Journal of Agricultural and Resource Economics 35(2):245–260

To Fund or Not to Fund: Assessment of the Potential Impact of a Regional Promotion Campaign

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This paper develops a framework for assessing the potential economic impact of a regional promotion campaign combining contingent valuation methods with a partial displacement equilibrium model. The proposed approach is applied to the evaluation of the potential economic impact of the locally grown campaign in South Carolina. Results reveal that the first season of the promotion campaign increased consumer willingness to pay for produce by 3.4%. The change in consumer preferences and the corresponding shift in demand increased producer surplus by \$3.09 million. This economic benefit, combined with the 2007 promotion campaign investment, resulted in a benefit-cost ratio of 6.18.

Key Words: contingent valuation, economic impact, equilibrium displacement model, regional promotion campaign

Introduction

Regional promotion campaigns have played an important role in agricultural and food policy around the world (e.g., Van Ittersum, 2002; Kaiser et al., 2005). For example, in the European Union, such campaigns have been supported since 1992 by legislation of the European Commission [Regulation (EEC) N 2081/1992], which enabled producers to register, protect, and market geographically based products (Commission of the EU, 1992). In the United States, regional promotion programs have seen substantial growth since the mid-1990s. In fact, between 1995 and 2006, the number of states conducting such programs rose from 23 to 43 (Patterson, 2006). A large portion of this increase occurred as a result of the Community Food Security Act (part of the Nutrition Title of the Federal Agriculture Improvement and Reform Act of 1996, P.L. 104-127), which generated \$22 million in support for 166 local food system initiatives from 1996 to 2003 (Tauber and Fisher, 2002). Continued support for regional products has been expressed in the Food, Conservation, and Energy Act of 2008 (P.L. 110-246); the 2008 act directed the Secretary of Agriculture to encourage institutions, such as schools, to purchase locally grown and locally raised unprocessed agricultural products to the maximum extent practicable and appropriate. State governments provide specific appropriations for such programs and are another significant source of funding for regional promotion campaigns in the United States.

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Review coordinated by Gary W. Brester.

Little is known about the effectiveness of the multiple state-funded promotion campaigns in the United States. For example, a study on the 1999 *Arizona Grown* campaign provided little evidence for the program's effectiveness in increasing product sales (Patterson et al., 1999). In contrast, Govindasamy et al. (2003) assert that the 2000 *Jersey Fresh* program provided about $32 to fruit and vegetable growers for every dollar invested in the campaign. This finding suggests the $1.16 million campaign generated $36.6 million in sales for New Jersey produce growers. The resulting impact of the *Jersey Fresh* program on total economic activity in New Jersey was estimated at $63.2 million. Given the mixed success of previous campaigns, initiating a new one is potentially risky. When policy makers seek funding for regional promotion campaigns, they are often asked to provide information on potential returns on investment. Unfortunately, the agricultural economics literature offers little guidance.

Previous studies examining state promotion programs have concentrated either on theoretical questions, such as the necessary conditions for campaign effectiveness (e.g., Adelaja, Brumfield, and Lininger, 1990; Wirthgen, 2005), or on practical issues of evaluating historical program performance after sufficient time-series data have become available (e.g., Patterson et al., 1999; Govindasamy et al., 2003). However, these studies are of little benefit in cases where it is necessary to evaluate potential returns at the initial stages of campaign implementation in order to justify further funding. Yet, such guidance can prove critical to campaign survival. Accordingly, the primary objective of this study is to develop an approach for measuring the potential economic impact of regional promotion campaigns that can be used during initial implementation phases.

We extend the previous literature on regional promotion campaign evaluation by developing and applying a novel approach combining contingent valuation methods and the partial equilibrium displacement modeling (EDM) framework to provide an ex ante assessment of regional promotion campaign impact. An equilibrium displacement modeling approach is used to identify the way in which the campaign will affect prices and quantities of labeled and mass-marketed products in the campaign region. We demonstrate that potential campaign impacts can be measured using information on the pre-campaign quantities, prices, market shares, and demand and supply elasticities for labeled and mass-marketed products as well as an estimate of shift in demand for branded products resulting from the promotion campaign.[1] Thus, the only unknown at the initial stages of campaign implementation is the shift in consumer demand. This study proposes the use of contingent valuation techniques to measure shifts in consumer demand in response to promotion at the initial stages of campaign implementation. The approach developed here is applied to estimating the potential impact of the South Carolina (SC) locally grown campaign.

Conceptual Framework

Equilibrium Displacement Model

Our first objective is to determine how to measure changes in welfare as a result of changes in prices and quantities of branded and nonbranded products within a two-region competitive model. This model is based on the EDM methodology originally developed by Muth (1964) and widely used for agricultural price and policy analysis (e.g., Alston, Norton, and Pardey,

[1] Piggott (1992) argues that for small (10% or less) exogenous shocks, the first-order approximation effects provided by the EDM approach are likely to be close to the "true" effects with significantly lower research resources.

1995; Piggot, 2003; Wohlgenant, 1993). Most recently, the EDM approach has been applied by Anders, Thompson, and Herrmann (2008) to markets segmented by regional-origin labeling with quality control. The authors extend the EDM approach to reflect product differentiation (rather than perfect substitutability as in previous studies) based on their regional origin and quality. Their main argument for regional product differentiation is the success of the association of European regional promotion programs with a quality-control system that leads regionally branded products to be superior to nonbranded products.

Our innovation is in adapting the EDM approach to an ex ante evaluation of regional promotion campaigns. The model is adjusted to account for campaign effects only within a promoting region—consistent with the structure of most U.S. regional promotion campaigns, which encourage consumers within a promoting region to purchase locally produced products and do not target consumers in other regions.

We begin with a multi-equation equilibrium model for two regions: region A promotes locally grown products, and region B is the rest of the economy that has trade and ties with region A. This framework assumes the agricultural promotion campaign is concentrated in region A, and no advertising efforts associated with this campaign are in place in region B. Thus, the two-region competitive market model can be described as follows:

■ Region A (promoting region)

Demand:

(1) $$D_A^l = D_A^l(P_l, P_m, c_l),$$

(2) $$D_A^m = D_A^m(P_l, P_m, c_l);$$

Supply:

(3) $$S_A^l = S_A^l(P_l, P_m),$$

(4) $$S_A^m = S_A^m(P_l, P_m);$$

■ Region B (rest of the country)

Demand:

(5) $$D_B^m = D_B^m(P_m),$$

Supply:

(6) $$S_B^m = S_B^m(P_m);$$

■ Market-Clearing Conditions

(7) $$D_A^l = S_A^l,$$

(8) $$D_A^m + D_B^m = S_A^m + S_B^m,$$

where D, S, and P denote quantity demanded, quantity supplied, and price; subscripts A and B denote promoting region (A) and rest of the country (B); superscripts l and m represent regionally labeled products and mass-marketed products, respectively; and c_l is a variable related to the advertising of regionally labeled products, which we assume to be exogenously determined. The model does not rule out the possibility that producers can sell their products without using the locally grown label. The demand functions in region A allow for substitute relationships between the labeled and mass-marketed products.

An EDM approach is applied to evaluate how the advertising campaign will affect prices and quantities of regionally labeled and mass-marketed products (the endogenous variables in the system). This approach requires differentiation of equations (1)–(8), conversion of partial derivatives into elasticities, and expression of changes in the endogenous variables as proportional changes. The EDM approach including an exogenous shock γ, due to changes in the advertising variable c_l, yields:[2]

(1′) $$d\ln(D_A^l) = \varepsilon_A^{ll}\, d\ln(P_l) + \varepsilon_A^{lm}\, d\ln(P_m) + \gamma,$$

(2′) $$d\ln(D_A^m) = \varepsilon_A^{ml}\, d\ln(P_l) + \varepsilon_A^{mm}\, d\ln(P_m) - \frac{w_{AA}^{Dl}}{w_{AA}^{Dm}}\gamma,$$

(3′) $$d\ln(S_A^l) = \beta_A^{ll}\, d\ln(P_l) + \beta_A^{lm}\, d\ln(P_m),$$

(4′) $$d\ln(S_A^m) = \beta_A^{ml}\, d\ln(P_l) + \beta_A^{mm}\, d\ln(P_m),$$

(5′) $$d\ln(D_B^m) = \varepsilon_B^{mm}\, d\ln(P_m),$$

(6′) $$d\ln(S_B^m) = \beta_B^{mm}\, d\ln(P_m),$$

(7′) $$d\ln(D_A^l) = d\ln(S_A^l),$$

(8′) $$w_{AT}^{Dm}\, d\ln(D_{AT}^m) + w_{BT}^{Dm}\, d\ln(D_B^m) = w_{AT}^{Sm}\, d\ln(S_A^m) + w_{BT}^{Sm}\, d\ln(S_B^m),$$

where $d\ln$ is the percentage change in the respective variable, ε_k^{ij} is the price elasticity of product *i* with respect to the price of product *j* in the *k*th region, and β_k^{ij} is the supply elasticity of product *i* with respect to the price of product *j* in the *k*th region. Demand and supply market shares are denoted by w_{kh}^{Di} and w_{kh}^{Si}, where *i* and *j* refer to either labeled (l) or mass-marketed (m) products; *k* equals either *A* (promoting region) or *B* (rest of the country); and *h* can equal either *A* (promoting region), *B* (rest of the country), or *T* (aggregate market composed of $A + B$). For example, w_{AT}^{Dm} represents region A's share of demand for mass-marketed products *m* with respect to the entire market *T*. Using this notation, we can specify the following adding-up conditions:

$$w_{AA}^{Dl} + w_{AA}^{Dm} = 1,\; w_{AT}^{Dm} + w_{BT}^{Dm} = 1,\text{ and } w_{AT}^{Sm} + w_{BT}^{Sm} = 1.$$

The linear equation system (1′)–(8′) can be written in matrix form as:

(9) $$\mathbf{AY} = \mathbf{X},$$

[2] The adding-up condition restricts own- and cross-advertising effects. Hence, for the two-goods case, the cross-advertising effect of the advertising campaign on D_A^m is a function of the marketing shares and the own-price advertising effect (see Basmann, 1956, p. 53; Kinnucan, 1996, p. 263).

where **A** is a 7×7 matrix of parameters including elasticities and shares, **X** is a 7×1 vector containing the exogenous demand shifters γ and $-(w_{AA}^{Dl} / w_{AA}^{Dm})\gamma$, and **Y** is a 7×1 vector of changes in the endogenous variables $[d\ln(D_A^l), d\ln(D_A^m), d\ln(S_A^m), d\ln(D_B^m), d\ln(S_B^m), d\ln(P_l),$ and $d\ln(P_m)]$.

Relative changes in the endogenous variables (**Y**) due to demand shifts (**X**) can be calculated by solving (9) as $\mathbf{Y} = \mathbf{A}^{-1}\mathbf{X}$. Hence, changes in equilibrium prices and quantities of the labeled and mass-marketed products are functions of supply and demand elasticities, market shares, and the exogenous shock to demand due to advertising. Whereas data on aggregate supply and demand elasticities for most products are usually available from public sources, the shifts in demand due to the promotion campaign, as well as the disaggregated demand elasticities, must be estimated.

Willingness to Pay (WTP) and Advertisement Effects

Theoretically, WTP measures the maximum amount of money an individual is willing to give up to obtain a product of a given quality. Hence, WTP can be used to construct inverse compensated demand curves for a good (Lusk and Hudson, 2004). For example, if a specific application elicits WTP for one unit of a good, the individual demand curve consists of a single point (e.g., price = WTP; quantity = 1). If the elicitation is conducted before and after an advertisement campaign, the change in WTP (ΔWTP) can be interpreted as the vertical shift in the demand curve due to the campaign. The corresponding horizontal shift γ is measured as the product of the vertical shift, ΔWTP, and the own-price elasticity of demand for products in the promoting region A, ε_A^{ll} (i.e., $\gamma = -\Delta WTP\, \varepsilon_A^{ll}$).[3]

To the best of our knowledge, this method of advertisement evaluation has not been used previously for a regional promotion campaign evaluation. This approach is particularly attractive for evaluating public or private campaigns at their initial stages when sales data necessary to directly measure the shift in demand are not yet available. The information generated by this approach can be used to evaluate the potential impacts of an advertising or promotion campaign and to monitor the effects of the campaign on consumers.

Elasticity Decomposition

Evaluating the market impacts of the promotion campaign requires estimated demand and supply elasticities for both regionally labeled and mass-marketed products [equation (9)]; however, elasticity values available in the literature correspond to the aggregate elasticities, which combine these two types of products. Hence, we follow a procedure suggested by James and Alston (2002) to recover disaggregate elasticities for regionally labeled and mass-marketed products from the aggregate elasticities. The procedure is based on the assumption that regionally labeled products and mass-marketed products are weakly separable (Edgerton, 1997; James, 2000).

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[3] Interestingly, there are several studies in the environmental economics literature that have looked at the issue of temporal reliability of the contingent valuation method [see Whitehead and Aiken (2007) for a survey of these studies]. WTP estimates are said to be temporally reliable if they are stable over time. Hence, advertising or information campaigns can be seen as looking to affect the stability of WTP, which in turn can change benefit-cost estimates of policy alternatives.

Under this assumption, the elasticities of demand for these products can be expressed as follows: $\varepsilon_A^{ij} = w_{AA}^{Di}(\alpha_i \varepsilon + \vartheta) - \delta_{ij}\vartheta$, where ε is the elasticity of demand of the aggregate quantity with respect to the aggregate price, ϑ is the elasticity of substitution between regionally labeled products and mass-marketed products ($\vartheta > 0$), α_i is the elasticity of demand for group i with respect to expenditures ($\alpha_i > 0$), and δ_{ij} is the Kronecker delta ($\delta_{ij} = 1$ when $i = j$; $\delta_{ij} = 0$ when $i \neq j$) (James and Alston, 2002). In a similar manner, elasticities of supply for these products can be expressed as $\beta_A^{ij} = w_{AA}^{Di}(\rho_i \beta + \tau) - \delta_{ij}\tau$, where β is the elasticity of supply of the aggregate quantity with respect to the aggregate price, τ is the elasticity of transformation between regionally labeled products and mass-marketed products in the production process ($\tau < 0$), and ρ_i is the expansion elasticity ($\rho_i > 0$) (James and Alston, 2002).

Empirical Analysis

We now apply our conceptual framework to the evaluation of potential economic impacts of the South Carolina locally grown campaign, which was launched on May 22, 2007, and financed by a special appropriation of $500,000 by the state legislature. We focus on estimating advertising shock γ using contingent valuation methods, which ask respondents hypothetical questions about their WTP for products with specific attributes. We examined the "South Carolina grown" characteristic as the key product attribute for produce and animal products.

The contingent valuation questions used in this study are presented in the appendix. The questions use a dichotomous choice format, where a respondent is asked to identify his or her preference to buy or not to buy a product at the stated price. Note that in contrast to other contingent valuation studies, the WTP questions are asked using premiums expressed in percentage terms (relative to the current price) rather than dollar values. Percentage premiums are used since we are trying to measure the average premium across the aggregate categories of produce and animal products. Individuals were initially asked if they would purchase an in-state- or out-of-state-grown product at the same bid price [i.e., price differential (PD_I) equals 0]. If respondents indicated a preference for in-state products, they were subsequently asked if they would be willing to pay a randomly selected premium bid [i.e., price differential (PD_H) greater than 0] to consume the in-state-grown product over the out-of-state product. If they did not indicate a preference for in-state products in the first question, a follow-up question with a price bid was not asked.

The three possible responses to the bid scenarios are: (1) a "no" to the first bid (i.e., no preference for in-state over out-of-state products at 0% premium), (2) a "yes" followed by a "no" (preference at 0% premium, but no preference at higher premium), and (3) "yes" to both bids (i.e., preference at 0% premium and preference at higher premium). The sequence of questions defines the following ranges for the true WTP values: $(-\infty, PD_I]$, $[PD_I, PD_H]$, $[PD_H, \infty)$. The following three discrete outcomes of the bidding process are observable:

$$(10) \qquad D = \begin{cases} WTP \leq PD_I & \text{(response outcome 1)}, \\ PD_I \leq WTP < PD_H & \text{(response outcome 2)}, \\ PD_H \leq WTP & \text{(response outcome 3)}, \end{cases}$$

where *WTP* is the individual's willingness-to-pay function for the "South Carolina grown" attribute in products. Assume that the mean WTP function is:

$$WTP = \mathbf{X}\theta + u, \tag{11}$$

where $\mathbf{X}$ is a vector of explanatory variables, $\boldsymbol{\theta}$ is a conformable vector of coefficients, and u is a random variable accounting for unobservable characteristics. By using equation (11) and assuming that $u \sim F(0, \sigma^2)$, where F is a cumulative distribution function with mean 0 and variance σ^2, the choice probabilities corresponding to expression (12) are:

$$P(WTP \le PD_I) = P(u \le PD_I - \mathbf{X\theta}) = F(PD_I - \mathbf{X\theta}), \tag{12.1}$$

$$\begin{aligned} P(PD_I \le WTP < PD_H) &= P(PD_I - \mathbf{X\theta} \le u < PD_H - \mathbf{X\theta}) \\ &= F(PD_H - \mathbf{X\theta}) - F(PD_I - \mathbf{X\theta}), \end{aligned} \tag{12.2}$$

$$P(PD_H \le WTP) = P(u > PD_H - \mathbf{X\theta}) = 1 - F(PD_H - \mathbf{X\theta}), \tag{12.3}$$

and the log likelihood becomes:

$$\begin{aligned} \mathrm{L} = {} & \textstyle\sum_{D_1} \ln\left[F(PD_I - \mathbf{X\theta})\right] + \sum_{D_2} \ln\left[F(PD_H - \mathbf{X\theta}) - F(PD_I - \mathbf{X\theta})\right] \\ & + \textstyle\sum_{D_3} \ln\left[1 - F(PD_H - \mathbf{X\theta})\right], \end{aligned} \tag{13}$$

where D_g indicates the group of individuals belonging to the gth bidding process outcome. Given a choice for the F cumulative distribution function, the parameters θ and σ^2 can be estimated. The approach outlined in equations (12) and (13) is an adaptation of the censored regression approach for the estimation of "closed-ended" contingent valuation surveys proposed by Cameron and James (1987) and Cameron (1988) for the case when survey participants respond in dichotomous fashion (yes/no) to a single bid. In this study, their procedure is adapted to account for the double-bidding process.

Data

Data on quantities and prices of SC agricultural products at the farm level were obtained from several sources, including *South Carolina Agricultural Statistics* [USDA/National Agricultural Statistics Service (NASS), 2008] and IMPLAN (Minnesota IMPLAN Group, Inc., 2006). The data on aggregate price elasticities of demand were constructed using the elasticities of demand from Huang and Lin (2000).[4] Aggregate supply elasticities for livestock were obtained from Shumway and Alexander (1988) and Chavas and Cox (1995); aggregate supply elasticities for fruits, nuts, and vegetables were extrapolated from Chavas and Cox.

The individual demand and supply elasticity values were calculated using equations (10) and (11), which replaced eight elasticity values with seven underlying parameters: ε, β, ϑ, τ, α_l, ρ_l, and w_{AA}^{Dl}, since

$$w_{AA}^{Dl} + w_{AA}^{Dm} = 1, \quad w_{AA}^{Dl}\alpha_l + w_{AA}^{Dm}\alpha_m = 1, \quad \text{and} \quad w_{AA}^{Dl}\rho_l + w_{AA}^{Dm}\rho_m = 1.$$

[4] Huang and Lin's (2000) demand elasticities for animal products include elasticities for the beef, pork, poultry, other meat, fish, dairy, and eggs subgroups, and demand elasticities for fruits and vegetables separately. The disaggregated demand elasticities were transformed to aggregate elasticities using the approach outlined in Carpio, Wohlgenant, and Safley (2008).

Table 1. Parameter Values Used for Model of South Carolina (SC) Grown and Mass-Marketed Agricultural Products

	Fruits and Vegetables		Animal Products	
Parameter Values	SC-Grown ($i = l$)	Mass-Marketed ($i = m$)	SC-Grown ($i = l$)	Mass-Marketed ($i = m$)
Aggregate own-price elasticity of demand (ε) [a]	−0.77		−0.74	
Aggregate own-price elasticity of supply (β) [b]	1.00		0.88	
Elasticity of substitution (ϑ)	2.00		3.00	
Elasticity of transformation (τ)	−1.80		−1.60	
Price [c] ($/lb.)	0.24		0.43	
Aggregate quantity demanded [c,d] (mil. lbs.)	379,070		1,564,920	
Market Shares:				
w_{AA}^{Di}	0.18	0.82	0.47	0.53
w_{AT}^{Di}	—	3.00×10^{-3}	—	5.48×10^{-3}
w_{AT}^{Di}	—	4.71×10^{-4}	—	3.27×10^{-3}
Expenditure elasticity (α_i)	1.20	0.96	1.20	0.82
Expansion elasticity (ρ_i)	1.00	1.00	1.00	1.00
Elasticity of demand for:				
SC-grown (ε_A^{li})	−1.81	0.89	−2.03	1.12
Mass-marketed (ε_A^{mi})	0.22	−0.96	1.13	−1.73
Elasticity of supply for:				
SC-grown (β_A^{li})	1.47	−0.59	1.26	−0.38
Mass-marketed (β_A^{mi})	−0.53	1.40	−0.34	1.22

[a] Huang and Lin (2000).
[b] Chavas and Cox (1995) and Shumway and Alexander (1988).
[c] The aggregate price was calculated employing a weighted average of prices using the quantity shares as weights.
[d] Price and quantity data were obtained from the USDA/NASS, *South Carolina Agricultural Statistics*, E-497 (2008) and Minnesota IMPLAN Group, Inc. (2006).

Because previous studies and data sources only provide direct estimates of ε, β, and w_{AA}^{Dl}, the values of the remaining parameters were carefully selected based on the previous literature and economic theory, as is common practice in studies of commodity markets and polices (e.g., James and Alston, 2002; Piggott, 1992). Elasticities of demand with respect to expenditures were assumed to be larger for the regionally labeled products ($\alpha_l = 1.2$); mass-marketed product elasticities were recovered from the adding-up condition. On the supply side, expansion elasticities of regionally labeled products were assumed to be equal to 1 for both locally grown and mass-marketed products ($\rho_l = \rho_m = 1$). The remaining parameter values (ϑ and τ) were chosen to ensure SC-grown and mass-marketed products were substitutes in demand and supply. All values used for the underlying parameters are reported in table 1. The disaggregated own-price and cross-price elasticities derived from these values are also shown in table 1 and are consistent with theory and expectations.

The data used to calculate the advertising shock γ were collected by Richard Quinn and Associates via two statewide telephone surveys of South Carolinians age 18 or over, one before the beginning of the campaign (March 2007) and the second six months thereafter (September 2007). A total of 500 SC consumers responded to each of the above surveys. The surveys were designed to measure the attitudes and perceptions of SC consumers about "SC-grown" agricultural products. The survey also collected information on the socioeconomic characteristics of the respondents, as well as consumers' perceptions about the quality of SC products and motivations to buy state-grown products (Carpio and Isengildina-Massa, 2009).

Results and Discussion

Evaluation of the Shift in Consumer Demand Due to the Promotion Campaign

The campaign's effect can be analyzed by measuring consumers' mean WTP before and after the campaign. To perform statistical tests related to campaign effectiveness, consumer surveys conducted before and after the campaign's first season were pooled. In addition to the intercept, two dummy variables were included in the models. The first is used to differentiate the pre-campaign and post-campaign data (= 1 if post-campaign, 0 otherwise). The second dummy variable is used to distinguish customers who indicated awareness of the SC agricultural branding campaign (= 1 if aware, 0 otherwise).

Results of the WTP model assuming a normal distribution are reported in table 2.[5] Two models are presented for both produce and animal products. Model 1 includes the intercept and the post-campaign dummy variable. This dummy variable assesses the change in the population mean WTP as a result of the promotion campaign.[6] Model 2 includes the post-campaign dummy as well as the "awareness of campaign" dummy. Model 2 was estimated to isolate the change in mean WTP as a result of the state campaign from other effects that might influence consumer preferences for locally grown products (e.g., national media).

Results from model 1 for produce reveal that mean WTP increased after the SC promotion campaign. As shown by the intercept, mean WTP prior to the campaign was 27.5%, which is the premium consumers were willing to pay for produce identified as "SC-grown." This estimate is comparable to the findings of previous studies that measured consumer WTP for locally grown food. For example, Loureiro and Hine (2002) found Colorado consumers were willing to pay a 5% premium for locally grown potatoes. More recent studies describe WTP values of 9% to 20% for local specialty food products in northern New England (Giraud, Bond, and Bond, 2005), and report that Ohio consumers are willing to pay premiums of about 20% to 40% for locally grown strawberries (Darby et al., 2008). While our baseline WTP estimates are comparable to those reported in previous studies, our main interest is the change in WTP values before and after the promotion campaign.

The coefficient on the post-campaign dummy variable indicates mean WTP rose by approximately 3.4% after the campaign. Results from model 2 indicate most of the increase in consumer preference for SC-grown produce is due to the SC branding campaign. Specifically, impact shifts from the post-campaign dummy variable to the awareness dummy variable, showing that only individuals aware of the campaign expressed a change in preferences. Mean WTP of consumers aware of the campaign (30% of respondents) increased by 7.1%.

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[5] We also estimated models assuming lognormal distribution. The results were very similar and are not presented here.

[6] Details on factors that affect consumer WTP for SC-grown products as well as its implications for targeting the promotion campaign in South Carolina are available in Carpio and Isengildina-Massa (2009).

Table 2. Estimation Results of the WTP Model for SC-Grown Products

	Fruits and Vegetables		Animal Products	
Variable	Model 1	Model 2	Model 1	Model 2
Intercept	0.275***	0.274***	0.236***	0.236***
	(0.013)	(0.013)	(0.013)	(0.013)
Post-campaign	0.034**	0.013	−0.004	−0.016
(Yes = 1, No = 0)	(0.018)	(0.020)	(0.017)	(0.019)
Aware of the SC branding campaign		0.071***		0.044**
(Yes = 1, No = 0)		(0.029)		(0.026)
σ	0.211***	0.210***	0.190***	0.189***
	(0.009)	(0.009)	(0.008)	(0.008)
Log-likelihood statistic	−704.630	−701.637	−658.692	−657.313
Sample size	817		728	

Notes: Double and triple asterisks (**,***) denote statistical significance at the α = 0.05 and 0.01 levels, respectively. Values in parentheses are asymptotic standard errors. Estimation results assume a normal probability density function.

For animal products, model 1 results reveal the change in the population mean WTP to pay after the campaign is not statistically different from 0. However, results from model 2 show mean WTP increased by 4.4% among consumers aware of the campaign relative to consumers not aware of the campaign. These somewhat contradictory findings can be explained by the fact that the post-campaign dummy variable measures the effect across all consumers whereas the "awareness" dummy isolates the effect for a specific group of consumers who were aware of the campaign.

The results of the WTP analysis provide evidence of change in consumer preferences for SC-grown products. The higher effect on produce than on animal products is likely explained by the focus on fruits and vegetables in the first season of the locally grown campaign. These results were robust to the inclusion of other explanatory variables such as socioeconomic characteristics of individuals surveyed.

It is important to point out that the WTP measures do not reflect actual price differentials between SC-grown and out-of-state products observed in the market. Actual price differentials are determined by supply and demand for these products and may be observed through prices and quantities of products consumed in the market. Until these data become available, the change in the WTP measures can be used as a tool to measure shift in demand for regionally promoted products.[7]

Assessment of the Potential Economic Impact of SC Locally Grown Campaign

Two types of demand shifts are analyzed using the EDM for the SC agricultural market. The first is the current demand shift due to the effect of the campaign, 3.4% for fruits and vegetables and 0% for animal products (table 3). These values represent change in mean WTP and can be used to calculate exogenous shock due to advertising γ using the equation

[7] Some authors argue that hypothetical WTP measures tend to overestimate real WTP values (e.g., Whitehead and Cherry, 2007). However, note that the focus in this study is on the change in WTP values (pre- and post-campaign) rather than actual values. An implicit assumption of our analysis is that the size and direction of the bias (if any) do not change and are unaffected by the campaign.

Table 3. Price, Quantity, and Producer Surplus (PS) Changes (Δ) Due to the SC Regional Promotion Campaign

	After First Season [a]		Estimated Potential [b]
Variable	Fixed Supply [c]	Elastic Supply [d]	Elastic Supply
Fruits and Vegetables:	**$\gamma = 0.062$**	**$\gamma = 0.062$**	**$\gamma = 0.129$**
$\%\Delta D_A^l$	0.0000	2.9373	6.1338
$\%\Delta D_A^m$	−0.5728	−0.9433	−1.9698
$\%\Delta S_A^m$	0.0000	−0.2571	−0.5369
$\%\Delta D_B^m$	0.0017	0.0012	0.0025
$\%\Delta S_B^m$	0.0000	−0.0015	−0.0032
$\%\Delta P_L$	3.3989	1.7731	3.7027
$\%\Delta P_M$	−0.0022	−0.0015	−0.0032
ΔPS (mil. $)	3.0922	1.6368	3.4719
	[0.4588, 6.3156] [e]	[0.1878, 4.0171]	[0.5896, 7.7391]
Animal Products:	**$\gamma = 0.000$**	**$\gamma = 0.000$**	**$\gamma = 0.089$**
$\%\Delta D_A^l$	0.0000	0.0000	3.4059
$\%\Delta D_A^m$	0.0000	0.0000	−4.7784
$\%\Delta S_A^m$	0.0000	0.0000	−0.9296
$\%\Delta D_B^m$	0.0000	0.0000	0.0106
$\%\Delta S_B^m$	0.0000	0.0000	−0.0126
$\%\Delta P_L$	0.0000	0.0000	2.6953
$\%\Delta P_M$	0.0000	0.0000	−0.0144
ΔPS (mil. $)	0.0000	0.0000	18.4460
			[1.9100, 45.5150]

Note: All calculations are based on 2006 average prices and quantities.

[a] The change in demand due to the campaign after the first season was assumed to be 3.4% for fruits and vegetables and 0% for animal products.

[b] The estimated potential change in demand due to the campaign was assumed to be 7.1% for fruits and vegetables and 4.4% for animal products.

[c] The "fixed supply" scenario corresponds to a perfectly inelastic supply curve where producers cannot react to the increase in demand by increasing the quantity supplied.

[d] In the "elastic supply" scenario, both quantity and price adjust to the shift in the demand curve.

[e] Estimates in square brackets represent the lower and upper bounds for 95% confidence intervals.

$\gamma = \Delta WTP \varepsilon_A^{ll}$. For example, in the case of fruits and vegetables, the 3.4% vertical shift in demand corresponds to $\gamma = 0.062$ since $\Delta WTP = 0.034$ and $\varepsilon_A^{ll} = -1.81$ (tables 1 and 2).

The second shift in demand is the potential shift that would have occurred if all consumers were aware of the campaign. We use the effect of the "awareness" dummy variables shown in table 3 (7.1% for produce and 4.4% for animal products) for all consumers. In addition, two scenarios are considered. The first is a short-run scenario labeled "fixed supply" in table 3. This scenario analyzes the advertising effect in a very short run (fixed supply), when producers cannot react to an increase in demand by increasing quantity supplied. Therefore, an increase in producer surplus is due only to the price change. The second scenario corresponds to the case where both quantity and price adjust to the demand curve shift ("elastic supply," using elasticities specified in table 1).

Table 3 shows the estimated changes in prices and quantities associated with the SC branding campaign. Changes in quantities and prices are calculated using equation (9). All results are consistent with expectations. After the first season, assuming a fixed supply, shift in demand due to the promotion campaign raises the price of SC-grown produce by 3.4%. When the supply is allowed to adjust to changes in demand, the price of SC-grown produce increases by 1.77% and quantity demanded increases by 2.94%. In both cases, the increase in the quantity demanded for locally grown products comes at the expense of mass-marketed products. No measurable impact is detected in the animal products market after the first season of the locally grown campaign.

Changes in SC producer surplus due to the SC branding campaign can be used to measure the effects of the campaign on SC producers' welfare (table 3).[8] Results show that if consumers are able to identify SC-grown produce, the campaign's first season will increase producer surplus by \$3.09 million in the short run. This increase in producer surplus reflects the effect on producer revenues of an estimated 3.40% price increase for locally grown fruits and vegetables due to the promotion campaign, while keeping production unchanged (i.e., the short run assumes fixed supply).

As producers adjust their production (i.e., elastic supply), the campaign will likely result in a 2.94% increase in production and a 1.77% increase in the price of SC-grown products, yielding a total increase in producer surplus of \$1.64 million. This conclusion is based on the assumption that consumer preferences will remain at the level measured in the fall of 2007. However, this preference level reflects only about a 30% rate of campaign awareness. Our estimates indicate a total increase in producer surplus of approximately \$22 million dollars if the campaign is able to reach all consumers over the long run. This estimate is based on an increase in demand for produce by 7.1% and for animal products by 4.4% (as measured for individuals aware of the campaign). This demand increase will result in a 6.13% increase in production and a 3.70% increase in price for SC-grown produce, yielding a producer surplus of \$3.47 million, and for SC animal products, a 3.41% increase in production and a 2.69% increase in price, yielding a producer surplus of \$18.44 million. These estimates only reflect changing consumer preferences if results from the campaign's first season remain constant in the future. As the campaign continues to affect consumer preferences in coming years, these estimates can be revised to reflect further changes in consumer demand.

Sensitivity Analysis

We evaluated the robustness of the estimated producer surplus and benefit-cost ratio with respect to market parameter uncertainty using the stochastic approach proposed by Davis and Espinoza (1998) and Zhao et al. (2000). The first step involved specifying subjective probability distributions from econometric studies and the investigators' judgment. In the second step, the distributions of the resulting surplus changes or benefit-cost ratios were obtained through a Monte Carlo simulation. Finally, the restriction that locally grown and mass-marketed products be substitutes in demand and supply was imposed by discarding the draws that did not satisfy this condition (Piggott, 2003).

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[8] The formula used to calculate change in producer surplus (ΔPS) is $\Delta PS = \Delta PQ_0 + 0.5\Delta P\Delta Q$, where ΔP and ΔQ are changes in price and quantity, and Q_0 is the initial quantity demanded.

The simulation used one million sets of parameter values, but after discarding the observations that did not satisfy the substitutability restriction, about 400,000 sets remained for generating the distributions for surplus changes and the benefit-cost ratio. For the subjective probability distributions, seven parameters were assumed random: the elasticity parameters ε, β, ϑ, τ, α_l, ρ_l, and the change in WTP (ΔWTP). All other elasticity values needed, as well as the shock γ, are functions of these seven underlying parameters.

Following Zhao et al. (2000), we used independent truncated normal distribution for each parameter in the base simulation. This distribution allows imposing the sign on the parameters: negative for the own-price elasticity of demand (ε) and the elasticity of transformation (τ), and positive for all other parameters. Base distributions were set with the baseline parameter values shown in table 1 as the means (μ).[9] Standard deviations (σ) were specified using the coefficient of variation (CV), i.e., $\sigma = \text{CV}\ \mu$. Of the seven parameters considered, only ΔWTP has a known standard deviation. For example, the standard deviation for the ΔWTP of 0.034 (3.4% increase in mean WTP for SC fruits and vegetables) is 0.018, or 53% CV. Given the very limited empirical studies on all other parameters, we used a 100% CV for the base specifications. This value is higher than the 50% CV used by Zhao et al. (2000) in similar circumstances and provides for a sensitivity analysis across a wider range of variation in market parameters.

Table 3 displays the 95% confidence intervals generated using the simulated distributions. The intervals show that all surplus measures are statistically different from 0, since the constructed confidence intervals do not include 0. The resulting 95% confidence interval for the benefit-cost ratio has a lower bound of 0.92 and an upper bound of 12.63; the best estimate of this benefit-cost ratio is 6.18. The precision with which the benefits are measured indicates we can be 97% certain that the benefit-cost ratio is greater than 1. These results were robust to different assumptions regarding the unknown CV values as well as the substitutability restriction.

Conclusions and Policy Implications

This study has developed and applied a novel approach, combining contingent valuation methods and a partial displacement equilibrium modeling framework, to provide an ex ante assessment of a regional promotion campaign. An equilibrium displacement model was used to analyze the effect of a regional promotion campaign on prices and quantities of labeled and mass-marketed products in the campaign region. It was demonstrated that the potential impact of the campaign can be measured using information on the pre-campaign quantities and prices, demand and supply elasticities for the promoted products, and an estimate of the shift in demand for branded products resulting from the promotion campaign. Thus, the only unknown at the initial stages of campaign implementation is shift in consumer demand. We propose using contingent valuation techniques to measure the shift in demand as a result of promotion.

The approach developed in this study was applied to the estimation of potential impact of the South Carolina (SC) locally grown campaign, initiated in May 2007. The data for this study were collected via telephone surveys in March 2007 (two months prior to the launch of

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[9] Normal distributions are specified by the mean μ and the standard deviation σ. In truncated normal distributions, the mean and the standard deviation are no longer equal to μ and σ. However, since the truncation is far out in the right or left tail, the differences are very small. Thus, for convenience, we still refer to μ and σ as the mean and standard deviation, respectively (see also Zhao et al., 2000).

the campaign) and in September 2007 (immediately after its first summer season). Contingent valuation surveys provided data regarding consumer willingness to pay (WTP) for local versus out-of-state produce and animal products. The results of the WTP analysis prior to the campaign and after its first summer season provide evidence of changing consumer preferences for SC-grown products. Specifically, consumers aware of the campaign are willing to pay 7.1% and 4.4% higher premiums for produce and animal products. At the aggregate level, mean WTP for produce increased by 3.4% after the first campaign season. Change in consumer preferences and the corresponding shift in demand curves are estimated to have increased producer surplus by $3.09 million.

Since estimated changes in producer surplus represent potential benefits to producers, they can be used to calculate the return on investment for the SC campaign. The $3.09 million change in producer surplus (the short-run effect after the first season of the campaign) and the $500,000 total investment in the campaign in 2007 resulted in a return on investment of 618%, or a benefit-cost ratio of 6.18. This figure is lower than that found by Govindasamy et al. (2003), who calculated that for every dollar invested in the Jersey Fresh program, the campaign returned about $32 for local fruit and vegetable growers (a return on investment of 3,200%). Our finding can also be compared to results from 11 previous studies on commodity promotion programs, summarized by Kaiser et al. (2005, p. 410). The lowest benefit-cost ratio of these program studies was 1 (Goddard and Amuah, 1989), the highest was 30.9 (Van Sickle and Evans, 2001), and the average was 10.66. Thus, our estimate of the impact of the SC locally grown campaign in the short run is within the impact range reported in other studies.

Over the long run, our estimates indicate a total potential increase in producer surplus of about $22 million dollars if the campaign is able to reach all consumers. Depending on the annual campaign expenditures, this figure may result in a higher return on investment in the long run. Furthermore, the analysis in this study concentrates on direct benefits from the promotion campaign received by farmers. This positive impact in the SC farming sector is likely to have an indirect impact on the rest of the economy as well. A previous study assessing the potential impact of the SC branding campaign on the SC economy (Carpio, Isengildina, and Hughes, 2007) found that a $1 million increase in the surplus of fruit and vegetable producers has an additional indirect impact of $1.52 million throughout the state economy, due to the multiplier effect.

The framework proposed here can be used to evaluate the potential impact of a regional promotion campaign in the early stages of campaign development. The results of this analysis could help policy makers assess the costs and potential benefits of a promotional campaign to ensure a more efficient allocation of taxpayer funds.

[*Received February 2010; final revision received June 2010.*]

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Appendix:
Contingent Valuation Questions Used in the Consumer Survey

If you were buying vegetables or fruit from the market, and you could choose *at equal prices* between produce grown in South Carolina and out-of-state produce, which one would you choose? [categorize based on response]

- Produce grown in SC 1
- Out-of-state produce 2

If the person takes more than a few seconds to respond, ask: Are you . . .

- Not sure? 3
- Makes no difference? 4
- Don't know? 5

If produce marked as grown in SC was the respondent's first choice, then ask: Okay, what if the price of SC-grown produce was [5%, 10%, 20%, 30%, 50%] more expensive than out-of-state produce. Which one would you choose?

- Produce marked as grown in SC 1
- Out-of-state produce 2

If the person takes more than a few seconds to respond, ask: Are you . . .

- Not sure? 3
- Makes no difference? 4
- Don't know? 5