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Does Government Sponsored Advertising Increase Social Welfare?
A Theoretical and Empirical Investigation

Carlos E. Carpio

Associate Professor, Department of Agricultural and Applied Economics,
Texas Tech University, Box 42132, Lubbock, TX 79424-213,
carlos.carpio@ttu.edu

Olga Isengildina-Massa

Associate Clinical Professor, Department of Economics, University of Texas at Arlington,
Box 19479, Arlington, TX 76019-0479, isengild@uta.edu

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Carlos E. Carpio and Olga Isengildina-Massa**

Abstract

The main objective of this study was to analyze the effect of advertising on social welfare in a perfectly competitive market where the level of advertising is chosen by a social planner. The theoretical model revealed that social planner sponsored advertising that increases the equilibrium price of the advertised good can increase society's welfare if the effect of advertising in consumers' utility is higher than the consumer welfare reducing price effect (producer welfare is increased by the same amount as the reduction in consumer welfare). The empirical illustration focuses on the U.S. state of South Carolina "buy local" food products campaign. The findings suggest that this government sponsored advertising campaign increases total welfare.

JEL codes: D11, D12

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Does Government Sponsored Advertising Increase Social Welfare?

A Theoretical and Empirical Investigation

The welfare effects of advertising have been a subject of debate among economists for some time. The controversy arises from the conceptual characterization of advertising as persuasive, informative or complementary in the consumption of goods. According to the persuasive view, advertising is deceptive in nature and persuades consumers to buy commodities they did not previously find useful (Kaldor 1950). The informative view contends that advertising benefits society by informing consumers about product characteristics, prices and availability (Telser 1964). The complementary view argues that advertising influences demand by operating as a complement in the consumption of the advertised good (Becker and Murphy 1993; Fisher and McGowan 1979).

The conceptual disagreement about the nature of advertising likely led to a paucity of empirical studies quantifying the consumer welfare effects of advertising. Moreover, given that (in theory) perfectly competitive firms do not benefit from advertising, the majority of previous theoretical studies on the subject have assumed imperfectly competitive markets. However, imperfectly competitive firms are not the only agents that engage in advertising. Many agricultural commodities in the U.S. have mandated marketing programs (e.g., the *Got Milk* and the *Incredible Edible Egg* promotion programs) financed by an assessment collected from all producers of the relevant commodity (Kaiser et al 2005). Government sponsored advertising campaigns are also common around the world. Examples in the U.S. include government sponsored anti-smoking and anti-obesity campaigns, as well as the regional “buy local” promotion programs conducted by all 50 states in 2010 (Onken and Bernard 2010). Whereas the

goals of government sponsored advertising campaigns vary, a common characteristic of these campaigns is that they are funded by taxpayer money. However, little is known about the effect of such campaigns on consumer welfare.

The goal of this study is to analyze the effect of advertising on social welfare in a perfectly competitive market where the level of advertising is chosen by a social planner. The theoretical analysis is accompanied by an empirical illustration analyzing the impact of the U.S. state of South Carolina “buy local” food campaign on consumer welfare. We propose a novel approach to empirically determine whether advertising is informative or complementary in nature using contingent valuation procedures. Furthermore, since the South Carolina “buy local” campaign is sponsored and funded by the regional government, we evaluate how the use of alternative campaign financing vehicles (a new tax versus the reallocation of current taxes) effects the evaluation of the promotion campaign.

The theoretical framework developed in this study can be applied to the evaluation of different types of government sponsored advertising campaigns. The empirical findings will help the South Carolina government with their campaign evaluation efforts and contribute evidence on the effectiveness of regional promotion campaigns in the United States.

Literature Review: Empirical Studies Analyzing Consumer Welfare Effects of Advertising

We identified two groups of studies within this literature. The first group of studies corresponds to the U.S. alcohol and cigarette markets which are assumed to be imperfectly competitive. Tremblay and Tremblay (1995a) and Farr, Tremblay and Tremblay (2001) estimate the welfare effect of advertising for the U.S. cigarette industry. To account for the different forms of advertising these authors utilize three different empirical models assuming cigarette

advertising is alternatively: purely persuasive, purely informative, or purely complementary. Tremblay and Tremblay (1995b) use Becker and Murphy's (1993) complementary advertising framework to analyze the welfare effect of advertising in the US brewing industry.

The second group of studies corresponds to studies from the agricultural economics literature evaluating the effectiveness of generic advertising of agricultural commodities. As argued by Alston, Chalfant and Piggot (2000), most of this literature has focused on producer welfare effects whereas the interests of consumers or general taxpayers have been largely overlooked. To the best of our knowledge, the only articles within this literature that consider producer and consumer welfare effects are Wolhgenant (1993) and Alston, Chalfant and Piggot's (2000) work on the welfare effects of advertising in the U.S. beef and pork industries. Both studies assume the complementary advertising framework.

As in the case of studies evaluating the effect of agricultural generic advertising programs, previous studies of regional agricultural promotion campaigns are limited to the effects of advertising on producer surplus (e.g., Govindasamy et al. 2003; Carpio and Isengildina-Massa 2010). Thus, a comprehensive approach is needed to evaluate the effect of government sponsored advertising on total social welfare.

Conceptual Framework

In this section we show how government sponsored advertising affects social welfare in perfectly competitive markets. Three approaches are presented: (1) a geometric analysis, (2) a marginal analysis, and (3) an analysis using compensating welfare measures. The analysis using compensating welfare measures allows us to develop a novel approach to empirically determine

whether advertising is informative or complementary in nature using contingent valuation procedures.

Welfare Effects of Advertising in a Perfectly Competitive Market: Geometric Analysis

The perfectly competitive market structure is characterized by the demand function and the aggregate supply function that simultaneously determine equilibrium prices and quantities. This model is described in Figure 1. The initial supply and demand curves are S_0 and D_0 which result in the equilibrium price P_0 and quantity Q_0 . The impact of an effective government sponsored promotion campaign on consumer demand is illustrated by the shift of the demand curve from D_0 to D_1 .¹ Since advertising is sponsored by the government, the producer cost structure remains unchanged. The equilibrium prices and quantities increase from P_0 to P_1 and Q_0 to Q_1 , respectively. The new equilibrium illustrates a shift in demand and a movement along a supply curve.

Purely Persuasive Advertising

If advertising is purely persuasive or deceptive, the promotion campaign is designed to convince consumers that they would be better off with the advertised product. Therefore, consumer welfare should be evaluated using pre-advertising tastes (Dixit and Norman 1978; Carlton and Perloff 2000). Hence, the demand curve D_0 , representing consumers' true preferences, is used to measure the effect of advertising on consumer surplus. Consumer surplus without advertising is equal to area P_0NT_0 . With advertising, consumer surplus becomes $P_1JT_0 - MKJ$. Notice that the area $NMKG$ represents expenditures that would not occur if

¹ Throughout this section we assume: a) linear supply and demand curves, and b) the only effect of advertising is an outward shift of the demand curve. The analytical framework presented in the next section is more general and relaxes these assumptions.

consumers were not misled by advertising. The change in consumer surplus due to advertising is always negative and represented by $\Delta CS_{pers} = -P_0 N K P_1 - M K J$. Change in producer surplus is $\Delta PS_{pers} = P_0 N K P_1$. Therefore, if the social planner engages in a promotion campaign of a product and the advertising is purely persuasive, the change in total welfare due to advertising in the market for that good is always negative and given by $\Delta TS_{pers} = -N M K$. Furthermore, the losses in consumer surplus due to this type of advertising outweigh the gains in producer surplus. However, the effects of persuasive advertising for rational optimizing consumers should only be temporary; hence, we will not consider this form of advertising in the next sections.²

Purely Informative Advertising

If advertising is informative in nature, consumers learn about product characteristics, and the demand curve D_1 reflects consumers' true preferences and should be used to measure the effect of advertising on consumer surplus (Dixit and Norman 1978; Carlton and Perloff 2000). Consumer surplus without advertising equals area $P_0 N G T_1$. With advertising, consumer surplus becomes $P_1 K T_1$. The change in consumer surplus due to advertising is negative and given by $\Delta CS_{inf} = -P_0 N J P_1$. Change in producer surplus is positive and represented by $\Delta PS_{inf} = P_0 N K P_1$. Therefore, if the social planner engages in a promotion campaign of a product and advertising is purely informative, the change in total welfare due to advertising in the market for the good is always positive and given by $\Delta TS_{pers} = N K J$. Thus, this form of advertising is able to generate a net benefit to society.

² One would also hope that advertising funded by government agencies is not deceptive.

Complementary Advertising

If advertising is complementary in nature, it influences demand by acting as a complement to the consumption of the advertised good. In this case, advertising enters utility directly as an additional argument. The effect on demand is similar to that of quality improvement and the demand curve D_1 reflects consumers' post-advertising preferences (Becker and Murphy 1993; Cardon and Pope 2003; Tremblay and Tremblay 1995a). In Figure 1, consumer surplus without advertising equals P_0NT_0 , consumers surplus with advertising equals P_1KT_1 , and the change in consumer surplus due to advertising is positive and given by $\Delta CS_{compl} = T_0JKT_1 - P_0NJP_1 = P_1KGR$. Change in producer surplus is given by $\Delta PS_{compl} = P_0NKP_1$. Thus, both consumers and producers benefit from this type of advertising. When advertising is complementary, if the social planner engages in a promotion campaign, the total welfare change due to advertising is always positive and given by $\Delta TS_{compl} = P_0NKGR$.

Welfare Effects of Advertising in a Perfectly Competitive Market: Marginal Analysis

To analyze the marginal changes in welfare due to government sponsored advertising in a perfectly competitive market, we follow Dixit and Norman (1978) and Cardon and Pope (2003) and assume consumer demand is generated by a quasi-linear utility function:³

$$(1) \quad U = z + u(x, A)$$

where x is the market output of the competitive industry, z is the numéraire good, and A is the advertising level chosen by the social planner. Consumption of the numéraire good is given by $z = I - px$, where I is income. Utility maximization subject to the budget constraints yields the following inverse and direct demand functions:

³ This simplifies welfare analysis by eliminating income effects. Hence, consumer surplus can be used as a welfare measure.

$$(2) \quad p = u_x(x, A) \quad \text{and} \quad x = x(p, A)$$

On the supply side, assume industry profits are given by $\Pi(p, A) = px - f - cx$, where c is the marginal cost of output, and f is the fixed production cost. Profits are assumed to be a function of the level of advertising A . However, since advertising is sponsored by the government, the cost of advertising to the industry is assumed to be zero.

Total social welfare is:

$$(3) \quad W(A) = u(x(p, A), A) + I - px(p, A) + \Pi(p, A)$$

The effect of advertising on total social welfare is determined by totally differentiating equation (3) with respect to A :

$$(4) \quad \frac{dW}{dA} = \frac{\partial x}{\partial A}(u_x - p) + \frac{\partial x}{\partial p} \frac{dp}{dA}(u_x - p) + u_A - x \frac{dp}{dA} + \frac{\partial \Pi}{\partial A}.$$

Hence, the marginal effect of the level of advertising selected by a social planner includes both the impact on industry profits $\left(\frac{\partial \Pi}{\partial A}\right)$ and the impact on consumers. In the perfectly competitive markets $p = c$, hence $\frac{\partial \Pi}{\partial A} = x \frac{dp}{dA}$. Thus, industry profits increase when advertising increases the equilibrium output price $\left(\frac{dp}{dA} > 0\right)$. Utility maximization implies that $p = u_x(x, A)$ and equation (4) simplifies to

$$(5) \quad \frac{dW}{dA} = u_A - x \frac{dp}{dA} + x \frac{dp}{dA} = u_A.$$

Equation (5) combines the effect of advertising on consumers $\left(u_A - x \frac{dp}{dA}\right)$ and producers $\left(x \frac{dp}{dA}\right)$. Equation (5) also demonstrates how the characterization of advertising: the informative type of Dixit and Norman (1978) versus the complementary type of Becker and

Murphy (1993) can be empirically investigated, since the only difference between the two types is the assumption regarding the marginal effect of advertising on utility.

The informative view assumes that $u_A = 0$. Hence, under the informative characterization, social planner sponsored advertising entails a transfer of welfare from consumers $\left(-x \frac{dp}{dA}\right)$ to producers $\left(x \frac{dp}{dA}\right)$ or vice versa but not a change in total social welfare.⁴ In other words, in a perfectly competitive market, advertising can be used by a social planner as a welfare transfer mechanism. This result contrasts with Dixit and Norman's (1978) finding for imperfectly competitive markets (with $\frac{\partial \pi}{\partial A} = 0$) where an increase in advertising levels decreases society's total welfare $\left(-x \frac{dp}{dA} < 0\right)$ when advertising increases equilibrium output price $\left(\frac{dp}{dA} > 0\right)$. Differences between the effects of a marginal change (analyzed using derivatives in this section) and a finite change (analyzed using graphs in the previous section) are due to the second order smallness of the triangles around the market equilibrium point. In the case of informative advertising, whereas the geometric analysis of advertising determines a potential increase in total welfare due to a price increasing advertising campaign (given by area NKJ in Figure 1), the marginal analysis only shows a net transfer of welfare.

When the marginal effect of advertising on utility u_A is different than zero, which is assumed under Becker and Murphy's (1993) complementary type, it becomes possible that social planner sponsored advertising campaign will change society's total welfare. The change in

⁴ Government funded campaign can promote or discourage the consumption of certain products and hence $\frac{dp}{dA}$ can be higher, lower or equal to zero. Examples of campaigns discouraging the consumption of goods include anti-smoking campaigns.

consumer surplus is determined by the signs and relative magnitudes of u_A and $x \frac{dp}{dA}$. In this case the finite and marginal analyses can be made comparable by noting first that $u(x, A) = \int_0^x u_x(t, A) dt$ and since $u_x(x, A) = p$, then $\int_0^x u_x(t, A) dt = \int_0^x p(t, A) dt$. Therefore, the change in utility is,

$$(6) \quad u_A = \int_0^x \frac{\partial p(t, A)}{\partial A} dt,$$

which is given by area T_0NGT_I in Figure 1.⁵ Observe that if the shift in demand is parallel, the area equals T_0JKT_I which in the graphic analysis was identified as the increase in consumer surplus due to advertising.⁶ The reduction in consumer welfare due to the advertising induced price increase is $x \frac{dp}{dA}$, which is shown in Figure 1 by area P_0NEP_I (slightly different than the area identified in the geometric analysis, P_0NJP_I , due to the second order smallness of area JEN).

This section presented a theoretical model that encompasses both the complementary and informative views of advertising. The model indicates that under the complementary view, two factors influence the overall impact of advertising on consumer welfare, the marginal effect of advertising on utility and the effect of advertising induced price change (u_A and $-x \frac{dp}{dA}$). On the other hand, if advertising is informative its effect on consumer welfare is determined only by the change in price ($-x \frac{dp}{dA}$). Therefore, under the complementary view of advertising, social planner sponsored promotion campaigns can increase society's total welfare, while under informative view they only result in a transfer of welfare from consumers ($-x \frac{dp}{dA}$) to producers ($x \frac{dp}{dA}$) or vice versa but not a change in total social welfare. The nature of government sponsored

⁵ Note that $\frac{\partial p(t, A)}{\partial A}$ is the marginal willingness to pay for advertising (Tirole 1988). Hence, an increase in the marginal willingness to pay for advertising shifts the advertising demand curve and subsequently the demand curve for its complement: the good being advertised.

⁶ The two areas will likely differ in the case of a nonparallel shift in demand.

advertising can be determined by investigating whether the marginal effect of advertising on consumer utility u_A is different than zero⁷.

Compensating Welfare Measures of Advertising Effects

Previous attempts to empirically evaluate the impacts of advertising on consumer welfare (e.g., Tremblay and Tremblay 1995a) have relied on revealed preferences (i.e., market data). The limitations of this approach stem from the fact that market data do not allow the researcher to disentangle the effect of advertising on utility from its effect due price change. Thus, the researcher is unable to determine whether advertising is informative or complementary in nature and has to make assumptions about the nature of advertising and use different measures of the welfare effect based on these assumptions. In lieu of this approach we propose to use compensating welfare measures estimated using contingent valuation methods to empirically determine whether government sponsored advertising is informative or complementary in nature.

The compensating welfare measure is the amount of income that could be taken away from a household after a policy (e.g., increase of the level of advertising by a social planner) has been implemented in order to leave the household indifferent to the policy (Freeman 2003). In terms of policy implementation, the social planner's most obvious alternative to "take away" money from the consumer is a new tax. However, most government sponsored advertising campaigns are funded using current tax revenues instead of new taxes. In this section we discuss compensating welfare measures for both campaign financing alternatives: a new tax versus tax reallocation.

⁷ As mentioned before, this approach assumes that government sponsored advertising is not likely to be purely persuasive or deceptive.

New Tax

Using 0 superscripts to denote the initial conditions and 1 superscripts to denote the post-advertising conditions, we define the compensating welfare measure (CW), using the indirect utility function $V(\cdot)$:⁸

$$(7) \quad V(p^0, A^0, I^0) = V(p^1, A^1, I^1 - CW)$$

Hence, contingent valuation can be used to measure the effects of “policies” affecting advertising levels (A), prices (p) and income (I), simultaneously or separately. Assuming income level remains unchanged before and after the policy ($I^0 = I^1$), the change in consumer welfare encompassing both the utility effect due to change in the advertising level from A^0 to A^1 and the price effect due to increase in price from p^0 to p^1 (i.e., complementary effect of advertising) is given by CW_T in

$$(8) \quad V(p^0, A^0, I^0) = V(p^1, A^1, I^0 - CW_T).$$

The effect of advertising on utility can be estimated considering only a change in the level of advertising ($A^1 > A^0$) with no change in the price of the advertised good ($p^1 = p^0$):

$$(9) \quad V(p^0, A^0, I^0) = V(p^0, A^1, I^0 - CW_C).$$

⁸ The utility function $V(\cdot)$ in equation (7) corresponds to a direct utility of more generality than that shown in equation (1). In fact, this equation can be said to represent the indirect utility function of the consumer problem where demand is generated by a utility function $u(x_1, x_2, \dots, x_n, A_1)$ subject to the budget constraint $I = \sum_{i=1}^n x_i p_i$, where x_i is the quantity of the i th good, p_i are the quantity, price and amount of advertising for i th good, respectively. The indirect utility function of this problem has the form $V(p_1, p_2, \dots, p_n, A_1, I)$. For simplicity, equation (7) only includes the arguments of interest and assumes that all other arguments in the indirect utility are constant between the initial and final conditions.

Here CW_C represents the discrete version of u_A from equation (5). The difference between CW_T and CW_C can be interpreted as the welfare effect of the informative type of advertising (i.e., the discrete version of $x \frac{dp}{dA}$ from equation (5)).

Tax Reallocation

A tax reallocation payment vehicle requires the consumer to tradeoff some amount of other public goods (Z) to obtain an increase in A . The compensating welfare measure obtained in this context is referred to as compensating tax reallocation (CTR) (Bergstrom et al. 2004). In general, the CTR can be defined as:⁹

$$(10) \quad V(p^0, A^0, Z^0, I^0) = V(p^1, A^1, Z^1 - CTR, I^0).$$

Note that CTR is expressed in dollars and can be subtracted from a composite measure of all public goods Z . If income levels remain unchanged before and after the policy ($I^0 = I^1$), the change in consumer welfare due to complementary advertising is given by CTR_T in:

$$(11) \quad V(p^0, A^0, Z^0, I^0) = V(p^1, A^1, Z^1 - CTR_T, I^0).$$

The effect of advertising on utility only (CTR_C) can be estimated considering only a change in the level of advertising while keeping the price constant ($p^0 = p^1$):

$$(12) \quad V(p^0, A^0, Z^0, I^0) = V(p^0, A^1, Z^1 - CTR_C, I^0).$$

⁹ The consumer optimization problem corresponding to the indirect utility function in (10) includes Z as an argument in utility $u(x_1, x_2, \dots, x_n, A_1, Z)$ and the constraint $I = \sum_{i=1}^n x_i p_i + Z$, where Z is a composite commodity of all public goods with unit price. Since Z is “rationed”, the demand functions for the i th good also have Z as an argument, and therefore, the indirect utility function for this problem has the form $V(p_1, p_2, \dots, p_n, A_1, Z, I)$ (see Bergstrom et al., 2004; Cornes, 1992). However, notice that in contrast to Bergstrom et al. (2004) we define CTR using the indirect utility function rather than the expenditure function. Also, for simplicity, the indirect utility function in equation (10) only includes the arguments of interest.

In the same manner as with the CW measures, the difference between CTR_T and CTR_C is the welfare effect of the informative type of advertising. As shown in Bergstrom et al. (2004), the relative magnitude of CW and CTR is determined by the relative marginal value of a consumer having a bundle of public goods (Z) and private goods (disposable income). If a consumer lives in a region where the existing bundle of public goods available to citizens has a high (low) marginal value relative to private goods, then CTR should be lower (higher) than CW .

Equations (7) to (12) provide the theoretical definition of the welfare effect of a discrete change of advertising on consumers, as well as the link between the theoretical and the empirical aspects of this study. The empirical strategy for determining the nature of advertising consists of contingent valuation procedures to estimate consumer willingness to pay (CW or CTR) for advertising campaigns that differ in price effects (from no effect to 3% and 6% increase). This variation in advertising induced price increases allows us to separate the welfare effects of the price increase from the direct effect of advertising on utility (no price effect), thereby enabling us to empirically establish whether advertising is informative or complementary in nature.

Empirical Illustration

The South Carolina Promotion Campaign

The methodology developed in the conceptual framework is applied to the evaluation of the impact of the South Carolina “buy local” promotion campaign on consumer welfare. The campaign was launched on May 22, 2007 and was financed by special appropriations from the state legislature from 2007 to 2010 with average annual expenditures of \$1.3 million. This campaign is an illustration of the growing trend across state governments to promote locally grown products. The continued support for regional products has also been expressed in The Food, Conservation and Energy Act of 2008 (P.L. 110-246) which directs the Secretary of

Agriculture to encourage institutions, such as schools, to purchase unprocessed agricultural products, both locally grown and locally raised, to the maximum extent practicable and appropriate. The goal of the South Carolina “buy local” campaign is to increase consumer demand for the state produced food products (<http://www.certifiedscgrown.com>). Campaign activities include the design and distribution of labels and signage for “Certified South Carolina Grown” products; the advertisement of South Carolina food products on television, radio, magazines, newspapers and billboards; and the “Fresh on the Menu” component focusing on advertising at local restaurants. Most of the campaign expenditures (>70%) are devoted to multimedia advertising.

Data

The data were collected via a mail survey of 4,000 South Carolina households randomly selected from a list provided by a professional survey research firm. Four hundred and nine usable responses were collected from the survey (10.2% response rate) but after deleting observations with missing values only 317 observations were used for the analysis. In addition to the valuation questions for the locally grown campaign, the survey collected information on the socioeconomic characteristics of the respondents. The average socio-demographic characteristics of survey respondents shown in Table 1 demonstrate that our sample contained slightly less female respondents than the state average¹⁰ of 51.3%. Survey respondents were also slightly older than the average South Carolina resident (40-44 years old), but sample household size and income were very similar to state averages of 2.52 and \$58,368, respectively.

The valuation questions were designed to elicit consumer willingness to pay (*WTP*) for the campaign using two alternative payment vehicles: a special tax and a tax reallocation. Thus

¹⁰ State population data according to the U.S. Census Bureau 2005-2009 American Community Survey (available at <http://www.census.gov/acs/www/>).

the *WTP* measured either *CW* from the new tax or *CTR* from tax reallocation (equations 7-12). In the case of the new tax, the *WTP* questions (listed in Appendix 1) clearly indicated that the special tax needed to fund the program would reduce the amount of money a household has to spend on other private goods. In the case of tax reallocation, it was explained that this measure would decrease the current amount of household taxes spent on other public goods without affecting disposable income. The valuation questions were preceded by statements explaining the campaign goals and components, amount and the source of funding and questions about awareness and general support for the campaign. The valuation questions were pre-tested using a pilot phone survey of about 100 individuals.

Valuation questions used a dichotomous choice format, where a respondent was asked if she would vote to support the campaign given a specified program cost (C_I) in terms of a special tax or tax reallocation (Appendix 1). Respondents were also provided with an estimate of the percentage increase in the price of South Carolina food products due to the campaign (0%, 3% and 6% increase). If respondents indicated that they were willing to accept the initial bid, they were subsequently asked if they would be willing to accept a higher bid (C_{SH}). Alternatively, if the respondents were not willing to accept the initial bid, a lower follow up bid (C_{SL}) was offered. The contingent valuation questions and bid levels were developed and validated on the basis of about 100 pre-test phone surveys.

The four possible responses to the bid scenarios were (1) a “yes” to both bids, (2) a “no” followed by a “yes”, (3) a “yes” followed by a “no”, and (4) “no” to both bids. The sequence of questions defined the following ranges for the *WTP* values: $(\infty, C_{SH}]$, $[C_{SL}, C_I)$, $[C_I, C_{SH})$, and $(0, C_{SL})$. The following four discrete outcomes of the bidding process were observable:

$$(13) \quad D = \begin{cases} C_{SH} \leq WTP < \infty & (\text{response outcome 1}) \\ C_{SL} \leq WTP < C_I & (\text{response outcome 2}) \\ C_I \leq WTP < C_{SH} & (\text{response outcome 3}) \\ 0 < WTP < C_{SL} & (\text{response outcome 4}). \end{cases}$$

Econometric Models

Determinants of Willingness to Pay

The impact of explanatory variables on consumer WTP is analyzed using the function:

$$(14) \quad WTP = X\beta + \varepsilon ,$$

where X is a vector of explanatory variables, β is a conformable vector of coefficients, and ε is a random variable accounting for unobservable characteristics. Using equation (12) and assuming that $\varepsilon \sim H(0, \sigma^2)$, where H is a cumulative distribution function with mean zero and variance σ^2 , we derive the choice probabilities corresponding to expression (11) as:

$$(15.1) \quad P(WTP \geq C_{SH}) = 1 - H(C_{SH} - X\beta)$$

$$(15.2) \quad P(C_{SL} \leq WTP < C_I) = H(C_{SL} - X\beta) - H(C_I - X\beta)$$

$$(15.3) \quad P(C_I < WTP \leq C_{SL}) = H(C_I - X\beta) - H(C_{SL} - X\beta)$$

$$(15.4) \quad P(WTP < C_{SL}) = H(C_{SL} - X\beta).$$

The log-likelihood function is:

$$(16) \quad L = \sum_{D_1} \ln[1 - H(C_{SH} - X\beta)] + \sum_{D_2} \ln[H(C_{SL} - X\beta) - H(C_I - X\beta)] + \sum_{D_3} \ln[H(C_I - X\beta) - H(C_{SL} - X\beta)] + \sum_{D_4} \ln[H(C_{SL} - X\beta)] ,$$

where D_j indicate the group of individuals belonging to the j^{th} bidding process outcome from the survey (equations 13). The approach outlined in equation (16) is an adaptation of the censored regression estimation procedure based on “closed-ended” contingent valuation survey data proposed by Cameron and James (1987) and Cameron (1988). Estimation of the parameters in equation (16) requires assuming a specific distributional form for H . The most commonly

assumed distributions are the lognormal and the normal (Cameron 1988). The model was estimated under both distributional assumptions and Vuong's (1989) likelihood ratio test was used to select a preferred model.

The vector of explanatory variables in (14) included dummy variables for payment vehicle (new taxes and current taxes), respondent awareness of the campaign, respondent perceptions regarding the quality of the local products and gender (see Table 1). The vector also included continuous variables for the estimated price increase in local products due to the campaign, household income, and the age of the respondent. The price increase variable (p), income (I) and payment vehicle (CW and CTR) have direct correspondence with variables included in the theoretical section equations (7) to (12). All other variables in the empirical model account for differences in consumers' *WTP* for the campaign due to demographic characteristics and perceptions (Boyle 2003). Maximization of the log-likelihood functions was performed using MATLAB.

Results and Discussion

Summary Statistics

Summary statistics of the explanatory variables shown in Table 1 illustrate that while only 43% of survey respondents were aware of the campaign, an overwhelming 84% of respondents supported it. The majority of survey respondents (73%) indicated that their main motivation to buy South Carolina food products was either to support South Carolina farmers or the South Carolina economy. When consumers were asked how the quality of South Carolina products compared to out-of-state products, 62% indicated that South Carolina food products were of the same or better quality than products from out of the state. Previous studies have shown that consumers often respond to non-pecuniary factors in their choice of consumption of

locally grown products (e.g., Scarpa, Phillippidis, and Spalantro 2005; Eastwood, Brooker and Orr 1987). Consumer characteristics describing length of residence in the state and employment in agricultural sectors are included to control for these non-pecuniary factors. About 82% of survey respondents lived in the state more than 10 years, and most (95%) did not work in agriculture.

Summary statistics of the responses to the dichotomous choice questions are reported in Table 2. Even though 84% of respondents supported the campaign when no mention of payment was made (Table 1), only 46% of respondents indicated that they were willing to pay the initial bid to fund the promotion campaign. About a third of respondents not willing to pay the initial bid, agreed to pay a smaller follow up bid.

WTP Regression Analysis

The *WTP* regression model results are shown in Table 3. The parameters of the *WTP* function were estimated assuming both a normal and a lognormal distribution. We present the results for the normal distribution as the Vuong's model selection test for strictly non-nested models provides evidence to reject the null hypothesis that the normal and lognormal models are equivalent ($\alpha < 0.01$) in favor of the alternative that the normal model is better than the lognormal model (Vuong 1989). The parameter estimates of the continuous variables represent the change in the *WTP* for the South Carolina "buy local" campaign given a one unit change in the variable. Thus, a \$10,000 increase in income is estimated to raise the *WTP* for the campaign by \$2.10. Respondent age was not significantly related to *WTP*.

The marginal effects of the dummy explanatory variables can be interpreted relative to those not included in the model: a male, who is not aware of the campaign, whose valuation question (a) used a new tax as the payment mechanism, and (b) assumed no change in the price

of the advertised South Carolina food products. Results indicate that females are willing to pay \$13 per year more for the campaign than males. Consumers that are aware of the campaign are willing to pay about \$11 per year more than those who are not aware of the campaign. This result can be interpreted as a change in demand for the promotion campaign due to the impact of advertising on consumer preferences.

Welfare Effects: Complementary versus Informative Advertising

Whether advertising is complementary or informative in nature can be inferred from comparing the *WTP* for an increase in the level of advertising ($A^I > A^0$) that does not change the price of the advertised goods ($p^I = p^0$), to the one that increases the price of the advertised good ($p^I > p^0$). Hence, it is of interest to estimate both the mean *WTP* values for each case as well as the difference between the cases. We first discuss the difference in *WTP* between the two cases, which can be estimated directly from the regression results, followed by a discussion of the mean *WTP* estimated using the two alternative payment vehicles.

The price effect in the *WTP* model was estimated using a dummy variable (percentage increase in price due to campaign in Table 3).¹¹ The parameter estimate indicates that, relative to consumers whose valuation question used a 0% price increase for South Carolina food products, *WTP* of consumers faced with a 3% or 6% potential price increase was about \$11.86 lower. The estimated difference in the *WTP* for advertising with and without a price increase can be interpreted as the welfare effect of advertising under the informative view.

¹¹ The dummy variable restricts the effect of a 3% price increase to be equal to effect of a 6% price increase. The reason for combining these two categories was empirical. A model including dummy variables for each category separately yielded effects that were not statistically significant different. Another model estimating a linear effect yielded insignificant results.

Payment Instrument

The effect of the payment instrument used in the valuation question is demonstrated by the regression results that indicate that the *WTP* (*CW*) using a current tax is nearly \$30 greater than *WTP* (*CTR*) using a new tax.¹² Since the relative magnitude of *CW* and *CTR* is determined by the relative marginal value of consumer's existing bundle of public goods (*Z*) and private goods, this finding suggests that in South Carolina the marginal value of publicly provided goods relative to privately purchased goods is low.

To complete the *WTP* analysis we compared the acceptance rates (i.e., the percentage of respondents answering yes to the bid questions) for valuation questions using the new tax and the current tax. The percentage of respondents that answer yes to the first and second valuation question using the current tax was 54% and 44%, respectively. However, only about 37% of respondents answered "yes" to the valuation questions based on a new tax. These percentages of acceptance are reflected in the estimated willingness to pay values. From a policy implementation perspective, these percentages suggest that if the funding for the campaign was placed on a ballot, the campaign is more likely to be supported if the source of funding came from the current rather than new taxes.

Aggregate Economic Welfare Effects of the Promotion Campaign

Mean *WTP* estimates can be obtained using equation (14) with the mean values of the explanatory variables (\bar{X}) and the estimated parameter vector $\hat{\beta}$ (Boyle, 2003). Average *WTP* values for groups of consumers represented by the dummy variables can be calculated by replacing the mean value of the element \bar{X}_i in \bar{X} by a one or zero. For example, the average *WTP*

¹² In contrast to Bergstrom et al. (2004) who estimated different models for *CW* and *CTR*, we pooled the data together and estimated one model. The validity of the pooled model with main effects only was evaluated by estimating a model that included interactions between payment vehicle and all other variables in both the mean and variance functions. The likelihood ratio test failed to reject the null hypothesis that the interaction terms are not significantly ($\alpha < 0.01$) different from zero.

for advertising without a price increase can be estimated using the average of the predicted *WTP* values using a 0% price increase (i.e., price dummy=0). The estimated average *WTP* value for this scenario is \$37.57 which represents the pure effect of advertising on utility. Since the best available estimate regarding the potential campaign induced price increase is about 3% (Carpio and Isengildina-Massa 2010), the mean *WTP* value including both the pure effect of advertising in utility and the effect of advertising due to the price increase (price dummy=1) is \$25.71. This value can be interpreted as the welfare effect of advertising under the complementary view. Moreover, this estimate represents the average effect across both payment vehicles.

Given that the payment vehicle matters, the natural question to ask is what is the best estimate of the value of the campaign for consumers that can be used, for example, for a cost benefit analysis? As argued in Mitchell and Carson (1989) the choice of payment vehicle requires balancing realism against payment-vehicle rejection. Both payment vehicles are realistic from a policy implementation perspective; however, the new tax payment vehicle is more likely to result in rejection. This is consistent with a follow up question included in the pilot survey for respondents answering no to the bid question using new taxes that revealed that about 60% of respondents “do not agree with any special or new tax.” Hence, the *WTP* estimates using a new tax can be interpreted as a lower bound of the true *WTP* value. Given the fact that the South Carolina campaign is funded using current taxes, the *WTP* estimates using current taxes likely represent the true value of the campaign to consumers.

The mean *WTP* using current taxes and no price effect is about \$52 per household and decreases to \$40 per household when the estimated price effect is taken into account. The mean *WTP* using new taxes and no price effect is about \$23 per household and decreases to \$11 per household when the price effect is considered. In both cases the effect of advertising on utility is

significantly higher (at least 1.9 times in absolute value) than the effect arising from the price increase (i.e., informative advertising effect). Thus, the increase in consumer welfare due to the effect of advertising in utility outweighs the loss in welfare resulting from the estimated price increase. This finding suggests that government sponsored advertising within the South Carolina “buy local” food campaign is complementary in nature and leads to an increase in consumer surplus.

According to the U.S. Census Bureau there are approximately 1.7 million households in South Carolina. Based on actual campaign funding using current taxes, the estimated total aggregate value of the South Carolina promotion campaign for consumers is \$68 million per year (\$40 per household). This figure was derived using the estimated aggregate effect of the campaign on consumers’ utility (\$88 million per year; \$52 per household) and the estimated aggregate welfare effect of the price increase (-\$20.4 million per year; -\$12 per household) and illustrates the net benefits to consumers.

Summary and Conclusions

The main objective of this study was to analyze the effect of advertising on social welfare in a perfectly competitive market where the level of advertising is chosen by a social planner. We propose an empirical approach to differentiate and measure the welfare effects of advertising under alternative economic conceptualizations of advertising using contingent valuation procedures. The proposed framework was used to estimate the consumer welfare impact of a government sponsored regional “buy local” promotion program in the state of South Carolina. Finally, we empirically demonstrate that two plausible alternative campaign financing vehicles (a new tax versus the reallocation of current taxes) impact the net social welfare estimate.

The conceptual framework indicates that the complementary and the informative types of advertising can be analyzed within the same theoretical construct. The welfare effects of the complementary type of advertising are due to the effect on utility and the effect of the price change, whereas for the informative type the welfare effect is limited to the price effect. The theoretical model revealed that, in a perfectly competitive market, social planner sponsored advertising that increases the equilibrium price of the advertised good can increase society's welfare if the effect of advertising in consumers' utility is higher than the consumer welfare reducing price effect (producer welfare is increased by the same amount as the reduction in consumer welfare). Therefore, if the marginal effect of advertising in utility is zero, then government sponsored advertising is just a welfare transfer mechanism from consumers to producers.

The empirical illustration focuses on the South Carolina "buy local" food products campaign. The findings suggest that this government sponsored advertising campaign is complementary in nature as it results in both a utility and a price effect. Furthermore, the estimated welfare increasing utility effect is significantly higher than the estimated welfare reducing price effect, suggesting that the campaign results in a net increase in consumer welfare. The actual value of the welfare effect is sensitive to the use of a new tax or reallocation of taxes as the payment vehicle used for eliciting campaign *WTP* values. Specifically, *WTP* values estimated using new taxes were lower than those obtained using reallocation of current taxes.

Using tax reallocation as a payment vehicle, (the actual campaign funding mechanism) the estimated total net aggregate value of the South Carolina promotion campaign for consumers is \$68 million per year (\$40 per household). This value is derived as the difference between the estimated aggregate effect on consumer utility of \$88 million per year (\$52 per household) and

the aggregate welfare loss due to the campaign induced price increase of -\$20.4 million per year (-\$12 per household) and illustrates the net benefits to consumers.

To the best of our knowledge, this is the first study that has formally attempted to disentangle the alternative economic characterizations of advertising in order to measure its impact on consumer welfare. The methodology developed and presented in this paper should prove useful in evaluating different types of government sponsored advertising campaigns.

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Table 1. Description and Summary Statistics of Key Survey Variables (N=317)

Variable Name	Category	Category Proportion	Mean	Standard Deviation
Age	18 to 25 years	0.32	56.22	13.83
	25 to 45 years	22.71		
	45 to 60 years	34.70		
	Over 60 years	42.27		
Household Income	<\$25K	17.67	57.78	33.67
	\$25K to \$50K	31.86		
	\$50K to \$75K	19.56		
	\$75K to \$100K	17.03		
	>\$100K	13.88		
Gender	1=Female	43.53	0.44	0.50
	0=Male	56.47		
Number of members in the household	1	19.74	2.46	1.26
	2	44.01		
	3	17.15		
	4	13.27		
	>4	3.56		
Number of years living in SC ^a	0= \leq 10 years	21.50	0.82	0.38
	1= $>$ 10 years	82.01		
Working in agriculture	1=yes	5.36	0.05	0.23
	0=no	94.64		
Motivation to buy SC products	0=quality or price	24.60	0.25	0.43
	1=support SC or SC farmers	73.04		
Perception about the quality of SC products relative to out of state products	1= Better	37.85	0.38	0.49
	0= Same or Worse	62.15		
Aware of the campaign	1=yes	43.53	0.44	0.50
	0=no	56.47		
Support the campaign	1=yes	83.60	0.84	0.37
	0=no	16.40		

^aSouth Carolina.

Table 2. Responses to dichotomous questions (N=317)

First Discrete Choice Question	Yes		No	
Percentage of Respondents (%)	45.74		54.25	
Average Bid (\$)	50.00		31.03	
Second Discrete Choice Question	Yes	No	Yes	No
Percentage of Respondents (%)	51.72	48.28	31.40	68.60
Average Bid (\$)	39.87	80.57	21.40	23.67

Table 3. Estimation Results of the Willingness to Pay Model for the South Carolina Promotion Campaign

Variable	Parameter ^a
Mean	
Intercept	7.49 (21.52)
Payment Instrument (0=New Tax, 1=Current Tax)	29.10*** (8.39)
Aware of the SC Promotion Campaign (Yes=1, No=0)	10.90* (7.82)
Percentage Increase in Price due to Campaign (0%=0, 3% and 6%=1)	-11.86* (7.81)
Household Income (\$10,000/year)	2.10* (1.37)
Gender (0=Male, 1=Female)	13.04** (7.70)
Age (years)	(-0.12) (0.31)
Standard Deviation (σ)	
Intercept	3.56*** (0.17)
Payment Instrument (0=New Tax, 1=Current Tax)	0.45*** (0.14)
Household income (\$10,000/year)	0.06*** (0.02)
Log-likelihood	-473.05
Sample size	317

^a Heteroskedasticity was incorporated using the multiplicative form $\sigma = \exp(\alpha' \mathbf{z})$, where \mathbf{z} is the vector of explanatory variables and α is a parameter vector. Numbers in parenthesis are asymptotic standard errors. One asterisk (*) indicates significance at the 10% level, two asterisks (**) indicate significance at the 5% level, and three asterisks (***) indicate significance at the 1% level.

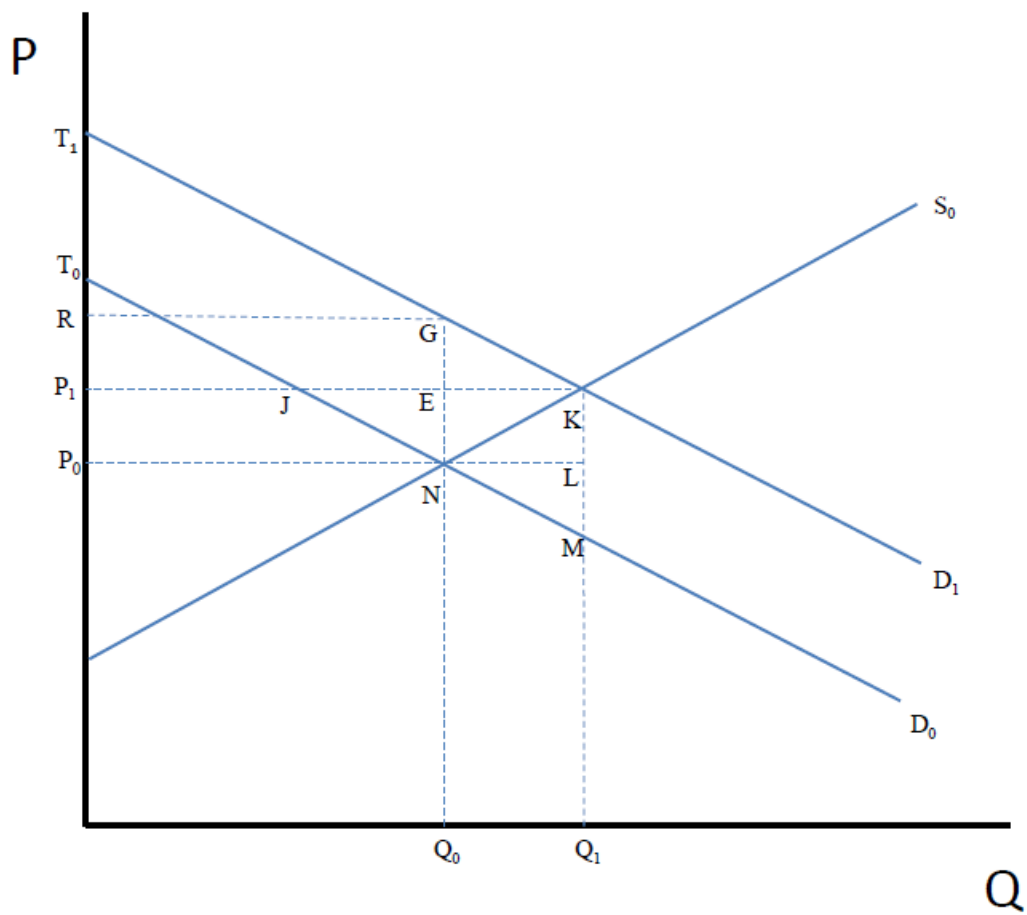


Figure 1. Consumer Welfare Impacts of Advertising

Appendix

Contingent Valuation Questions

Introductory questions

1. A few years ago the South Carolina Department of Agriculture launched an advertising campaign called “Nothing’s Fresher, Nothing’s Finer” to promote the quality of fruits, meats and vegetables produced in South Carolina. Are you aware of this promotion campaign?

☐ Yes

☐ No

2. The goal of the South Carolina “Nothing’s Fresher, Nothing’s Finer” campaign is to increase consumer demand for the state grown agricultural products. Campaign activities include the design and distribution of labels and signage for “Certified South Carolina Grown” products; the advertisement of South Carolina grown products on Television, Radio, Magazines, Newspapers and Billboards; and the “Fresh on the Menu” program displays at local restaurants. Similar campaigns are run by most other states in the country.

Do you support this campaign?

☐ Yes

☐ No

Version A: Current Taxes

3. Since its launch in 2007, the campaign has been funded using approximately 1.3 million dollars per year of State taxes. However, the financial support for continuing the Nothing's Fresher, Nothing's Finer campaign is now uncertain.

One option is to continue funding the campaign with State tax dollars. However, as you know, paying for the campaign redirects money from other public services, such as roads, bridges, schools, parks, police protection, health care, etc.

If the Nothing's Fresher, Nothing's Finer program were placed on the next ballot, would you vote for the program if it required to **continue spending \$5** per year of your household taxes to fund the campaign, knowing that due to the increased consumer demand as a result of the campaign, South Carolina grown product prices will likely increase by about **3%**?

- ☐ Yes
☐ No

Version B: New Taxes

3. Since its launch in 2007, the campaign has been funded using approximately 1.3 million dollars per year of State taxes. However, the financial support for continuing the Nothing's Fresher, Nothing's Finer campaign is now uncertain.

One option for funding the campaign is to introduce a special tax for this specific purpose. Obviously, if you choose to pay this tax you will have less money to spend on other goods and services.

If the Nothing's Fresher, Nothing's Finer program were placed on the next ballot, would you vote for the program if the **new special tax** needed to fund the program cost your household **\$5** per year knowing also that due to the increased consumer demand as a result of the campaign, South Carolina grown product prices will likely increase by about **3%**?

- ☐ Yes
- ☐ No