noted by Higgins et al. (2014), wine purchases in the absence of tasting are often challenging and information-laden decisions so wine consumers are sensitive to product labels. Second, research has found that the reputations of both the firms and the wine-producing region often play a role in consumers' wine choices (Costanigro et al., 2010; Rickard et al., 2015). Therefore, using different types of water when irrigating the wine grapes could influence a firm's reputation in the long run and shift consumer preferences for all of its wine products. Finally, wine is an important product to study because so much wine is grown in California, which was an early adopter of recycled water for irrigation (Napa Sanitation District, 2012).

In 2015, California was responsible for 85% of total U.S. wine production, accounting for 638 million gallons, while simultaneously suffering from a severe drought for most of the past decade. In the Napa Valley, where much of California's highest valued wines are produced, the Napa Sanitation District has been working to expand use of recycled water and developed a Recycled Water Strategic Plan to explore options for maximizing water recycling (Napa Sanitation District, 2012). In recent years, the California wine industry has recognized that recycled water is an acceptable alternative source for irrigation that provides numerous environmental and agricultural benefits, but growers and vintners remain deeply concerned about whether consumers will accept the resulting wines. Therefore, a timely study of consumers' responses to wines produced using recycled water greatly benefits the wine industry and provides important information for policymakers. We find that labels providing information on the type of irrigation water used in wine production does not increase consumers' WTP for wine. When information about the type of irrigation water used is presented, wine that does not specify the type of water used produces the highest average WTP, followed by use of conventional water and then by use of recycled water. Positive information about recycled water did not increase participants' WTP relative to a baseline case of no information. In fact, the evidence produced in the experiment suggests that providing information about irrigation water to consumers decreases their valuations for the wines. These results imply that labeling a product as "irrigated with conventional water" or as "irrigated with recycled water" is likely to reduce WTP. Thus, in the case of wine made from grapes that were irrigated with recycled water, consumers prefer less information; hence "ignorance is bliss."[4] This can be partly explained by the fact that use of recycled water is controversial, and people tend to react more strongly to negative information than to positive information.

In terms of how demographic characteristics affect WTP for the wines, we find that politically liberal individuals generally reported a greater WTP for wine associated with recycled water than politically conservative individuals. Income and education have opposite effects; individuals with higher incomes prefer wine produced using conventional water while individuals with greater education prefer wine produced using recycled water.

2. Related Literature

How information influences consumer choices has gained much attention in recent years. Information about a commodity is usually communicated to consumers through two channels: (1) brief labels on packages and (2) more-detailed descriptions delivered by media sources. Previous studies have found that both channels have significant effects on consumer preferences. Well-known examples for brief label information include eco-labeling, which generally has a positive effect on consumer WTP for a product (Wessells et al., 1999; Takahasi et al., 2018). Examples of the effects of relatively detailed media information include positive effects of information regarding scientific innovations (Li and McCluskey, 2017) and negative effects from media-induced concerns about food safety (Payne et al., 2009).

Though many studies have found that information influences WTP in expected directions—positive information increases consumer WTP and negative information decreases WTP—consumers can suffer from information "overload" and providing "too much" information can result in negative consequences (Malhotra, 1984; Jacoby, 1984; Scheibehenne et al., 2010). As various information technologies have developed, information overload has become an especially pressing issue that deserves additional study.

The literature has investigated cases in which policymakers and industries can clearly label a product as good or bad. For products such as wine made from grapes irrigated with recycled water that both provide a benefit and present some disutility (Po et al., 2005), little is

[2] Note that the "ick" factor does not have to be all powerful. Rather, it might have a mild effect that the consumer would rather not focus on and still consume the product.

[3] This venue was chosen because we focused on wine products in this study, and we needed to restrict the participants to regular wine consumers. To study how consumers respond to irrigation water type for more general food products such as produce, a venue that attracts a more general population is more suitable.

[4] Oster et al.'s (2013) analysis of genetic testing for Huntington's disease (HD) contributes a rationale for information avoidance. If an individual is tested for HD receives a positive test result, he or she can no longer have hope for a future without HD. They argue that the loss of the option to believe that one is healthy regardless of the true state is a cost of testing and can result in individuals electing to not be tested.