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Graduate Student Paper Competition Winner:

Effects of Cost and Campaign Advertising on Support for California's Proposition 37

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Proposition 37 would have required genetically engineered food in California to be labeled. This paper reports the results of a survey designed to determine Californians' voting intentions prior to the vote, perceptions about the prevalence of genetically engineered foods in the United States, willingness to pay for a mandatory label, and effectiveness of advocacy advertising. Overall, Californians had inaccurate knowledge about the prevalence of genetically engineered foods, and stated they were willing to pay up to 13.8% higher food costs on average for a mandatory label. Findings suggest that the effectiveness of opposition advertising was likely a formative factor in the defeat of Proposition 37.

Key words: biotechnology, campaign advertising, genetically engineered, genetically modified, mandatory labeling, perceptions, Proposition 37

Introduction

On November 6, 2012, Californians voted on Proposition 37 (hereafter Prop 37), a ballot initiative that would have required mandatory labeling of raw or processed food made from genetically engineered (GE) plants or animals. California is one of the largest states in terms of both agricultural imports and exports; Prop 37 was therefore thought to be the first major policy attempt to transition from voluntary to mandatory labeling of GE foods in the United States. Some economists warned that the proposition could result in restricted choice and serve as a regressive food tax on the poor and elderly (Alston and Sumner, 2012; Carter et al., 2012; Kalaitzandonakes and Lusk, 2012), while advocates claimed the proposition would give the consumers "the right to know" at a minimal cost (Pino, 2012; Boxer, 2012).

Many experiments have shown that consumers are willing to pay to avoid GE foods (e.g., Lusk et al., 2001; Noussair, Robin, and Ruffieux, 2002; Huffman et al., 2007; Tonsor and Schroeder, 2003; VanWechel et al., 2003; Lusk et al., 2004; Noussair, Robin, and Ruffieux, 2004), and other analyses have used consumer preferences to infer implications for GE food-labeling policies (e.g., Teisl, Bockstael, and Levy, 2001; Dhar and Foltz, 2005; Hu, Veeman, and Adamowicz, 2005; Lusk et al., 2005; Rousu et al., 2007). An implicit assumption when using experimental data to infer preferences for policies is that the same underlying preferences drive both decisions.

However, it has been argued that the factors motivating voting and purchasing decisions often differ. As Brooks and Lusk (2012) or Hamilton, Sunding, and Zilberman (2003) demonstrate, purchasing behavior may not reflect voting behavior. This behavioral dissonance is often referred to as the "citizen versus consumer" conflict, although Brooks and Lusk (2012) point out that it is

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not always the case that consumers demand more regulation than their shopping behavior would suggest.

Prop 37 failed to pass, with 51.4% (6,442,370) of Californian voters opposing the ballot measure. The result astounded many observers, as virtually every poll leading up to the election indicated the proposition would pass. Support for Prop 37 repeatedly polled around 70% until less than a month before the election. The reasons for the sudden decline in voter intentions are unknown, but information from advocacy groups likely had some effect.

In the weeks just prior to the election, both opponents and supporters of Prop 37 communicated information about the possible outcomes of the proposition through media campaigns. Some supporters of Prop 37 blame the change in voter intentions on the deep pockets of biotechnology corporations that produce GE seed and food companies that use GE ingredients. This belief is not completely unfounded, as opponents of Prop 37 raised almost $45 million compared to the almost $11 million raised by supporters (California Secretary of State, 2013).

It is likely that consumers used advocacy information about Prop 37 to update prior knowledge about GE foods. Previous experiments have examined how consumers' willingness-to-pay (WTP) is influenced by benefit/risk information about food technologies (Fox, Hayes, and Shogren, 2002; Lusk et al., 2004; Rousu and Shogren, 2006; Marette et al., 2008; Rousu and Lusk, 2009); however, many of these studies did not incorporate the types of advocacy information actually used by activist organizations in the "real world." Many (if not most) of the campaign information disseminated about Prop 37 had little to do with the benefits and risks of GE foods *per se*. Rather, opponents' ads focused on the labeling contradictions of the proposition and the likely costs, while supporters' ads focused on the deception of large corporations and consumers' "right to know." Notable exceptions are studies by Marks et al. (2003) and Kalaitzandonakes, Marks, and Vickner (2004), which examined media coverage of GE foods and its influence on consumer choice. However, these analyses were not related to a specific policy. Due to the "consumer vs. citizen" issue, it is not clear that WTP studies will reveal how consumers will vote on an issue or how sensitive votes are to information.

This study examines the intended voting behavior of Californians and determining: 1) how consumers intended to vote on Prop 37 before the actual vote; 2) the sensitivity of voting intentions to potential increases in food costs; 3) the effects of opponent and supporter advertisements on voting intentions; and 4) how prior perceptions of GE foods and socioeconomic characteristics affect voting behavior and response to information. Overall, this study reveals insights that help explain how prior perceptions and advocacy advertising affected voting intentions and ultimately ended in the failure of Prop 37.

Survey Questions, Methods, and Summary Statistics

Five weeks before the election, September 20–27, 2012, we administered a survey to a random sample of Californians chosen from an online panel maintained by Qualtrics© and their associated partners. The completed sample included 1,003 Californians. Although online surveys have disadvantages related to potential weaknesses in representativeness, the online platform allowed us to show actual television advertisements from opponents and supporters of Prop 37 and measure their effectiveness.

Survey questions, described in more detail in subsequent sections, were asked in the following order: 1) voting intention on Prop 37 (*Initial Vote*); 2) respondents in support of Prop 37 and a mandatory label were then asked a contingent valuation (CV) question to determine WTP for a mandatory label (*WTP Vote*); 3) a series of questions to determine perceptions about the proliferation of GE crops and ingredients in the U.S. food supply (*Perceptions about the Proliferation of GE Crops and Ingredients*); 4) voting intention on Prop 37 after viewing either an anti-Prop 37 advertisement

Table 1. Description of Variables Used in Data Analysis

Dependent Variables	Description	Mean
Initial Vote	1 if vote of "YES" on Prop 37 before WTP question and campaign advertisement, 0 if "NO"	0.754
WTP Vote	1 if vote of "YES" on Prop 37 after WTP question and before campaign advertisement, 0 if "NO"	0.513
Advertisement Vote	1 if vote of "YES" on Prop 37 after campaign advertisement, 0 if "NO"	0.673
WTP Vote Change	1 if vote changed from "YES" to "NO" after WTP question, 0 if no change	0.487
Advertisement Vote Change	1 for a change in vote that corresponds with commercial viewed, -1 for a change in vote that contradicts commercial viewed, 0 if no change	0.077
Independent Variables		
Age	Age in years	26.10
Education	1 if Bachelor's degree or higher, 0 otherwise	0.493
Gender	1 if female, 0 of male	0.507
Income	An integer variable ranging from 1 to 8, used to represent income categories (1=$0–19,999, 2=$20,000–$39,999 … 8=$140,000 or more)	3.776
Political Ideology	-2 if extremely liberal, -1 if liberal, 0 if independent or I don't know, 1 if conservative, and 2 if extremely conservative	−0.109
GE Crops	Ranges from 0 to 3 in intervals of 0.05, determined by the sum of percentage of acres believed to be planted to GE corn/soybeans/wheat in the United States	1.360
GE Products	An integer variable ranging from 0 to 4, determined by the sum of indicator variables equal to 1 if a respondent believed that Coke or Pepsi/Frito-Lay/Kashi/Kellogg's products contain GE ingredients, 0 otherwise	1.312
Cost	An integer variable ranging from 2 to 25, equal to the randomly assigned Cost value in the WTP question	15.08
Video	1 if in "YES" advertisement treatment, 0 if in "NO"	0.499

or a pro-Prop 37 advertisement (*Advertisement Vote*); and 5) a series of demographic questions.[1] A complete list, description, and means of all dependent and independent variables used in model estimation can be found in table 1. It should be noted that the sample is slightly younger and more educated than the average U.S. citizen.

Perceptions about the Proliferation of GE Crops and Ingredients

Respondents were asked two series of questions to determine their perceptions about the proliferation of GE crops and ingredients in the U.S. food supply. The first questions asked, "In the United States, what percent of CORN acres are planted with genetically engineered seed?" Participants responded by choosing a number that ranged from 0% to 100% in intervals of 5%. Respondents answered similar questions for soybeans and wheat. The second series of questions asked, "Do any Coca-Cola and/or Pepsi products contain genetically engineered ingredients?" Response categories were "Yes," "No," and "I don't know." Respondents answered similar questions for Frito-Lay, Kashi, and Kellogg.

Across respondents, the average percentage of corn, soybean, and wheat acres believed to be planted with GE seed was 48%, 47%, and 45%, respectively. In 2012, 88% and 93% of all corn and soybean acres planted were GE according to the USDA; however, there is no commercial production of GE wheat in the United States at present (USDA National Agricultural Statistics Service, 2012). Only 11.2% and 12.2% of respondents said they thought more than 85% of corn and soybean acres

[1] The analysis was conducted both by focusing only on those people who intended to vote in the November election and using weights for county size. The findings were virtually identical to the full sample results; as such, we report the results for the full sample.

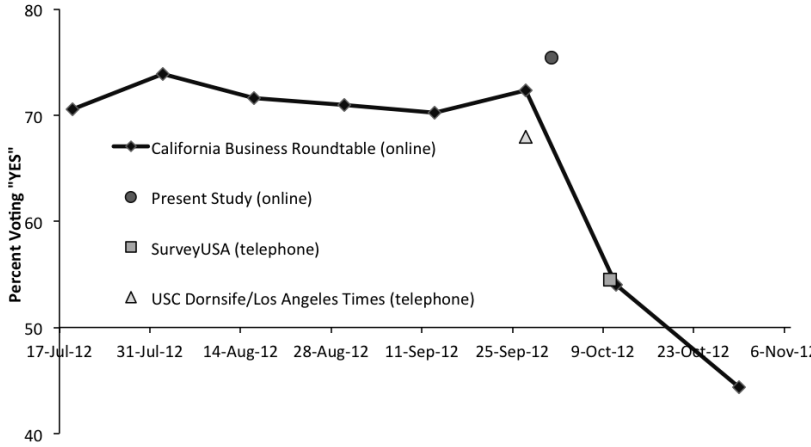

Figure 1. Prop 37 Polls Leading Up to Election Day

were GE, and only 4.9% of respondents correctly stated that 0% of wheat acres were GE. We found that 31%, 45%, 21%, and 41% of respondents said "Yes" that Coca-Cola/Pepsi, Frito Lay, Kashi, and Kellogg sell at least one product that contains GE ingredients. However, all these brands sell products that contain or have contained GE ingredients.

The models included two explanatory variables designed to measure perceptions about the extent of GE use in the food-supply chain. Answers to questions about the percentage of corn, soybean, and wheat acres believed to be planted with GE seed were summed for each respondent to create a variable (*GE Crops*). *GE Crops* ranges from 0 to 3 in intervals of 0.05 and provides an index related to perceptions about prevalence of GE seed in U.S. crop production. A higher number indicates a belief that GE is more widely adopted. In terms of perceptions about the GE content of retail food products, indicator variables equal to 1 were created for each major food brand (Coke/Pepsi, Frito-Lay, Kashi, or Kellogg's) if a respondent believed the brand sold a product that contained GE ingredients and 0 for each brand not believed not to have a product containing GE ingredients. The indicator variables were summed for each respondent to create a measure of prior belief about the use of GE ingredients in food products (*GE Products*). *GE Products* ranges from 0 to 4. *A priori*, the effect of perceptions about prevalence of GE crops or food on voting behavior is unknown; it is plausible that a belief in high prevalence may increase or decrease demand for a mandatory label. In addition to the belief measures, the regressions include age, education, gender, income, and political ideology as independent variables.

Initial Vote

Respondents were asked about their Prop 37 voting intentions using text provided in the California Voter Information Guide. A "YES" vote mandates a label and a "NO" vote maintains the status quo of voluntary labeling. Of the sampled California respondents, 75.4% intended to vote "YES" on Prop 37. This result does not mirror the actual outcome, as Prop 37 ultimately failed to pass; however, as shown in figure 1, most major polls (including this one) leading up to the election indicated that Prop 37 would pass. The California Business Roundtable was the only poll that indicated Prop 37 would fail, and that particular poll occurred just six days prior to the election and conflicted with the results of the previous seven polls conducted.

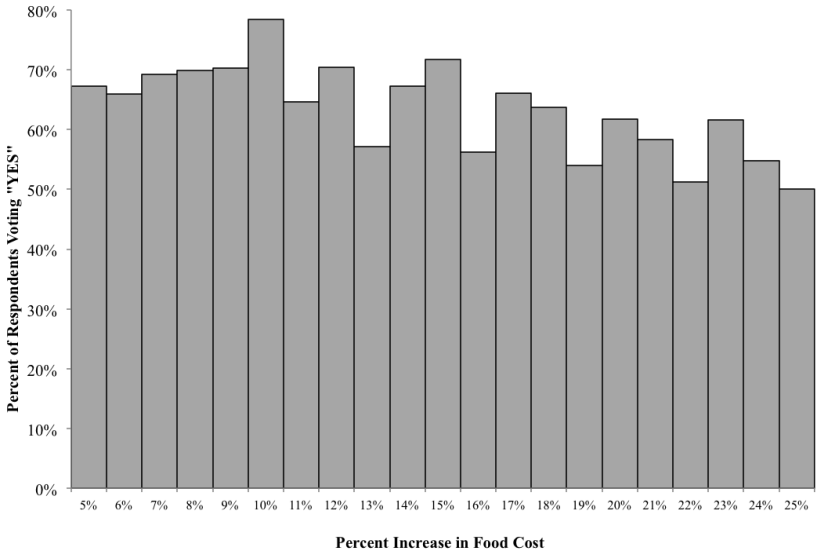

Figure 2. Proportion of Consumers Who Persisted in Intending to Vote "YES" after WTP Question

WTP Vote

Although the precise change in food costs caused by Prop 37 was unknown, opponents and supporters agreed that food costs would increase by *some* amount. Following the one-and-a-half bound CV format discussed in Cooper, Hanemann, and Signorello (2002), we sought to determine WTP for a mandatory label by asking the follow-up question: "Would you still vote "YES" on Proposition 37 if you knew it would increase food costs by «*Cost*»%?" to respondents who initially said they intended to vote "YES" on Prop 37. *Cost* randomly varied from 5 to 25 across respondents and had a mean of 15.08.

The number of respondents intending to vote "YES" on Prop 37 after being asked the CV question was nearly halved, decreasing from 756 to 388. Figure 2 displays the percentage of respondents for each *Cost* that intended to vote "NO" after the CV question. More than 30% of respondents intended to vote "NO" at lower *Cost* values, and, as expected, the percentage of respondents intending to vote "NO" increased at higher *Cost* values. This result indicates that demand for a mandatory labeling policy is price sensitive.

Advertisement Vote

At the time the survey was developed, there were only two television advertisements that had been made public (No on Prop 37, 2012; Yes on Prop 37, 2012). We randomly assigned half of the subjects to each of the two advertisement treatments. After viewing one of the two advertisements, respondents were asked to vote on Prop 37 again. The anti-Prop 37 advertisement (No on Prop 37, 2012) focused on the exemptions or "loopholes" provided by Prop 37, including the exemption of prepared food, while the pro-Prop 37 advertisement (Yes on Prop 37, 2012) focused on the deceptions of large industries like Big Tobacco and then referenced Monsanto to suggest that consumers should mistrust GE technology.

Figure 3 shows the effects of the advertisement treatments. Of 503 respondents assigned to the anti-Prop 37 advertisement treatment, 375 (74.5%) initially intended to vote "YES." After viewing the No on Prop 37 advertisement, 95 respondents changed their vote from "YES" to "NO" and 16 respondents changed their vote from "NO" to "YES," decreasing the intended "YES" vote by 15.7%.

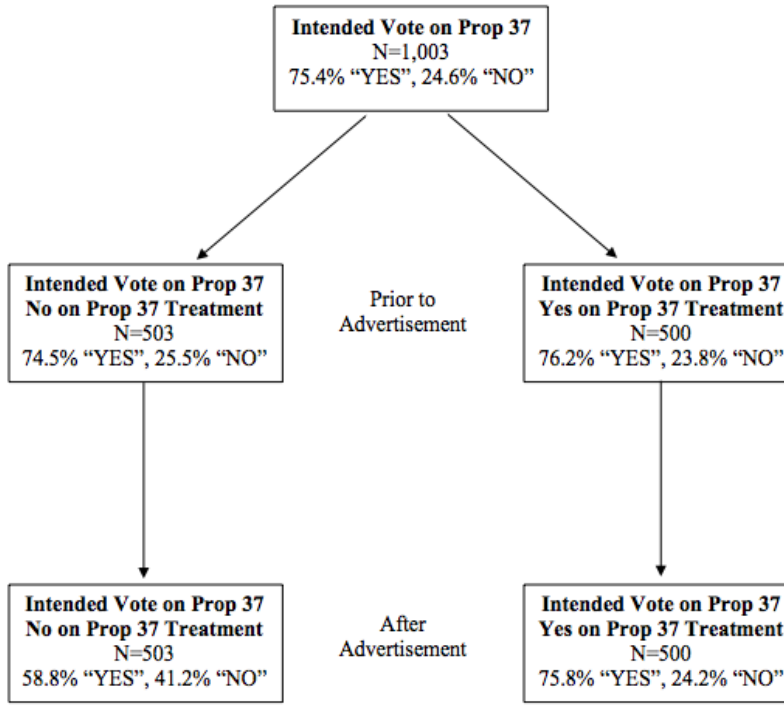

Figure 3. Effect of Television Advertisements on Intentions to Vote for Prop 37

Of 500 respondents assigned to the pro-Prop 37 advertisement treatment, 381 (76.2%) initially intended to vote "YES." After viewing the pro-Prop 37 advertisement, 36 respondents changed their vote from "NO" to "YES" and 38 respondents changed their vote from "YES" to "NO," *decreasing* the intended "YES" vote by 0.4%.

Econometric Modeling and Results

Vote Models

Initial Vote

A binary probit model was estimated using the data from the initial vote (before cost or advertising information was introduced) as a dependent variable (*Initial Vote*). The assumption that the parameter estimates for both treatments were equal was a valid concern when combining data from two treatments (i.e., the two campaign advertisement treatments) to estimate models. Therefore, log-likelihood ratio tests estimated to test whether combining the data was appropriate were conducted for all models. As expected (due to random assignment to treatment), there were no significant differences in estimates prior to the videos. We therefore do not report separate estimates related to the *Initial Vote* model.[2]

[2] The null hypothesis that the parameter estimates for the two treatments are equal was not rejected at a 0.05 significance level by a Chi-square test. The combined model had a log-likelihood function value of -543.18, whereas the separate models had values of -275.91 and -265.26. The test statistic is $2 \times (543.18 - 541.17) = 4.02$, which is a distributed chi-square with eight degrees of freedom; the 0.05 critical chi-square value with eight degrees of freedom is 15.51.

WTP Vote

Only respondents who voted "YES" on the initial vote question were presented with a follow-up cost question. As a result, there are three possible voting outcomes ("NO"; "YES, NO"; and "YES, YES"). We estimated an econometric model based on the probability of falling into each of these three categories as a function of cost, demographic characteristics, and perceptions. Following the approach of Cooper, Hanemann, and Signorello (2002), the probabilities for "NO" (π_i^{NO}); "YES, NO" ($\pi_i^{YES,NO}$); and "YES, YES"($\pi_i^{YES,YES}$) responses for the i^{th} respondent are given by

$$\pi_i^{NO} = \text{Prob}\{WTP_i \leq 0\%\} = 1 - \Phi(0\%; \boldsymbol{\beta}_{v2}, \gamma), \tag{1}$$

$$\pi_i^{YES,NO} = \text{Prob}\{0\% \leq WTP_i \leq Cost_i\%\} = \Phi(0\%; \boldsymbol{\beta}_{v2}, \gamma) - \Phi(Cost_i\%; \boldsymbol{\beta}_{v2}, \gamma), \tag{2}$$

$$\pi_i^{YES,YES} = \text{Prob}\{WTP_i \geq Cost_i\%\} = \Phi(Cost\%; \boldsymbol{\beta}_{v2}, \gamma), \tag{3}$$

where WTP_i is the true unobserved WTP for respondent i, $Cost_i$ is the increase in food cost random assigned to respondent i $\boldsymbol{\beta}_{v2}$, is a vector of coefficients to be estimated for explanatory variables in vector $\boldsymbol{X}$, and γ is an additional coefficient to be estimated for *Cost*. The coefficients are estimated using maximum likelihood. The log-likelihood function is

$$\begin{aligned} \ln L(\boldsymbol{\beta}_{v2}, \gamma) \quad = \quad & \sum_{i=1}^{1,003} \{I_i^{NO}[1 - \Phi(0\%; \boldsymbol{\beta}_{v2}, \gamma)] + I_i^{YES,NO}[\Phi(0\%; \boldsymbol{\beta}_{v2}, \gamma) - \\ & \Phi(Cost_i\%; \boldsymbol{\beta}_{v2}, \gamma)] + I_i^{YES,YES}[\Phi(Cost\%; \boldsymbol{\beta}_{v2}, \gamma)]\}, \end{aligned} \tag{4}$$

where $I_i^{NO} = 1$; $I_i^{YES,NO} = 1$; or $I_i^{YES,YES} = 1$ if respondent i responded "NO;" "YES, NO;" or "YES, YES" to the two voting questions.

Mean WTP for a mandatory label was calculated using the variable means in vector $\boldsymbol{X}$ and the coefficients from the estimated model. Specifically, mean WTP was calculated by

$$WTP^{mean} = -\frac{\overline{\boldsymbol{X}}'\boldsymbol{\beta}_{V2}}{\gamma}. \tag{5}$$

As before, we tested whether it was appropriate to pool the data across the two campaign advertisements and failed to reject the null hypothesis that the parameter estimates were equal at a 0.05 significance level.[3] These results reconfirm that assignment of participants to the two advertising treatments was indeed random.

Advertisement Vote

A binary probit model was estimated using the data from the vote after advertising information was introduced as a dependent variable (*Advertisement Vote*). Unlike the two previous models, combining the data for the two campaign advertisement treatments was not appropriate, because the null hypothesis that the parameter estimates for the two treatments were equal was rejected at a 0.05 significance level.[4] This result implies that the different television ads had significantly different effects on voting outcomes.

[3] The combined model had a log-likelihood function value of -1,108.40, whereas the separate models had values of -574.67 and -533.73. The test statistic is $2 \times (1,108.40 - 1,108.40) = 0$, which is a distributed chi-square with eight degrees of freedom; the 0.05 critical chi-square value with eight degrees of freedom is 15.51.

[4] The combined model had a log-likelihood function value of -616.16, whereas the separate models had values of -326.10 and -267.48. The test statistic is $2 \times (616.16 - 593.58) = 45.16$, which is a distributed chi-square with eight degrees of freedom; the 0.01 critical chi-square value with eight degrees of freedom is 20.09.

Table 2. Probit Model Coefficient Estimates for *Vote* Variables

Independent Variables	Dependent Variables				
	Initial Vote	**WTP Vote**	**Ad. Vote**	**No on Prop 37 Ad. Vote**	**Yes on Prop 37 Ad. Vote**
Constant	0.430*	−0.122	0.166	−0.249	0.454
	(0.147)	(0.143)	(0.141)	(0.210)	(0.206)
Age	0.000	0.001	0.000	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Education	0.052	0.051	0.000	0.196	−0.216
	(0.099)	(0.094)	(0.094)	(0.129)	(0.141)
Gender	0.267***	0.315***	0.173**	0.154	0.249**
	(0.089)	(0.085)	(0.084)	(0.116)	(0.126)
Income	0.003	0.049	0.001	0.016	0.024
	(0.022)	(0.021)	(0.021)	(0.028)	(0.033)
Political Ideology	−0.159***	−0.134***	−0.132***	−0.124**	−0.175***
	(0.042)	(0.039)	(0.040)	(0.054)	(0.061)
GE Crops	−0.008	−0.015	0.004	0.010	−0.015
	(0.063)	(0.059)	(0.060)	(0.081)	(0.092)
GE Products	0.076**	0.171*	0.120***	0.143***	0.093*
	(0.034)	(0.032)	(0.032)	(0.044)	(0.050)
Cost	-	−0.037***	-	-	-
	-	(0.003)	-	-	-
Log Likelihood	−543.18	−1,108.40	−616.16	−326.10	−267.48

Notes: Estimates are from a binary probit modeled for the probability of a "YES" vote on Prop 37. Number of observations equals 1,003 for *Initial Vote*, *WTP Vote*, and *Advertisement Vote*, 503 for No on Prop 37 *Advertisement Vote*, and 500 for Yes on Prop 37 *Advertisement Vote*. Standard errors are reported in parenthesis. Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level.

Vote Models Results

Table 2 shows the results for the five models estimated to determine the effects of GE prevalence perceptions and demographics on intended vote for Prop 37. The *Political Ideology* coefficients were negative across all models, indicating that self-identified conservatives were significantly less likely to vote "YES" on Prop 37 (and by implication, liberals were more likely to vote "YES"). This result is consistent with the theory that, in general, conservatives vote against policies that reflect a "nanny" state. The *GE Products* coefficients were positive across all models, indicating that respondents who believe popular brands include GE ingredients in food products were more likely to vote "YES" on Prop 37. The *Gender* coefficients were positive and significant in all models except the anti-Prop 37 *Advertisement Vote* model, indicating that females were more likely to vote "YES" on Prop 37.

The *Cost* coefficient and was negative and significant, indicating that possible increases in the price of food caused by Prop 37 decreased the likelihood that a respondent would vote in favor of the mandatory labeling policy. The mean WTP for a mandatory label was 13.8%.[5] Thus, if food costs were projected to increase less (more) than 13.8% as a result of the policy, Prop 37 would pass (fail). It should be noted that this estimated mean WTP for a mandatory label is likely inflated, for at least two reasons. First, the CV question was hypothetical, and there is abundant evidence that individuals tend to inflate their WTP in hypothetical surveys compared to real-money experiments (Loomis, 2011). A common practice in the CV literature is to apply a calibration factor to estimated WTP values, with a value of two being suggested by the NOAA panel (Arrow et al., 1993). Applying this factor to our estimate would imply a mean WTP of $13.8/2 = 6.9\%$. Secondly, in the present

[5] Mean WTP was calculated at variable means and is normally distributed; therefore, mean WTP and median WTP are equivalent. When using predicted respondent WTP, mean WTP was 13.3% and median WTP was 12.4%.

study, more respondents indented to vote "YES" than were observed in the actual vote. This would also exaggerate mean WTP.

The decrease in support of Prop 37 leading up to the election may be due to fears of possible increases in food costs or an indication of the effectiveness of the media campaign by opponents of Prop 37. After viewing the anti-Prop 37 advertisement, 79 respondents changed their vote to "NO." This is a large change in intended voting considering the sample size assigned to this video was 503; equaling a change in intended voting behavior of approximately 16%. Thus, it is no surprise that the Pearson's Chi-squared test statistic is significant at a level of less than 0.001. We conclude that the No on Prop 37 advertisement significantly affected the frequency distribution of intended votes.

Voting intentions changed little after respondents viewed the pro-Prop 37 advertisement. Counter to intuition, more respondents actually intended to vote "NO" after viewing the pro-Prop 37 advertisement. Although the pro-Prop 37 advertisement had a negative effect, it was extremely small, with only 0.4% switching from "YES" to "NO," and the null hypothesis of independence could not be rejected. Consequently, these findings indicate that one advertisement (anti-Prop 37) was extremely effective in changing the voting intentions of respondents while the other (pro-Prop 37) was ineffective, if not counter-productive to the advertiser's aim. Taken together, these findings are perplexing, but the outcome of the actual election did coincide with and possibly confirm the findings.

Change in Vote Models

WTP Vote Change

Only respondents who initially intended to vote "YES" on Prop 37 were asked the CV question; thus the only possible change in voting intention was from "YES" to "NO." An indicator variable equal to 1 was created for respondents who changed their vote after the CV question, 0 if there was no change in vote. The indicator variable was used as a dependent variable (*WTP Vote Change*) to estimate a binary probit model.

Reporting separate *WTP Vote Change* models for the two campaign advertisement treatments was not necessary, because the null hypothesis that the difference in parameter estimates for the two treatments is equal to zero was not rejected at a 0.05 significance level.[6]

Advertisement Vote Change

Each respondent voted on Prop 37 before and after viewing a campaign advertisement. Therefore, a respondent's intended vote could change from "YES" to "NO" or from "NO" to "YES." If a respondent's intended vote changed in a way that corresponded with the advertisement treatment (e.g., a respondent that viewed the No on Prop 37 video changed his or her intended vote from "YES" to "NO"), an indicator variable was coded as a 1; if a respondent had a change in intended vote that contradicted with the advertisement treatment (e.g., a respondent that viewed the No on Prop 37 video changed intended vote from "NO" to "YES"), an indicator variable was coded as a -1; the indicator variable was coded as a 0 for no change in intended vote. The indicator variable for change in intended vote after campaign advertisement was used to estimate an ordered probit model.

Separate ordered probit models were estimated for each campaign advertisement treatment, as the null hypothesis that the difference in parameter estimates for the two treatments is equal to 0

[6] The combined model had a log-likelihood function value of -474.77, whereas the separate models had values of -228.97 and -241.10. The test statistic is $2 \times (474.77 - 470.07) = 9.4$, which is a distributed chi-square with eight degrees of freedom; the 0.05 critical chi-square value with eight degrees of freedom is 15.51.

was rejected at a 0.05 significance level.[7] Additionally, an *Advertisement Vote Change* model was estimated using an indicator variable for advertisement treatment to examine whether change in vote was effected by a particular advertisement. The variable Video is equal to 1 if a respondent was randomly assigned to the Yes on Prop 37 advertisement treatment and 0 if a respondent was randomly assigned to the No on Prop 37 advertisement treatment.[8]

Change in Vote Models Results

Table 3 shows results for the four models estimated to determine the effects of prior perceptions and demographics on change in intended vote. *Gender*, *Income*, and *GE Products* were all significant and negative in the *WTP Vote Change* model. Therefore, respondents who are males, have a lower income, and believe major food brands do not use GE ingredients were more likely to change voting intention from "YES" to "NO" after being presented with the possibility that Prop 37 would result in an increase in food costs. This indicates that respondents with these characteristics have a lower WTP for a mandatory labeling policy. The *Cost* coefficient was positive and significant, indicating that respondents were more likely to change their voting intentions as food costs increased. This confirmed the previous finding that demand for a mandatory food-labeling policy is price sensitive.

Video and *GE Products* were the only variables significant in any of the advertisement vote-change models. The *Video* coefficient was negative and indicates that respondents who viewed the anti-Prop 37 advertisement were more likely to change their voting intentions in a way that corresponded with the treatment. This result jointly signals the effectiveness of the anti-Prop 37 advertisement and the ineffectiveness of the Yes on Prop 37 advertisement.

The *GE Products* coefficient was negative and significant for the No on Prop 37 *Advertisement Vote Change* model; this was the only variable significant in both the change in vote after the CV question and after an advertisement. Therefore, respondents who believed that major food brands use GE ingredients were less willing to change their voting intention to "NO."

Conclusions

On November 6, 2012, Prop 37 failed to pass by margin of 2.9%. If Prop 37 had passed, raw or processed food made from GE plants or animals would have required a label. Using data from surveys of 1,003 Californians, this study identified intended voting behavior of Californians on Prop 37 before the election. Results indicated that 75.4% of respondents intended to vote "YES" on Prop 37. Obviously, this result is 28.3% higher than what was actually observed in the election. However, at the time of the survey, other polls also showed the "YES" vote to be over 65%.

This study examined the statistical relationship between prior perceptions about GE crops/foods and intended voting behavior. Results imply a dearth of knowledge on the part of Californian respondents about the proliferation of GE crops sown for production and the inclusion of GE ingredients in major brand name foods; however, respondents who believed that major food brands use GE ingredients were more likely to desire a mandatory labeling policy. This finding was consistent with the rhetoric that proponents of Prop 37 are intrinsically more likely to believe there is a "right" to know relative to others. Women and respondents who self-identified as liberal were also more likely to vote "YES" on Prop 37.

If a mandatory food-labeling policy were to pass, food costs would likely increase by some amount. Possible increases in food costs provided strong motivation for a respondent to change

[7] The combined model had a log-likelihood function value of -588.01, whereas the separate models had values of -306.72 and -259.90. The test statistic is $2 \times (588.01 - 566.62) = 42.78$, which is a distributed chi-square with eight degrees of freedom; the 0.01 critical chi-square value with eight degrees of freedom is 20.09.

[8] Including *Video* into the *Advertisement Vote Change* model did provide a better fit at the 0.01 significance level. The test statistic is $2 \times (588.01 - 568.99) = 38.04$, which is a distributed chi-square with one degree of freedom; the 0.01 critical chi-square value with one degree of freedom is 6.63.

Table 3. Probit Model Coefficient Estimates for *Vote Change* Variables

	Dependent Variables				
Independent Variables	**WTP Vote Change**	**Ad. Vote Change**	**Ad. Vote Change**	**No on Prop 37 Ad. Vote Change**	**Yes on Prop 37 Ad. Vote Change**
Constant 1	−0.407**	−1.160***	−0.885***	−0.773***	−1.558***
	(0.207)	(0.146)	(0.154)	(0.205)	(0.217)
Constant 2	-	2.747***	2.839***	2.771***	2.904***
	-	(0.079)	(0.084)	(0.124)	(0.114)
Age	−0.002	0.001	0.000	−0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Education	−0.036	−0.089	−0.110	−0.062	−0.151
	(0.107)	(0.094)	(0.095)	(0.130)	(0.141)
Gender	−0.214**	0.114	0.103	0.148	0.064
	(0.097)	(0.084)	(0.085)	(0.117)	(0.125)
Income	−0.087***	0.009	0.001	−0.011	0.017
	(0.025)	(0.021)	(0.021)	(0.029)	(0.033)
Political Ideology	0.036	0.019	0.028	0.025	0.032
	(0.045)	(0.039)	(0.040)	(0.054)	(0.060)
GE Crops	−0.008	0.010	0.025	0.012	0.027
	(0.060)	(0.060)	(0.061)	(0.083)	(0.092)
GE Products	−0.235***	−0.043	−0.045	−0.092**	0.011
	(0.036)	(0.032)	(0.032)	(0.044)	(0.048)
Cost	0.026***	-	-	-	-
	(0.008)	-	-	-	-
Video	-	-	−0.533***	-	-
	-	-	(0.088)	-	-
Log Likelihood	−474.77	−588.01	−568.99	−306.72	−259.90

Notes: Estimates for *WTP Vote Change* are from a binary probit and estimates for *Advertisement Vote Change* are from an ordered probit using 756 and 1,003 observations, respectively. Estimates for No on Prop 37 *Advertisement Vote Change* and Yes on Prop 37 *Advertisement Vote Change* are from an ordered probit using 503 and 500 observations, respectively. Standard errors are reported in parenthesis. Standard errors are reported in parenthesis. Double and triple asterisks (**, ***) indicate statistical significance at the 5% and 1% level.

voting intention from "YES" to "NO," as nearly half of the respondents who were formerly in favor changed voting intention after being asked a CV question eliciting WTP for the mandatory labeling policy. Respondents who are low-income, male, and did not believe that major food brands use GE ingredients were especially sensitive to food price increases

Campaign advertising may have played a large role in the failure of Prop 37. Results indicate that a campaign advertisement by opponents of Prop 37 was effective in changing voting intention, while a campaign advertisement by supporters of Prop 37 had a slightly perverse effect. Moreover, other than believing that major food brands used GE ingredients, viewing the anti-Prop 37 advertisement was the only factor that significantly contributed to a respondent changing his or her voting intention after receiving information via a campaign advertisement. Not only did opponents of Prop 37 outraise supporters more than two to one ($44.4 million versus $10.6 million), the results presented here suggest that their ad was also much more effective.

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