Media Advertising and Ballot Initiatives: An Experimental Analysis

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Abstract

Spending on political advertising increases with every election cycle, not only for congressional or presidential candidates, but also for state-level ballot initiatives. There is little research in marketing, however, on the effectiveness of political advertising at this level. In this study, we conduct an experimental analysis of advertisements used during the 2008 campaign to mandate new animal welfare standards in California (Proposition 2). Using subjects' willingness to pay for cage-free eggs as a proxy for their likely voting behavior, we investigate whether advertising provides real information to likely voters, and thus sharpens their existing attitudes toward the issue, or whether advertising can indeed change preferences. We find that advertising in support of Proposition 2 was more effective in raising subjects' willingness to pay for cage-free eggs than ads in opposition were in reducing it, but we also find that ads in support of the measure reduce the dispersion of preferences and thus polarize attitudes toward the initiative. More generally, political ads are found to contain considerably more "hype" than "real information" in the sense of Johnson and Myatt (2006).

1 Introduction

In 2008, the citizens of California voted in favor of Proposition 2, which bans the use of cages for housing egg-laying chickens.[1] Similar propositions in Arizona (Proposition 204 in November, 2006) and other states mandate stall-free and crate-free housing for sows and calves for veal, respectively. Media advertising is used heavily in state-level propositions because of the narrow focus of the issue, the geographic concentration of likely voters and the (typically) highly polarized nature of the campaigns. There is evident support for this issue among some consumers as cage-free eggs sell for a significant premium in retail stores (sometimes $1.75 per dozen or more). What is less clear, however, is whether voting in initiatives similar to Proposition 2 is driven by advertising-inspired mass-support of the issue at hand, or whether it is highly motivated support by a small segment of the population that cannot be influenced by advertising. In this study, we examine the role of media advertising in the initiative process using an experimental analysis of ads used by both supporting and opposing sides for Proposition 2 in California in November 2008.

Polling voters' intentions is fraught with difficulties. Often, likely voters will tell the pollster what they think the pollster wants to hear. Second, more important for the narrow

[1] In July 2010, the governor signed follow-on legislation that banned the *sale* of caged eggs in California, preventing the importation of eggs from other states that are produced in a way that is deemed inconsistent with the principles laid out in Proposition 2.

issues that are often the subject of public referenda, many voters simply do not care, or are unaware of the issue (Rothschild, 1975). In the issue at hand, only a certain percentage of the population are even egg consumers or animal lovers so the issue seems abstract, at best. Third, voters sometimes lack a sense of consequentiality if they are asked their intent and they are not actually in the voting booth so put little thought into their response. In this study, we circumvent these problems by facing voters – consumers in this case – with real economic incentives in an experimental environment to determine their willingness-to-pay for cage-free eggs. Willingness-to-pay, while important from a food marketing perspective, is also a valuable proxy for likely voting intentions and an accurate gauge of the importance consumer-voters place on an issue. Ultimately, if a policy is a good one and "deserves" a vote, it should be welfare-improving. Therefore, in this study we assess the value of political advertising not on how many votes it generates, but on how it impacts the way the vote *should* go, or how the ad affects economic welfare.

Willingness-to-pay is not without limitations as a measure of the expected improvement in welfare due to a policy change. Hamilton, Sunding and Zilberman (2003) argue that individuals vote in referenda in ways that reflect their choices over public goods, and not necessarily private goods, so their choices regarding public policy alternatives may not reflect their private willingness-to-pay. Further, Lusk and Norwood (2009a,b) and Norwood and Lusk (2011) believe that conventional methods of estimating willingness-to-pay for public-good attributes are subject to a significant "social desirability bias" whereby a consumer's stated valuation includes an estimate of what he or she thinks the researcher would regard as appropriate. These authors show that social desirability bias with respect to animal welfare issues can be mitigated through a method of "inferred valuation," while Lusk and Norwood (2010) and Olnyk, Tonsor and Wolf (2010) address social desirability bias in an animal welfare context through indirect questioning, or asking survey respondents to express how they think the "average American" would respond. In the current study, we are not as concerned with social desirability bias as voting outcomes only depend upon whether the willingness-to-pay for cage-free eggs is greater than for conventional eggs, not how much.

Animal welfare is an important issue in its own right, and has become increasingly prominent as consumers become more conscious about what they eat, and where it came from. In addition to the studies cited above, others studies suggest that consumers perceive products with animal-friendly attributes to have a higher quality due to ethical beliefs, taste, food safety or health benefits (Harper and Makatouni, 2002; Ophuis, 1994; and Lusk et al., 2007).[2] Regulating animal welfare, however, presumes a market failure, but how does the market fail to adequately provide for the well-being of animals used to produce our food? To the extent that the method of production is a credence attribute – an attribute that can impact the individual agent's health, well-being or satisfaction with the product, but is not readily apparent in inspecting or consuming the product – then the usual asymmetric-information arguments arise (Larue, West, Gendron, and Lambert, 2002; Lusk, Fox, and Roosen, 2003; and Hartl and Herrmann, 2009). Alternatively, if we consider animals in general to be an appropriable resource similar to water, minerals or lumber, then many believe that producing food according to commercial methods imposes a negative production externality on society. Producing cage-free eggs or stall-free pork are thus means of internalizing the negative externality. Further, Carlsson, Frykblom and Lagerkvist (2007a) argue that consuming meat produced using conventional methods imposes a negative consumption externality on society. In either case, advertising in animal welfare ballot initiatives can therefore be interpreted as a means of convincing voters to voluntarily self-impose a tax meant to address the externality problem, much like a tax on fossil fuel is a means of reducing the costs imposed by greenhouse gas accumulation.

Others do not attempt to address whether or not the market fails, but estimate the premium for foods produced in ways that are consistent with presumed animal welfare standards. For example, Tonsor, Olnyk and Wolf (2009a) also use willingness-to-pay as a proxy for consumers' likely voting behavior and report a premium of $1.89 per pound for pork raised without the use of gestation crates, while these authors report a premium of

[2] The issue has assumed a global dimension as initiatives similar to Proposition 2 in Canada have begun to take shape on University campuses and among other animal-welfare interest groups (Potstra, 2008). Uzea and Hobbs (2009), however, suggest that a subset of Canadian consumers has very high standards for animal welfare and tend to drive legislation that risks "over-regulating" industry.

$2.11 per pound in a separate study (Tonsor, Olnyk and Wolf 2009b). Carlsson, Frykblom and Lagerkvist (2007b), on the other hand, find that other factors associated with meat production are more important than animal welfare attributes in a sample of European meat consumers, while Gracia, Louriero and Nayga (2009) find a statistically significant premium of approximately 0.42 Euro for ham marked with a label indicating that it was produced using methods that respect the animal's welfare. Among studies that estimate the demand impact of Proposition 2 using secondary data, Lusk (2010) interprets the media advertising during the campaign for and against Proposition 2 as an exogenous shock to demand. Comparing the demand for regular and cage-free eggs in California with the demand in a market not subject to Proposition 2 advertising, he finds that the demand for cage-free eggs increased by 180% over the period of the campaign. Similarly, Allender and Richards (2010) find that consumers in California are willing to pay a significant premium for eggs labeled as cage-free using a large-scale household-panel data set. Meanwhile, Chang, Lusk and Norwood (2010) find that consumers are willing to pay a 57% premium for cage-free eggs, but estimate that 42% of this premium is due instead to the color of cage-free eggs and not the cage-free attribute itself. Taken together, therefore, there is considerable evidence that consumers place a positive premium on animal-welfare attributes, but very little evidence on the differential effects of ads for or against the passage of animal welfare regulations or the welfare effects that result from shifting or rotating demand curves.

The welfare impacts of taxing egg-producers or imposing inefficient production techniques are critically dependent on whether advertising shifts the demand curve by changing preferences (referred to as "hype" by Johnson and Myatt 2006 and typically associated with Dixit and Norman 1978) or rotates the demand curve through the provision of "real" information about the product and its alternatives (Nelson, 1970, 1974). While the current orthodoxy in empirical advertising studies is to either assume advertising only shifts the demand curve, or to interact advertising and prices to obtain some type of ad-hoc measure of the rotational effect, we apply a new empirical approach to distinguish between the two. If consumers are indeed heterogeneous in their preferences, then a demand curve essentially represents a probability distribution of willingness to pay across consumers that

are highly knowledgable and involved with the product, and those with only casual knowledge of, and preference for, the product. This is the observation that lead Johnson and Myatt (2006) to develop a formal model of how advertising, and other media activites, really affects demand. We develop the model more completely below, but the intuition is straightforward. If a product appeals to a "niche" market, or if the issue is of intense interest to a concentrated group of voters, then advertisements that appeal to the core of this market will increase the dispersion of consumers' willingness to pay and rotate the demand curve clockwise, increasing the willingness-to-pay of the marginal consumer whose willingness-to-pay is above the mean and reducing it if the marginal consumer is below the mean. Reducing the dispersion of demand means that the advertisement contains real information as it allows consumers to sharpen their opinion of the product or, in this case, the issue. If a consumer strongly prefers a product or side of an issue, then real information regarding that issue will merely reinforce his or her position and move them away from the mean of all voters. If, on the other hand, the issue is of interest to the mass market or all voters who have at least a passing interest in the topic, then a successful ad will reduce the dispersion of demand and rotate the demand curve counter-clockwise (make it more elastic). In this case, the ad will increase the willingness-to-pay of the marginal consumer who begins with a valuation below the mean.

In either case, if the preference-effect of the ad dominates, then the pure shift effect dominates either rotation effect. If successful, exposure to the ad will change everyone's attitude to toward the issue and move the entire distribution of preferences in the direction of either favoring or opposing the issue. Econometrically, the test is straightforward: if the ad reduces the variance of willingness-to-pay, then it appeals to the diffuse mass of voters with casual interest, but if it increases the dispersion of willingness-to-pay then we conclude that the ad appeals to a small, yet focused group of voters. If the dispersion does not change, but preferences do, then the preference-effect is more important. Either way, we have a better understanding of how political advertisements can be better crafted depending on the nature of the issue at hand.

Our econometric model provides another way of testing for asymmetric effects of dif-

ferent types of information. Positive and negative information tend to have fundamentally different effects on consumer's attitude toward a product or an issue. The same is likely true in the case of political initiatives, where advertisement is inherently manipulative. Swartz and Strand (1981) and Smith, van Ravensway and Thompson (1988) conduct empirical studies of positive and negative information regarding contaminated food scares and find that the initial, negative information has a far stronger effect in reducing demand than subsequent positive information has in restoring demand. Similarly, Fox, Hayes and Shogren (2002) use an experimental method similar to the one used here to find that negative information regarding the potential health effects of irradiated pork greatly outweigh any positive information. Strongly negative information effects can be explained by the loss-aversion theory of Viscusi, Magat and Huber (1987) in which consumers are particularly sensitive to any negative variation in utility from the status quo. Losses are magnified while gains are minimized. The Viscusi-Magat-Huber theory, however, is observationally equivalent in these situations to the predictions of prospect theory developed by Kahneman and Tversky (1979). Prospect theory maintains that individuals assess losses and gains with respect to a reference point, which in this case is their expectation that eggs are produced in uncontroversial ways. When confronted with information that reality is somewhat worse than their expectations, they magnify the negative result, while ignoring any information that may lead them to believe that hens are more happy than they expect. Our experimental data, and the econometric model used to test our hypotheses regarding willingness-to-pay are well-suited to examining the issue of asymmetry and loss-aversion in the informative content of political ads.[3]

Political advertising has received little recent attention in the marketing literature, despite it evident, and growing, importance with each election cycle. Palda (1975) conducts a seminal econometric analysis of the effectiveness of advertising expenditure on determining the outcome of Congressional races. Arguing that "revealed preference" data are sufficient

[3] Our approach is also relevant to the literature on the "value of information." Rousu et al (2007) estimate the value of independent third-party, or "verifiable," information in an environment in which vested interests provide "private," asymmetric information to consumers. In our model, combining ads from both sides of the Proposition 2 debate allows consumers to form their own synthesis as to where the truth lies.

to analyze the effectiveness of campaign spending, Palda (1975) shows a significantly positive marginal return to campaign spending in Quebec, even after explicitly recognizing the endogeneity of campaign spending. Formalizing Palda's (1975) insights, Rothschild (1978) develops a conceptual model of political advertising in which he challenges the orthodoxy at the time – the "limited effects model" – which maintains that media advertising can have little impact on an otherwise stable political process. Rather, in a low involvement environment such as voting, advertisement is likely to be highly successful. He offers empirical data in support of his thesis, but only of an aggregate form. Similarly, Soley and Reid (1982) show that spending on political advertising has as great an effect on voting outcomes as party affiliation and incumbency – two factors that are widely regarded as the most important in determining electoral results. Each of these studies, however, investigate campaign spending in general election cycles and not on specific initiatives.

An explosion of ballot initiatives in recent years, many supported by aggressive advertising campaigns, has re-ignited interest in the role of advertising in the the exercise of direct democracy. Gerber (1999) finds that ad spending in favor of ballot propositions is not effective, while spending against is. The implication of this research is important: "economic groups," that is groups that are small in membership, but well-financed, cannot simply buy outcomes in direct democracy as is commonly believed. This is an important outcome as it suggests that direct democracy through the initiative process is more likely to result in policies that reflect majority interests (are closer to the median voter's preferences) than is the more usual legislative process. Specifically, Gerber (1999) finds that "...initiatives that received majority support from citizen interests passed at a significantly higher rate than those that received majority support from economic interests...." She also finds that "...the set of successful initiatives received a greater share of supporting contributions from citizen interests than from economic interests, whereas unsuccessful initiatives received a much larger share of supporting contributions from economic interests" (pp. 119-20) which suggests that higher spending on campaigns, and hence more media advertising, is not necessarily effective in increasing the likelihood that the proposition will be successful. Stratmann (2006) is one of the few empirical studies to directly estimate the

effectiveness of ad spending not on Congressional or Presidential elections, but on ballot measures similar to the one under study. Stratmann (2006) addresses the received wisdom in the academic literature that interest-group campaigning is, in fact, not effective either for or against a measure, but instead the status quo or the side advocating no change has a strong advantage. However, Stratmann (2006) recognizes that previous statistical analyses do not control for the endogeneity of campaigning – that spending is inherently strategic – so any estimate that does not control for endogeneity will be biased and inconsistent. By developing a research design that accounts for endogeneity (a two-way fixed effects model), he finds that special interest spending does indeed exert a positive and significant effect on the outcome of the vote. Understanding the economic role of the intiative process is critical to appreciating the importance of advertising for or against ballot propositions. Matsusaka (2005) explains the rise of the referendum process in terms of three economic functions it provides: (1) resolving principal-agent problems between voters and their representatives, (2) correcting fundamental asymmetric information problems on many issues, and (3) bundling issues together in one focused decision process. For these reasons, political intiatives have become a central part of how democracy works in the United States. But, in order for the initiative process to be effective, each side has to be able to inform (or persuade) the electorate, and advertising is the primary way this is done.

This article makes a number of contributions to the policy and marketing literature. First, we offer an alternative method of estimating the effect of marketing activities in an important, yet little studied category of advertising expenditure: voter behavior in public referenda. Second, our econometric model provides a way of separating the preference effect of advertising from its information effect. In doing so, we also offer a different perspective from the existing literature on the observed asymmetric effects of positive and negative information on consumers' preferences. Third, we propose and apply a metric against which policies may be judged as being either for or against the public interest. The role of marketing in the formation of public policy is too often overlooked, despite its obvious importance in the exercise of direct democracy.

Our research has three objectives. The first and primary objective of this study is

to determine the willingness-to-pay for food products raised in a "humane" way, or one that is fundamentally different from current practice. The second objective is to determine the relative effect on WTP of media advertising presented either in support of an animal welfare initiative, or counter to it. The third objective is to determine whether media advertising shifts or rotates the demand curve, and the welfare implications of whether the dominant effect is a shift or a rotation. Ultimately, we seek a better understanding of the role of campaign spending on matters that materially impact the ways in which firms can conduct themselves.

2 Research Method and Experimental Design

To determine the willingness-to-pay for cage-free eggs, we use a non-hypothetical experiment in which we offer subjects the opportunity to purchase eggs that are clearly labeled as cage-free. Stated preference methods, such as surveys or choice experiments (conjoint analysis), are often used to determine consumers' willingness-to-pay for new food products (Lusk, et al., 2001, for example). If the products do not currently exist, however, it is difficult to elicit "homegrown" or personal values for these products as the buyers have no basis for accurate comparison. Moreover, participants in stated choice data-gathering exercises have no real incentive to reveal their true demand as they have no economic stake in the outcome of the survey. List and Gallet (2001) find that respondents state values 2-20% greater in hypothetical questions relative to non-hypothetical valuation questions. A non-hypothetical experiment, on the other hand, has the ability to uncover consumers' true willingness-to-pay because participants in the experiment are provided real economic incentives to make decisions that provide the most benefit at the lowest possible cost. Consequently, we conduct a non-hypothetical experiment in which we use real economic incentives to elicit consumers' willingness to pay for cage-free eggs. Because these attributes are not apparent by inspecting the goods themselves in the absence of labels to that effect, we are essentially obtaining likely market prices for what are termed "credence" attributes, or attributes that the consumer must trust the producer to include in the product.

Recruitment services were contracted to a third-party marketing firm, Octagon Mar-

keting, Inc. of Phoenix, AZ. We chose Arizona residents for our sample because they were not exposed to the television ads that ran in California during the Proposition 2 campaign. Octagon advertised in local newspapers and on their website the opportunity to participate in an economic experiment at Arizona State University. Subjects were told that they had to be at least 18 years of age, and a consumer of eggs to participate. Each participant was guaranteed to earn no less than $40 plus a candy bar and case of eggs for participating. Subjects who agreed to participate were allocated to one of ten potential time slots from 8:00 AM to 3:00 PM on either Saturdy or Sunday of the test weekend on a first-come-first-served basis. We sent a map of the ASU Polytechnic campus to each participant, along with contact numbers and detailed instructions for how to find the research room. Our goal was to have 18 participants per session as the lab has a capacity of 21 subjects. In some sessions we allowed more than the 18 target, and in others some participants did not appear.[4] Overall, we had 178 participants, so we fell only two subjects short of our target average. Therefore, our final sample consists of 178 subjects who have identified themselves as egg consumers, selected from the general population to be broadly representative on demographic and socioeconomic grounds.

All auction procedures are carried out using the z-Tree (Fischbacher, 2007) software system, which is an open-source software tool that allows for a collaborative bidding process and the automated assignment of winners and losers and, of course, market prices for the commodity under bid.

On the two days of the auction, the experiment consisted of seven steps. Each of these steps was followed in identical fashion from one session to the next. The procedure and design elements in each of the seven steps is described below:

Step 1: In step 1, each participant was assigned to a computer terminal when they arrive at the lab. When all participants expected for that session were seated, they were instructed to ensure that their machine has a grey screen with the z-Tree logo on it. All subjects were

[4] The reasons why the data may have been rendered unuseable were generally associated with the survey component of the experiment as some participants did not provide income, gender or some other essential demographic information. Without this information, we were unable to use the observation in the econometric modeling procedure.

then shown a Powerpoint presentation of the experiment instructions, which were read by the experimenter. We informed each participant that their information would be kept strictly confidential and their participation in the experiment was completely voluntary. Next, we described the animal welfare issue and how it relates to the way in which eggs are produced on farms. We then confirmed that the research was not affiliated with any organization other than ASU and took any questions that participants might have had. Participants were asked not to communicate with one another from that point forward as any exchange of information regarding eggs or animal welfare may bias the results. They were told that their participation is completely voluntary and that they may leave at any time.

Step 2: In step 2, participants were introduced to the auction and the auction procedure. Subjects were provided an initial endowment of $45.00, a regular-size chocolate bar and a case (dozen) of regular (non-cage-free) eggs. They were then instructed that they could either use the $45.00 to upgrade from a regular-size chocolate bar to a king size in the practice round, upgrade from regular to cage-free eggs in the auction, or take the money and items without completing a transaction. All participants were told that one round of the auction will be chosen at random to be binding, and that they were to pick up their eggs, candy bar and payment after the session is complete and they have signed their payment receipt. We use a Becker-deGroot-Marschak (1964, BDM) auction mechanism to determine willingness-to-pay. Using a BDM mechanism is intended to ensure truthful value elicitation while minimizing the possibility that we exclude marginal bidders (those who are likely to have a low value for cage-free eggs) from the auction. The mechanics of the BDM procedure were carefully explained to the subjects, including the fact that it is incentive compatible, or in their best interests to report their true indifference amounts.[5] The BDM auction works as follows. All subjects are initially endowed with a

[5] The incentive compatibility of the BDM mechanism has been questioned by Horowitz (2006), among others. We assume that the argument advanced there, that the agent's willingness-to-pay depends on the distribution of future values, is of minor consequence. A popular alternative is the random nth-price auction (Shogren, et al. 2001). These authors show that the nth-price auction is not only demand-revealing (incentive compatible), but is better able to elicit willingness-to-pay from marginal bidders, or those who may place only a small value on cage-free eggs than a more usual, second-price auction. However, a BDM mechansim is equally adept at eliciting marginal bidders and is not subject to the over-valuation problems

regular-size candy bar and a dozen regular (non-cage-free) eggs. In each round (and in the practice round), subjects were asked to submit their willingness-to-pay to upgrade to either a king-size candy bar (practice round) or cage-free eggs (actual auction). The experimenter then draws a price at random from a uniform distribution between zero and the maximum willingness-to-pay submitted. All bidders willing to pay equal to or more than this random price receive the upgrade, while those below the random price do not. The "market price" in the auction is the random price. The BDM mechanism is demand revealing because the bidder does not know what the market price will be, but does understand that every price between zero and the maximum bid has an equal probability of becoming the market price. Therefore, if he or she were to shade their bid in order to save money, they may lose an item they value and if they bid above their true value, they risk buying something for more money than it is worth.

Step 3: Once the BDM mechanism had been explained carefully, we went through a simple example involving candy bars that demonstrated how the BDM mechanism works. Once we were confident that all the participants understood how the game was going to be played and answered any questions one might have had, we conducted a practice auction involving candy bars. A practice round was necessary to ensure participants understand how the BDM auction works and to familiarize them with the software (z-Tree). In the practice round, participants are shown a regular size candy bar (Snickers or Milky Way) and were told that they were currently endowed with the regular size bar, meaning that they could leave at any time and take the bar home with them. They were then told that were given the opportunity of buying up to a king-size version of the same bar through the BDM auction. They were instructed to enter their bids for what a king-size bar is worth to them over a regular-size bar and then wait for the results. Once the all the bids were submitted, a random price was drawn between 0 and the highest bid, the winners were tabulated, and all participants were told whether they won automatically via Ztree. They were also shown the random price that was drawn.

Step 4: After completing the practice round, the participants were then instructed that

ascribed to the nth-price auction (Lusk and Shogren, 2008).

we would begin the cage-free egg auction. The sample was divided into ten groups of fifteen participants each: two groups bid on cage-free eggs with only prior information regarding the existence of Proposition 2 (the control group); three groups bid after being shown a short media clip from a popular television show in which we had embedded ads developed in support of Proposition 2 (pro-cage-free legislation), three groups bid after being shown ads against Proposition 2 (anti-cage-free legislation) and two groups bid after being shown both sets of ads. The order in which the groups bid is varied randomly, with subjects in each group submitting bids in five separate auction rounds. One round was selected (randomly) as binding in order to determine whether the subject successfully upgraded to cage-free eggs, or retained his or her endowment of regular eggs. All bids were recorded electronically through the z-Tree software and saved in a file for further processing.

The pro-cage-free ads generally consisted of emotional appeals from Hollywood celebrities such as Ed Asner, Alicia Silverstone and other notable animal-rights supporters to vote "Yes" on Proposition 2 in order to prevent cruelty to farm animals. On the other hand, the anti-cage free ads were less emotional and appealed to viewers' affinity with the small farmers who raise eggs in California, their concern with growers' freedom of choice and their own testimonial that chicken-cages are not as harmful as they are purported to be. Ads for both the "pro" and "anti" Proposition 2 sides were embedded in a short clip from The Simpsons in order to mimic the actual viewing experience as nearly as possible.

Step 5: After all rounds were completed, the subjects were asked to fill out a survey designed to elicit a complete set of demographic, socioeconomic and attitudinal information, including age, income, education, employment, marital status, frequency of egg consumption, attitude toward animal welfare and knowledge of legislative propositions focusing on animal welfare. The complete survey instrument is available from the authors. Determining each participant's attitude toward animal welfare, and the California proposition were important to control for prior beliefs in forming opinions regarding a particularly polarizing issue. Frequency of egg consumption is also an important piece of data as each participant is likely to have a different level of involvement with eggs and, therefore, a different incentive to either gather more information, be receptive to the information content of the

ads, or to try alternative egg products. We also included a question regarding participants' awareness of the salmonella outbreak traced to eggs from Iowa in September 2010. Because the largest egg recall in history occured the week prior to our experiment, we were concerned that participants may associate cage-free eggs with eggs that are less likely to be contaminated by a bacteria that is easily passed among animals in confined spaces.

Step 6: Once the surveys were all completed, each participant was instructed to leave the computer lab and enter the adjoining room to receive their check, eggs, candy bar and to sign the payment receipt form. Of the 150 participants, only a few expressed any degree of uncertainty regarding either the validity of the checks or their expectation to be paid, in cash, immediately.

Step 7: The final step involves downloading and analyzing the bid and survey data. Once the data are collected, we estimate a regression model of willingness-to-pay (WTP) values and media treatments using a random-parameters multinomial logit estimation method (mixed logit) described in more detail below. With the mixed logit model, we are able to accurately estimate the marginal WTP for the specific attributes of interest – the "cage-free" attribute and whether pro- or anti- Proposition 2 messaging is more effective – for consumers in different demographic market segments. We then use these values to calculate aggregate welfare measures by market segment based on existing egg demands and the expected market adjustments that will occur if cage-free production methods are mandated.

In this way, the results of our research may be used to inform policymakers as to the true economic cost of the propositions, the distributional effects of regulating production practices, and to inform marketing managers in egg marketing firms as to how they should price and promote new food products to maximum advantage. More importantly, the empirical model described in the next section is able to determine whether media advertising of either type "shifts" the demand curve for cage-free eggs or rotates it. This distinction is important both in the calculation of welfare outcomes, and in determining the nature of the advertising effect: whether it provides information to consumers / voters, causing the demand curve to become more elastic (Norman, 1970, 1974), or whether it is inherently

persuasive, changing tastes and causing demand to become less elastic (Dixit and Norman, 1978).

3 Empirical Model of Media Advertising

We test for shift or rotation effects of media advertising using an empirical model that captures the theoretical effects of advertising described by Johnson and Myatt (2006). Conceptually, the information content of advertising is difficult to separate from what may otherwise be described as hype, or the preference effect. While the historical debate centers on whether advertising changes preferences (Dixit and Norman 1978), provides information (Norman 1974) or provides a complementary good to the product being purchased (Becker and Murphy 1983), Johnson and Myatt (2006) develop a general theory of demand that relies on none of these behavioral assumptions. Rather, Johnson and Myatt (2006) develop a fundamentally new perspective on how advertising works. Rather than simply shift demand, advertising in their model operates on the dispersion of consumer valuations for the product. If advertising provides "real information," in their terminology, then the dispersion of valuations for the product is likely to rise. Consumers who value the product relatively highly before the advertisement will like it even more after the ad, and those who value it less highly will like it even less. Demand rotates clockwise. For firms that sell a homogeneous product, designed to sell to the mass-market, this rotation in demand reduces the valuation of the marginal consumer, reducing profits. In this case, the marginal consumer is "below average" in terms of his willingness to pay for the product. Firms that sell highly differentiated products, designed to appeal to a niche market, however, prefer advertisements that rotate demand in this way because their marginal consumer is "above average." The willingness to pay for this consumer rises with a clockwise rotation in demand. Firms that sell homogenous goods, therefore, prefer to use advertising that results mainly in a preference effect as it shifts demand outward at each price. These firms would rather minimize the dispersion of valuations and thus rotate the demand curve counter-clockwise, raising the valuation of their marginal consumer and, hence, profits.

The analogy to political ads is straightforward. Polarizing issues that tend to have

both passionate supporters and equally passionate detractors are "highly differentiated products," while more mundane issues that are not likely to inspire as much controversy are more akin to "homogeneous products." Same-sex marriage is an example of the former, while bond issues for local sports stadiums are good examples of the latter. The marginal voter in a polarizing campaign is likely to have a valuation greater than the mean, so ads that provide real information are likely to increase the dispersion of demand, rotate the demand curve clockwise, increase the valuation of the marginal voter, and raise the "total take" on voting day. On the other hand, real information in a run-of-the-mill campaign is expected to reduce the dispersion of demand, essentially moving voters to the center of the issue, rotating the demand curve counter-clockwise, and increasing the willingness-to-pay of the marginal voter who began with a valuation that is below the mean.

In the current example, the debate surrounding Proposition 2 suggests that animal welfare is indeed a polarizing issue. Proponents of the initiative, or supporters of animal welfare legislation, are regarded by their detractors as extremely liberal, out of touch with reality and anti-business. Opponents, on the other hand, are regarded by animal-rights supporters as cruel, barbaric and corporate apologists. To the extent that advertisements on either side contain elements of both real information and the preference effect, we expect to find both shift and rotation effects for both types of ads. In terms of the rotation effect, we expect the dispersion of willingness-to-pay to rise for both pro-animal welfare and anti-animal welfare ads. The shift effect, on the other hand, is expected to be positive (increasing willingness-to-pay) for pro-animal welfare ads and negative (decreasing willingness-to-pay) for anti-animal welfare ads. Because of these opposing effects, and the mitigating impact of rotation, the net welfare effects are an empirical question.

Our model also provides another way of thinking about the asymmetric information effect of positive and negative media coverage. Swartz and Strand (1981) document a stronger negative effect on the demand for oysters from contaminated water, while Smith, van Ravensway and Thompson (1988) find a similar asymmetry in coverage of heptachlor in Hawaiian milk and Brown and Schrader (1990) for the purported negative health effects of consuming shell eggs. In an effect akin to the framing observations of Kahneman (2003),

consumers are shown to react more strongly to negative news regarding a product than positive. While the usual explanation for this effect is that consumers are inherently loss averse, Richards and Patterson (1998) argue that it is due rather to the convexity of utility with respect to information. In the context of the preference heterogeneity model of Johnson and Myatt (2006), negative media is likely regarded as real information as no agent has an incentive to reveal negative information about the product (except, perhaps, for sellers of a substitute good, but this seems implausibly strategic behavior). Therefore, negative information will rotate the demand curve clockwise, and reduce the willingness-to-pay of the average mass-market consumer, or voter as the case may be. Positive coverage, on the other hand, is not likely to be viewed as credible so will be regarded as a pure preference effect, shifting the demand curve to the extent that it is effective at all. We investigate this possibility in the empirical application below.

When both types of ads are considered together, the real information conjecture described above will likely give way to confusion. If both sides are viewed as credible sources of information, then the dominant effect will be the one that is regarded as the most convincing. The real information effect causes demand curves to rotate clockwise, raising the willingness-to-pay for consumers whose valuations were initially above the mean, but lowering them for above-average consumers. If neither is viewed as credible because the claims tend to contradict each other, then the shift or preference effect will likely dominate. Demand curves will still rotate, but our hypothesis is that this effect will be less important, particularly in terms of net welfare, when voters hear a cacophony of messages. Fortunately, this theory is imminently testable through experimental methods.

More formally, consider the definition of a rotation in the demand curve described by Johnson and Myatt (2006). Assume there is a unit mass of consumers, each willing to pay w for one unit of the item in question. The distribution of w is represented by $F_s(w)$, which is twice continuously differentiable in both s and w with density $f_s(w)$. The parameter s governs the shape of the distribution of valuations such that an increase in s represents a spread in the density of w and, hence a clockwise rotation of $F_s(w)$ about some point $\hat{w}$ (figure 1, Johnson and Myatt, 2006). We next derive the effect of a spread in valuations

on the distribution of market demand. At any price, p, the proportion of consumers who purchase the good is given by: $q = 1 - F_s(p)$. Inverting this expression gives an expression for the inverse demand curve: $P_s(q) = F_s^{-1}(1-q)$, so a change in s rotates the inverse demand curve in a manner analogous to the change in the distribution of valuations (figure 2, Johnson and Myatt, 2006). Namely, if demand is below the pivot point, $\hat{q}$, then an increase in the spread of valuations causes a rise in the market price, and vice versa, or:

$$q < \hat{q} \implies \frac{\partial P_s(q)}{\partial s} > 0, \quad q > \hat{q} \implies \frac{\partial P_s(q)}{\partial s} < 0. \tag{1}$$

Equation (1) implies that if we are below the pivot-point in demand, greater dispersion in valuations causes the valuation of the marginal consumer, and hence the market price, to rise and if we are above the pivot-point in demand, an increase in the dispersion of demand causes the price to fall. In the former case, the issue with the product is more likely to be of interest to a concentrated special interest, or niche group of voters, and in the latter the issue is likely to be of interest to the mass of voters.

We use the theoretical framework developed in this model to derive a structural model of pro- and anti-animal welfare regulation advertising. Our model is structural in the sense that it is derived directly from the utility-theoretic model of the shift or rotation effects associated with advertising. We derive the willingness to pay (WTP) for cage-free eggs in a random utility framework in which the distribution of consumer heterogeneity reflects the distribution of marginal valuations in the theoretical model above. In the random utility model, consumer utility is the sum of a deterministic and stochastic part such that:

$$U_{ij} = V_{ij} + \varepsilon_{ij}, \tag{2}$$

for product j by consumer i, where V_{ij} is the deterministic component of utility, and ε_{ij} is an iid error term. Utility, in turn, is a function of attributes of the chooser (x_i) and of the choice (z_j), a vector of advertising exposures (a_k) and income (y_i). The marginal value consumer i places on product $j = 1$ is defined as the amount of income that leaves his or her utility at least as great with and without the purchase:

$$V_{i0}(\mathbf{z}_0, \mathbf{a}_0, \mathbf{x}_i, y_i) + \varepsilon_{i0} \leq V_{i1}(\mathbf{z}_1, \mathbf{a}_1, \mathbf{x}_i, y_i - c_{i1}) + \varepsilon_{i1}, \tag{3}$$

where c_{i1} is the marginal value of product 1 by consumer i . We solve for the willingness to pay by consumecr i by invoking the random utility assumption and recognizing that:

$$\Pr(WTP_{i1} \geq c_{i1}) = \Pr(V_{i0} + \varepsilon_{i0} \leq V_{i1} + \varepsilon_{i1}), \tag{4}$$

Assuming the error term is double-exponential distributed with mean 0 and variance $\pi^2\mu^2/3$, the willingness to pay becomes:

$$\Pr(WTP_{i1} \geq c_{i1}) = \frac{\exp(V_{i1}/\mu)}{\exp(V_{i1}/\mu) + \exp(V_{i0}/\mu)}, \tag{5}$$

where μ is the logit scale parameter. Solving for the willingness to pay from this expression, we write the odds ratio of choosing product 1 relative to product 0 as:

$$\frac{\Pr(j=1)}{1-\Pr(j=1)} = \frac{\exp(V_{i1}/\mu)/(\exp(V_{i1}/\mu) + \exp(V_{i0}/\mu))}{\exp(V_{i0}/\mu)/(\exp(V_{i1}/\mu) + \exp(V_{i0}/\mu))} = \exp(V_{i1}/\mu), \tag{6}$$

where we normalize $\exp(V_{i0}/\mu)$ to one and $\Pr(j=1)$ is the probability of purchasing good 1. Taking logs of both sides of the odds ratio gives an expression for the willingness to pay by consumer i as a function of choice and chooser attributes, the level of advertising and the scale parameter (which we normalize to 1 without loss of generality in the empirical application below):

$$\ln\left(\frac{\Pr(j=1)}{1-\Pr(j=1)}\right) = WTP_{i1} = V_{i1}/\mu. \tag{7}$$

With an appropriate specification for V_{i1} it is possible to test for both the direct effect of pro- and anti-animal welfare advertising on the willingness to pay for cage-free eggs, and the indirect effect through the dispersion of valuations.

Utility in a random utility framework is typically additive over attribute arguments. Writing V_{i1} in terms of an empirical, or estimable, model of utility, we assume that:

$$V_{ij}(\mathbf{z}_j, \mathbf{a}_{mj}, \mathbf{x}_i, y_i) = \alpha_j + \sum_{k=1}^{K} \beta_k z_{jk} + \sum_{l=1}^{L} \gamma_l x_{il} + \sum_{m=1}^{M} \delta_m a_{mj} + \xi_j, \tag{8}$$

where α_j is a choice-specific constant, β_k are marginal values for each product attribute, γ_l represent the influence of each demographic attribute on willingness to pay, δ_m is the impact of advertising of type m (pro- or anti-animal welfare) on indirect utility and ξ_j is the iid econometric error term. Advertising, however, is hypothesized to have both a direct effect through changing preferences and shifting the demand curve, and an indirect effect through the dispersion of valuations. We model this latter effect by recognizing the that advertising response term is a function of unobserved consumer heterogeneity through the distribution of preferences, F_s above. Each advertising-impact parameter is randomly distributed according to:

$$\delta_m = \delta_{m0} + \delta_{m1}\sigma_m + \nu_m,\ \nu_m \tilde{} N(0,1), \tag{9}$$

where δ_{m0} is now interpreted as the direct effect of advertising of type m (shift effect), δ_{m1} is the indirect, or rotational effect caused by changes in the dispersion of valuations, and σ_{mj} is the variability in tastes associated with each type of ad. Substituting this utility model into the expression for WTP_{i1} provides an estimable model of the impact of advertising on the willingness to pay under each type of advertising. Note that, although consumers are assumed to make discrete choices among differentiated egg-brands in the store, the estimated bid function implied by the random utility decision process is continuous. This continuity reflects the underlying indirect utility functions that drive consumers' discrete decisions. Table 1 summarizes the hypotheses we test with this model.

[table 1 in here]

4 Results and Discussion

With the empirical model developed above, we test whether each type of ad, alone or in combination, is successful in changing the voting behavior of the electorate as a whole (a shift of the demand curve) or if the ad served rather to sharpen positions on each side (rotation of the demand curve). In this section, we report tests of these hypotheses, and a number of other insights into the experimental data.

Prior to presenting the parameter estimates from the formal econometric model of WTP

developed in the previous section, we begin by first presenting some summary statistics on the experimental WTP data. Inspecting the experimental data provides some insight into how different groups of consumers' value animal welfare attributes. To that end, table 2 provides a cross-tabulation of WTP values by income, race, gender, and household size. From the data in this table, it appears as though higher income participants are willing to pay less for cage-free eggs than those in lower income groups. This finding is somewhat surprising as cage-free eggs are well-understood to sell for a premium so, to the extent that eggs are a "normal" good in terms of income elasticity, we should see greater demand among higher income consumers. Further, although the standard deviation of the WTP estimate is high, Hispanic-Americans have the highest mean WTP among all the racial groups in our data.[6] There appears to be a more significant difference in WTP between genders, with females bidding a $0.923 premium over conventional eggs and males a $0.748 premium. Finally, the WTP for cage-free eggs is slightly lower among larger households. This finding is likely due to the fact that these households purchase in greater volumes, so are more sensitive to any attribute that would cause them to face higher prices.

[table 2 in here]

Summarizing the data by treatment provides a preliminary indication of whether the type of media exposure influences WTP (2). Pooling bids from all rounds, we find that the "Pro" ads are associated with a premium relative to control of nearly $0.14 / dozen, while the "Anti" ads a discount of almost $0.28 / dozen. When we combine both "Pro" and "Anti" ads, there is still a discount of $0.07 / dozen so it appears as though the "Anti" ads represent a dominant influence on consumers' choices. Considering only the first bids, we find a similar pattern, although the absolute values of the bids are significantly lower in each case. Most importantly, the differences between each treatment and control are all significant, so media advertising clearly has an effect on WTP.

[table 2 in here]

The data in table 2, however, does not take into account the possible inter-correlation between some of the explanatory variables in the WTP model. If some of the variables

[6] Note that many participants refused to provide their racial background. For the econometric estimation, these respondents were coded as the excluded dummy group.

explain the same effect, then the summary statisics presented above may be misleading. Therefore, even without the random parameter structure in the above model, at least a multiple-regression approach is preferred. A simple regression model, however, does not account for the unobserved heterogeneity that is likely to be an important determinant of the WTP for cage-free eggs. We test whether unobserved heterogeneity is indeed important by conducting a series of specification tests on the WTP model. These statistics, along with the full set of parameter estimates, are given in table 4. The first specification test involves a joint test of the significance of the scale parameters of the random-parameter model. If these parameters are jointly equal to zero, we reject the random parameters model in favor of a constant-parameters alternative. From the chi-square statistic reported in table 4 (1,306.183), it is clear that the scale parameters are jointly different from zero so we conclude that the random parameters model is preferred by this metric. Second, we conduct t-tests of each random parameter to determine whether, individually, a variable is better represented by a constant-parameter specification. Again, we reject the null hypothesis of a constant parameter in each case and conclude that the random parameter model is preferred. Therefore, we use this specification to test the our hypotheses regarding the effect of pro- and anti-animal welfare ads on the WTP for cage-free eggs and to examine more carefully how WTP varies among participants, and rounds of the experiment.

[table 4 in here]

The results in table 4 summarize our findings both with respect to the shift and rotaton effects, and the demographic and experimental-design questions. We find that bidding falls significantly from round 1 to round 2 and round 3, relative to the round 6 benchmark, and continues to fall through rounds 4 and 5, albeit not in a statistically significant way. While this finding is contrary to the experimental results of Fox, Hayes and Shogren (2002), it is not uncommon in the experimental auction literature (Lusk and Shogren, 2007). Because our participants are shown the "market price" after each round, and the market price is bound by zero and the highest bid, high bidders in early rounds tend to reduce their bids in subsequent rounds as they become more certain that their bid has earned them the cage-free eggs. The bid distribution thus becomes more concenrated as rounds progress

and bidders learn how the market works. Further, we find that women are willing to pay more for cage-free eggs than men, while members of larger households tend to bid less. These results are consistent with the summary statistics presented above, and are not particularly surprising. The estimated income-effect also confirms the summary results as the econometric model shows that higher income participants are willing to pay less for cage-free eggs than lower-income participants. Among the statistically-strongest effects, we find that single people are willing to pay significantly more for cage-free eggs than married participants. While striking, this outcome is likely not suggestive of any deeper, generalizable result that should raise any concern for egg marketers. Of potentially more importance, however, are the findings that pet owners and vegetarians are willing to pay more for cage free eggs. Although these findings are again not particularly surprising, they do emphasize that concern over animal welfare is real, and help identify, and quantify, market segments that are likely to be particularly sensitive to animal welfare concerns. Among the other effects of interest, we find that participants who had heard of Proposition 2, while not necessarily knowledgable about the nuances of the issue, were willing to pay less for cage-free eggs than other respondents. Given that our experiment was conducted in Arizona, this result likely reflects a more general sentiment in the state that voters in California tend to be more concerned with "liberal" issues than the conservative electorate of Arizona. Finally, in response to our question "Which of the following attributes is most important..." in selecting eggs, we find that respondents who regard animal welfare, local produce, organics and omega 3 content as important are likely to bid more than otherwise. Clearly, these consumers are highly involved in their egg-purchase decision and take issues other than price or color into account.

Of greater interest, however, are the elements of the random-coefficient advertising-effect function. The first set of results, the "Means of Random Parameters" refers to the shift, or preference effect associated with each type of advertising, or the absence thereof. Johnson and Myatt (2006) interpret the shift effect as hype because real information would instead rotate the demand curve. The constant term provides a benchmark mean WTP established by the control group. Relative to control, the "Pro" parameter implies that ads

in favor of Proposition 2 were effective in causing participants to be willing to pay more for cage free eggs than control - some $0.25 / dozen more. Next, the "Anti" parameter indicates that ads in favor of the status quo, which emphasized the importance of the issue for small farmers in the state, led participants to bid $0.07 / dozen less than control. At least with respect to this direct effect, our results support the findings of Schwartz and Strand (1986) and Fox, Hayes and Shogren (2002) more recently. Combining both types of information, however, we find that participants are willing to pay nearly as much as if they only saw the "Pro" ads – $0.21 / dozen more than control. In terms of loss-aversion theories either of Viscusi, Magat and Huber (1987) or Kahneman and Tversky (1979), if the "Pro" ads represent negative information to the exent that they reveal something bad about the egg production process that people were initially unware of, our respondents clearly exhibit response asymmetries consistent with either explanation.

The "Standard Deviations of Random Parameters" are interpreted as the "rotation" effects of the different types of ad as they refer to the impact on the dispersion of the distribution of responses in each case. Johnson and Myatt (2006) show that such dispersion effects are isomorphic to rotation effects. Insignificant rotation effects would suggest that the advertising contains only a preference effect and no real information: the stronger the rotation, the greater the real information content. Based on these estimates, we find that the "Pro" ads contain nearly three times the real information as "Anti" ads as measured by its embodiment in a rotating demand curve. Rotating the demand curve in a clockwise direction (more inelastic) means that consumers who care about animal welfare become more certain of their preferences and are thus willing to pay more than previously. On the other hand, participants who do not care how their eggs are produced will pay even less than before for cage-free eggs as they are more convinced of their position that cage-free eggs are only for "animal lovers" or "environmentalists" and not people like themselves. To the extent that the marginal consumer is to the left of the pivot point of the distribution of demand, "Pro" ads cause the willingness to pay to rise significantly. If the marginal consumer lies to the right of the pivot point, the "Anti" ads cause the willingness to pay to fall only marginally. The sharpness of the distinction between these two parameters

suggests that we have found another explanation for the apparent asymmetry of good and bad news described by Fox, Hayes and Shogren (2002). Whereas their theoretical explanation relies on behavioral insights from prospect theory and risk aversion, our explanation lies merely in a more careful explication of the underlying changes in utility. If preference heterogeneity is properly regarded, such asymmetries are easily explained in terms of the effect of advertising (or information more generally) and not necessarily some violation of the underlying postulates of economics and marketing theory.

These insights are supported by the parameter on the "Pro/Anti" variable. If participants are given a balanced perspective and are shown both types of ads, we find that the demand curve rotates even more sharply clockwise. As expected, the real information content of the "Pro" ads is reinforced by the reference point provided by the "Anti" ads. If participants are allowed to assess the internal validity of both sides of the argument on their own, they are better able to judge which is more plausible, and their evaluation of the issue more certain. This outcome supports similar findings by previous studies as the one that is closest to ours in spirit and method, Fox, Hayes and Shogren (2002), finds that providing simultaneous positive and negative information reinforces the negative effect. If an ad is able to convince the consumer or voter that "things are not as good as they seem," then the presence of contrary information merely reinforces their worst fears.

In terms of voting tendencies, the "Pro" ads may appeal to a core group of "citizen interests," in Gerber's (1999) terminology, increasing the intensity of support among voters who may have not been aware of this issue before the campaign, but are sensitive to how their food is produced in general. In this case, the ads in opposition to Proposition 2 made a very clear economic argument, transparently in support of business interests in the industry. The estimates from our preference heterogeneity model suggest that this group was likely to be sufficiently small to have little impact on the overall outcome of the vote as neither the pure preference effect of the "Anti" ads nor the real information were sufficient to overcome the "Pro" ads. While the content of the "Anti" ads was economic, the content of the "Pro" ads was emotional, popular and clearly representative of a position that consumers concerned about where their food comes from would want to associate with.

At the end of the day, the outcome of the vote would not be surprising had this analysis been conducted *ex anti*.

Ultimately, however, good policy should increase economic welfare, and the advertising that generates the greatest increment in welfare should rule the day. Welfare estimates, and the proportion of the change due to either a shift or rotatation are shown in table 5. Because voters in the real world see only a combination of ads in support of and in opposition to the proposition (the "Pro/Anti" scenario above), we calculate the combined welfare effects of both types of ads shown together. In the first section of table 5, we show the shift and rotation effects relative to the base case in utility-measure. Beginning from a base utility of 0.799, the shift effect of supporting and opposing ads increases utility to 0.885, while the rotation effect reduces it back to 0.805. Although the rotation effect causes the WTP of some consumers to rise sharply enough to cause the mean WTP to rise, the net effect is to reduce consumer welfare because the mass of consumers lower their WTP as a result of the ads. By dividing the utility effect by the marginal utility of income, we convert changes in utility to a dollar-metric, so the lower two sections of table 4 show the dollar values of political advertising on a per dozen basis, and then on an annual, per household basis. On a per-dozen basis, the net effect of the animal welfare ads is a positive \$0.297 / dozen, with \$0.278 / dozen from the shift effect and \$0.019 / dozen from the rotation effect. On an annual basis, using the average consumption rate per household in the data set to convert per-dozen values, the ads generate \$83.82 in welfare from the shift effect and \$5.67 from the rotation effect for a total of \$89.50 in additional welfare. Because the "Pro" ads dominate the "Anti" ads in terms of their welfare effect then, at least on purely economic grounds, Proposition 2 should have been passed – as it was. The fact that the rotation effect accounts for 6.3% of the total welfare created is striking. Real information in this case is apparently worth only \$5.67 on an annualized basis, while the preference-effect value of advertising is worth some 93.7% of the total, or \$83.82 per household per year. While somewhat depressing, this result is not surprising as the "Pro" ads made heavy use of celebrities with little real information on the pros and con of cage-free eggs while the "Anti" ads were just as partisan but apparently less convincing.

As Johnson and Myatt (2006) point out, all advertising consists of varying amounts of real information and hype. With the method used here, we sort out how much of each lies in each ad. Our insights thus generalize beyond the animal welfare case to any type of advertising program in which advertising is neither purely informative nor purely persuasive. Staying in the public policy realm, "issue ads" are now the order of the day given the unrestricted amounts interested parties can contribute to political campaigns. Issue ads are often even more partisan than state-level ballots so this method could be use to evaluate how voters perceive the message contained in the ads – do they understand the true motivations of the money behind the ad? From another perspective, tools like this can help ad agenices design political ads to maximize the effectiveness of ad spending. If an issue is particularly misunderstood among the electorate, then designing an ad with a high real information content may be able to skew the distribution of preferences such that the "willingness to pay" for the issue at hand rises significantly.

5 Conclusions and Implications

In this study, we evaluate the effectiveness of advertisements on either side of the 2008 California Proposition 2 campaign. Proposition 2, which was eventually passed and further strenghtened in the summer of 2010, sought to restrict agricultural production practices to ensure that animals, specifically egg-laying hens, were treated humanely. We develop an empirical approach based on the preference heterogeneity model of Johnson and Myatt (2006) to determine whether each type of ad, or a combination thereof, was able to change the preferences of the entire electorate, or if they merely sharpened positions on each side. We apply this model to experimental data gathered from a non-hypothetical auction for cage-free eggs.

Our results show that the preference or shift effect dominates the rotation effect for each type of ad. Moreover, the abilty of the ads supporting Proposition 2 were sufficiently effective in changing preferences to outweigh the negative effects associated with the opposing ads. Because the notion that animals may be mistreated in the production of food comes as a revelation to many consumers (who are also voters), this result can be explained by

Kahneman and Tversky's (1979) prospect theory. Framed by the assumption that all farm animals are happy, the ads supporting Proposition 2 revealed sometimes shocking images of animals being mistreated and caused consumers to perceive a measure of risk to animal welfare that they didn't fully appreciate before the campaign. This small amount of "bad news" regarding animal welfare was enough to outweigh many strong, but conventional economic arguments, on the other side.

The real information content of the ads was not inconsequential. Perhaps because the supportive ads revealed information that was not previously known to many voters, and participants in our study, the rotation effect for the "Pro" ads was nearly three times the strength of the rotation effect for "Anti" ads. Using measures of consumer welfare to convert our econometric estimates to a dollar-measure, we found that over 6% of the change in consumer welfare associated with the ads came from the real information effect as opposed to the preference effect. Therefore, the ads both changed preferences and managed to harden some voters' opinions on either side.

Based on campaign ad spending during the 2010 election cycle, studying the behavioral effects of political ads – for congressional, presidential, state, local and ballot measures – is an area ripe for futher research in marketing. Politics has become as much about marketing as it is about political science or public administration. Therefore, marketing researchers can have a significant impact on discourse in this area by bringing the tools of consumer behavior and marketing research to study political issues. In terms of our specific study, there are a number of issues in conducting non-hypothetical experiments that should be addressed in a political context: hypothetical bias (difference between hypothetical and non-hypothetical responses), social isolation bias (difference between responses made in private and in public) and consequentialty (the perception that a participant's responses will have a real effect) are only three important topics that remain to be explored.

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Table 1: Hypotheses for Advertising Effect

Hypothesis	Parameters	Expectation
1. "Pro" advertising increases WTP for all voters	$\delta_{10} > 0$	"Pro" ads are pure hype and shift demand curve out for all voters
2. "Pro" advertising increases the dispersion of preferences	$\delta_{11} > \delta_{01}$	"Pro" ads have real information and rotate demand clockwise
3. "Anti" advertising increases WTP for all voters	$\delta_{20} > 0$	"Anti" ads are pure hype and shift demand curve out for all voters
4. "Anti" advertising increases the dispersion of preferences	$\delta_{21} > \delta_{01}$	"Anti" ads have real information and rotate demand clockwise
5. "Pro/Anti" advertising increases WTP for all voters	$\delta_{30} > 0$	"Pro/Anti" ads are pure hype and shift demand curve out for all voters
6. "Pro/Anti" advertising increases the dispersion of preferences	$\delta_{31} > \delta_{01}$	"Pro/Anti" ads have real information and rotate demand clockwise

Note: δ_{00} and δ_{01} are constant shift and rotation terms, respectively. Index m=1 refers to "Anti" ads, index m=2 refers to "Pro" ads and m=3 refers to "Pro/Anti" ads.

Table 2: Summary of Willingness-to-Pay by Demographic Strata.

Variable	Classification	Mean	Std. Dev	Min	Max	N
Income	< $10,000	0.776	0.783	0.000	3.950	384
	$10,001 - $20,000	0.927	0.792	0.000	3.990	336
	$20,001 - $30,000	0.899	0.798	0.000	5.000	245
	$30,001 - $40,000	0.872	0.629	0.010	2.670	66
	> $40,000	0.569	0.664	0.000	2.070	36
Race	African-American	0.524	0.515	0.000	1.500	18
	Asian-American	0.718	0.560	0.000	1.750	30
	Asian	0.365	0.727	0.000	3.000	30
	Hispanic	0.604	0.403	0.000	1.220	18
	Hispanic-American	1.093	0.915	0.100	3.330	60
	Mixed Race	0.521	0.393	0.000	1.000	18
	White	0.748	0.635	0.000	1.500	30
Marital Status	Married	0.851	0.780	0.000	5.000	1067
HH Size	1	0.873	0.814	0.000	3.330	264
	2	0.903	0.768	0.000	3.990	432
	3	0.845	0.800	0.000	3.750	132
	4	0.781	0.722	0.000	2.900	138
	5	0.729	0.836	0.000	5.000	84
	6	0.332	0.090	0.250	0.500	11

Units are all $/dozen.

Table 3: Summary of Willingness-to-Pay by Treatment

	Control	Pro	t-ratio	Anti	t-ratio	Pro / Anti	t-ratio
All Bids	-0.9672	1.1056	4.2138	0.6907	-8.0755	0.8941	-2.1731
	0.7480	0.7698		0.8322		0.8056	
First Bids	0.7380	1.0879	10.3615	0.5758	-5.0165	0.6263	-3.6314
	0.7102	0.8447		0.7824		0.7114	

* Note: all values are in $/dozen. Values below bids are standard deviations. t-ratios compare treatment value to control value. A single asterisk indicates significance at 5%.

Table 4: Random Coefficient Willingess-to-Pay Model.

Non-Random Parameters			Random Parameters		
Variable	Estimate	t-ratio.	Variable	Estimate	t-ratio.
Bid Order 1	-0.272*	-5.948	Means of Random Parameters		
Bid Order 2	-0.180*	-3.449	Constant	0.341*	3.086
Bid Order 3	-0.123*	-2.139	Pro	0.253*	7.525
Bid Order 4	-0.076	-1.399	Anti	-0.070*	-2.158
Bid Order 5	-0.071	-1.125	Pro/Anti	0.211*	5.626
Female	0.068*	2.923			
HH Size	-0.029*	-2.678	Std. Deviations of Random Parameters		
HH Income	-0.003*	-2.724	Constant	0.533*	48.638
Marital	0.279*	10.223	Pro	0.352*	16.805
Vegetarian	0.080*	2.439	Anti	0.132*	7.901
Pet Owner	0.193*	7.679	Pro/Anti	0.416*	15.763
African-America	-0.075	-0.751			
Asian	-0.032	-0.388	Variance of Random Effects		
Asian-American	-0.579*	-3.479	Sigma	0.356*	80.011
Hispanic	-0.057	-0.548			
Hispanic-American	0.318*	4.899			
Mixed Race	0.042	0.413			
White	0.275*	5.783			
Food Safety	0.029	1.223			
Heard of Prop 2	-0.080*	-6.562			
Animal Welfare	0.690*	18.429			
Local Produce	0.433*	13.247			
Organic	0.630*	16.838			
Omega 3	0.169*	3.449			
Number of Eggs	0.006*	5.312	-		
LLF	-595.725				
Chi-Square	1306.183				

* Indicates significance at the 95% level.

Table 5: Welfare Effects of Cage-Free Egg Advertising.

	Mean	Std. Dev.
Base Utility	0.799	0.659
Shift Effect	0.885	0.679
Rotation Effect	0.905	0.862
Shift Effect per Dozen (cents)	27.781	46.464
Rotation Effect per Dozen (cents)	1.881	87.240
Total Effect per Dozen (cents)	29.663	99.616
Annual Shift Effect ($)	83.822	14.019
Annual Rotation Effect ($)	5.677	26.321
Annual Total Effect ($)	89.498	30.056