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# Markets Segmented by Regional - Origin Labeling with Quality Control

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## **Markets Segmented by Regional - Origin Labeling with Quality Control\***

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# **Markets Segmented by Regional Origin-Labeling with Quality**

## **Control**

### **1 Introduction**

Within the last decade, an increasing number of food scares has affected the food markets in industrialized countries. Consequently, food quality uncertainty by consumers has become a major issue in food and agricultural policy and in food marketing. Given this background and the fact that consumers continue to be more health conscious, quality signals have become increasingly important on food markets.

One of these quality signals is the regional origin of foods. Numerous consumer surveys suggest that the regional origin has gained more prominence in food-purchasing decisions (BALLING 2000, p. 19), now becoming one of the most important determinants of food demand in the EU (BECKER 2002, p. 21). Surveys additionally show that it is the own region which is preferred (GERTKEN/VON ALVENSLEBEN 1993, p. 248), but some consumers define their own region rather broadly. For example in Germany about 40 percent of the respondents view the federal state in which they live as their own region (CMA/ZMP 2003). When directly surveyed, consumers have at least some willingness to pay for the characteristic “regional origin” (SCHRÖDER/BURCHARDI/THIELE 2005).

The protection of the regional origin of foods is a major part of the EU’s quality policy in agriculture. According to Council Regulation No. 2081/1992, “the promotion of products having certain characteristics could be of considerable benefit to the rural economy, in particular to less-favored or remote areas, by improving the incomes of farmers and by retaining the rural population in these areas”

(COMMISSION OF THE EU 1992). There are two kinds of regional origin which can be registered and protected according to this Council Regulation:

- (i) protected designation of origin (PDO);
- (ii) protected geographical indication (PGI).

The first definition goes further than the second, as foodstuffs have to be produced, processed and prepared in that region. Additionally, a causal link has to exist between regional origin and quality: quality or characteristics have to be “essentially or exclusively due to a particular geographical environment with its inherent natural and human factors” (Art.2, Council Regulation No. 2081/1992). The PGI, on the other hand, covers a product where at least one of the stages – production, processing, or preparation – occurs in the designated area. In a somewhat weaker formulation than for PDOs, quality, reputation or other characteristics are “attributable to that geographical origin” (ibid., Art. 2) for a PGI.

Generic promotion of agricultural products by EU member countries as well as regional marketing initiatives by federal states have been widespread for years. There was a long dispute between the European Commission and EU member states on whether these regional promotion measures for agricultural products qualify for governmental support. The Commission’s point of view was confirmed in 2001 when the Community’s guidelines for State aid for advertising of products were established (COMMISSION OF THE EU 2001). According to these guidelines, only the promotion of those agricultural products can be supported which are protected designations of origin as outlined in Council Regulation No.2081/92. This decision implies that regional-origin labeling has to be associated with a quality-control system that leads to a superior quality, if the program is to be subsidized by the government.

Despite the high – and possibly increasing – value the EU addresses to the promotion of regional products, analytical work on the economic impacts of those initiatives is lacking. There is, however, a well-established literature on the economics of generic promotion, starting from classical and general contributions (NERLOVE/WAUGH 1961; FORKER/WARD 1993) to recent and very detailed impact analyses applied to selected questions, commodities and programs (see the contributions in KAISER 2003). Typically, the effects of generic advertising on demand for the advertised food are estimated or modeled and the redistributive and welfare impacts elaborated. Especially for the U.S., where generic advertising is financed by producer levies, cost-benefit ratios are calculated which relate additional revenues and costs for producers due to program participation. Studies in this literature investigated the importance of cross-price effects for advertising effectiveness (KINNUCAN 1996), the distribution of impacts of advertising within the marketing chain (KAISER/SCHMIT 2003), or the implications of market power for the allocative and redistributive effects of generic promotion (ZHANG/SEXTON 2002). Economic studies on European regional promotion programmes are rare, but some do exist for Germany (e.g., HOFF/CLAES 1997 or HERRMANN/THOMPSON/KRISCHIK-BAUTZ 2002).

Despite the numerous extensions in the promotion literature, analyses were mainly carried out within models where one uniform price at one stage of the marketing chain is determined. When a regional marketing program includes regional-origin labeling as well as additional costs for quality control, as is the case under the EU Council Regulation 2081/1992, different qualities have to be distinguished. Market segmentation occurs between a higher-quality market for the labeled product and an average-quality residual market. There have been models of segmented agricultural markets, e.g. on country-of-origin labeling (LUSK/ANDERSON 2003) and on markets for foods with and without genetically modified organisms (SCHMITZ/MOSS/SCHMITZ

2004). However, a segmented-market approach has not yet been applied to regional-origin labeling and its specific characteristics.

Given this background, it is the objective of this paper to provide a methodological framework for the analysis of regional marketing programs which include regional-origin labeling as well as quality assurance and control. An equilibrium-displacement model (EDM) for a segmented market with differential qualities will be developed that can be applied to a variety of regional marketing programs. An empirical application of the model is illustrated for a selected European case, i.e. “Gepruefte Qualitaet – Bayern”.

## 2 The Model

The objective is to model the economic implications of state-financed programs assuring both quality control at a superior level and the regional origin of an agricultural product.

To assess the direct and distributional effects of such programs, we develop a commodity market model that is segmented by both product quality and regional origin. Our segmented market model extends the existing work on commodity promotion evaluation which has been largely restricted to uniform markets. In our general model each region can produce for a uniform lower-quality market which we call the mass market. Each region can also incur additional program participation costs and produce for a high-quality market which is regionally labeled. The demand for these high quality regional products may be augmented by regional promotion expenditures borne within and outside the region.

As stated earlier, a linkage between improved product quality and regional-origin labeling is a justification for government-subsidized promotion efforts. So, we seek a model that will enable us to evaluate promotional programs designed to send product

quality signals based on regional origin. However, as shown by KINNUCAN (1996), when markets are interrelated, ignoring the cross-price and cross-advertising effects will yield biased measures of advertising effectiveness. We extend this result to present a general model which allows for interactions between mass and regional markets with respect to price, regional advertising, supply response and differing cost structures.

## 2.1 Structure of the Model

A multi-equation market equilibrium model for two regions engaged in regional-origin labeling which are related in price, advertising and costs is specified as

$$\text{Supply:} \quad S_j^i = S_j^i(P, C, Z) \quad (1)$$

$$\text{Demand:} \quad D_j^i = D_j^i(P, A, X) \quad (2)$$

$$\text{Market Equilibrium:} \quad S_j^i = D_j^i \quad (3)$$

where  $i$  = region A or B;  $j$  = mass-market product M, high-quality product A or B;  $P$  is a vector of producer prices,  $A$  is a vector of regional advertising expenditures,  $C$  = the supply effect due to additional producer cost of participation in the regional advertising program, and  $Z$  and  $X$  are exogenous supply and demand shifters. We assume competitive markets at the farm level. Prices and quantities are determined endogenously according to the market equilibrium (3).

We follow the general methods used by KINNUCAN (2003) and PIGGOTT (2003). For any variable  $x^* = dx/x = d\ln x$  is the percentage change in  $x$ . Then use of the logarithmic differential approximation to equations (1) – (3) yields the following multi-equation EDM where the parameters are interpreted as elasticities.

## Region A

Supply:

$$(4) \quad d \ln S_M^A = e_M^A d \ln P_M + e_{AM}^A d \ln P_A$$

$$(5) \quad d \ln S_A^A = e_A^A d \ln P_A + b_1 d \ln C_A$$

Demand:

$$(6) \quad d \ln D_M^A = h_M^A d \ln P_M$$

$$(7) \quad d \ln D_A^A = h_A^A d \ln P_A + h_{AB}^A d \ln P_B + e_{AA}^A d \ln A_A + e_{AB}^A d \ln A_B^A$$

$$(8) \quad d \ln D_B^A = h_B^A d \ln P_B + h_{BA}^A d \ln P_A + e_{BB}^A d \ln A_B^A + e_{BA}^A d \ln A_A$$

## Region B

Supply:

$$(9) \quad d \ln S_M^B = e_M^B d \ln P_M + e_{BM}^B d \ln P_B$$

$$(10) \quad d \ln S_B^B = e_B^B d \ln P_B + b_2 d \ln C_B$$

Demand:

$$(11) \quad d \ln D_M^B = h_M^B d \ln P_M$$

$$(12) \quad d \ln D_B^B = h_B^B d \ln P_B + h_{BA}^B d \ln P_A + e_{BB}^B d \ln A_B + e_{BA}^B d \ln A_A^B$$

$$(13) \quad d \ln D_A^B = h_A^B d \ln P_B + h_{AB}^B d \ln P_A + e_{AA}^B d \ln A_A^B + e_{AB}^B d \ln A_B$$

## Equilibrium Conditions

$$(14) \quad h_M^{Si} d \ln S_M^i = h_M^{Di} d \ln D_M^i$$

$$(15) \quad d \ln S_A^A = h_A^{DA} d \ln D_A^A + h_A^{DB} d \ln D_A^B$$

$$(16) \quad d \ln S_B^B = h_B^{DB} d \ln D_B^B + h_B^{DA} d \ln D_B^A$$

Superscripts denote the region ( $A$  or  $B$ ), subscripts denote products (mass-quality product  $M$ , high-quality product  $A$ , or high-quality labeled product  $B$ ),  $e$ 's are own- and cross-price elasticities of supply;  $h$ 's are own- and cross-price elasticities of

demand,  $e$ 's are the own- and cross-advertising elasticities and,  $c$ 's represent the marginal cost of participation for each region<sup>1</sup>. Equilibrium conditions (14) - (16) contain both supply and demand market shares  $h_j^{Si}$  and  $h_j^{Di}$ , respectively<sup>2</sup>. For instance  $h_A^{DA}$  is the market share of the total demand for high-quality product  $A$  within region  $A$ .

As we start from the idea of regional-origin labeling with quality control, this implies vertical product differentiation. Thus, the demand functions of model (4) to (16) do not include a substitutive relationship between the two quality levels. Substitution effects occur at one given quality level only, i.e. between qualities A and B but not between either A or B as opposed to M.

There is, however, substitution on the supply side between the two different qualities. A rising price in the high-quality market leads to a reduction of supply on the low-quality market ( $\varepsilon_A^A > 0$ ,  $\varepsilon_B^A > 0$ ).

Given exogenous market shares, advertising quantities, and program participation cost, the linear equation system (14) - (16) can be solved for the three endogenous price change variables  $d \ln P_j$  as,

$$(17) \quad \begin{bmatrix} d \ln P_M \\ d \ln P_A \\ d \ln P_B \end{bmatrix} = \begin{bmatrix} a_{11} & \cdots & a_{13} \\ \vdots & & \vdots \\ a_{31} & \cdots & a_{33} \end{bmatrix}^{-1} \begin{bmatrix} b_{11} & \cdots & b_{14} \\ \vdots & & \vdots \\ b_{31} & \cdots & b_{34} \end{bmatrix} \begin{bmatrix} d \ln A_A^A \\ d \ln A_B^A \\ d \ln A_A^B \\ d \ln A_B^B \end{bmatrix} + \begin{bmatrix} a_{11} & \cdots & a_{13} \\ \vdots & & \vdots \\ a_{31} & \cdots & a_{33} \end{bmatrix}^{-1} \begin{bmatrix} c_{11} & c_{12} \\ \vdots & \vdots \\ c_{31} & c_{32} \end{bmatrix} \begin{bmatrix} d \ln C_A^A \\ d \ln C_B^B \end{bmatrix}$$

---

<sup>1</sup> We assume the components of X and Z are subsumed in the constant terms of equations (1) and (2).

<sup>2</sup> If for supply,  $S = S_M^A + S_M^B$ , then  $d \ln S = d \ln S_M^A \cdot h_M^{SA} + d \ln S_M^B \cdot h_M^{SB}$ , where  $h^{SA}$  and  $h^{SB}$  are supply shares on the mass market originating from region A and B, respectively. This same relationship holds for markets segmented on the demand side.

where the  $a$  matrix includes own- and cross-price elasticities of supply and demand as well as market shares, the  $b$  matrix captures own- and cross-advertising elasticities, and the  $c$  matrix includes parameters associated with the added cost of regional program participation.

Parameterization of the above model is needed to simulate how changes in own- and cross-region advertising expenditures and changes in program participation cost affect market prices, quantities and producer welfare. Empirical illustrations will likely necessitate restrictions to the general model to characterize the unique dimensions of any particular empirical application.

The solution to equation (17) can be used to evaluate the total and distribution of changes in producer welfare due to regional advertising. This can be accomplished by computing changes in producer surplus (PS) in each market, assuming parallel shifts in demand and supply.

$$(20) \quad \Delta PS_j^i = \sum_{i,j} \left[ p_j^i S_j^i - d \ln P_j^i (1 + 0.5 d \ln S_j^i) \right].$$

## 2.2 Possible Model Uses

The model presented above has been designed for a combined analysis of regional-origin labeling and quality control. Accordingly, the implications of promotion expenditures for the labeled products can be elaborated as well as the consequences of increasing producer costs due to the instruments of quality control. The model allows for the general situation where competing high-quality products exist as well as a common non-competing lower-quality mass product. This is typical for the current situation in the EU where different regional labels have been introduced, e.g., beef and advertising occurs for competing labels. A crucial task in the empirical

application of the model is to define precisely (i) the competing high-quality products and (ii) the relevant market on which the products compete.

If strong competition between high-quality segments of the market does not exist, it would be necessary to restrict the model to distinguish only one regional label from the lower-quality market, but perhaps also allow for the possibility of trade between markets. Other problem-specific restrictions can be easily imposed.

The general model may serve other purposes as well. The EDM model could be applied to other relevant issues where market segmentation plays a major role. Cases in point are strategies of country-of-origin labeling, differentiation of ecological as opposed to conventional farming and foods, or the labeling of foods that do not contain genetically modified organisms (GMOs). Some modeling approaches of these markets have already been provided. CHUNG/ZHANG/PEEL (2004) and LUSK/ANDERSON (2003) analyze country-of-origin labeling on the U.S. meat sector. The COOL provision of the 2002 Farm Sector and Rural Investment Act requires from September 30, 2004 that retailers label the country of origin on fresh and frozen foods. CHUNG/ZHANG/PEEL and LUSK/ANDERSON use models which distinguish between domestic and foreign product market segments. Products from ecological as opposed to conventional farming are analyzed in a segmented equilibrium-displacement model by HAGNER (1997) and the impacts of governmental policies on the conventional and ecological markets are elaborated. MOSS/SCHMITZ/SCHMITZ (2004) use a partial-equilibrium segregation model in their study of how resistance to the introduction of genetically modified (GM) crops leads to segregated markets for GM and non-GM crops. Based on this model, they illustrate the welfare implications of market segregation and the relevance of segregation costs.

Our model differs from these approaches in the literature in two major respects:

1. The modeling framework is applied to regional-origin labeling. None of the other modeling approaches has been used to study this issue.
2. Although individual papers go further in other respects than we do, none of the segmented-market models in the literature cover competition between high-quality products as does our model with labeled goods of regions *A* and *B*.

We now provide an application of the model to a regional-labeling and quality control scheme. The case study is related to the German program "Gepruefte Qualitaet – Bayern".

### **3 An Empirical Application**

#### **3.1 Background**

The origin of Bavarian regional-origin labeling dates back to 1985 when the program "Quality from Bavaria" was established by the Bavarian Ministry for Nutrition, Agriculture and Forestry (for details, see HERRMANN/THOMPSON/KRISCHIK-BAUTZ 2002). After first used only for seed products and breeding cattle, a program for fed beef was introduced in October 1994, largely influenced by consumer concerns about BSE. To "re-establish and increase confidence of the strongly insecure consumer especially in Bavarian meat" was the declared objective of this program (BSTMELF 1999, p. 10). Advertising for the program occurred in various media and the Bavarian meat-controlling institution, "Bayerische Fleischpruefung e.V.", was responsible for quality and test regulations. Activities under the program were suspended in late 2002 when BSE cases were discovered in Germany.

In accordance with the EU rules on protected designations of origin, a revised program was then started in February 2002: "Gepruefte Qualitaet – Bayern" (BSTMLF 2002). Participation in the program was open to producers, processors and

retailers who agreed to a detailed system of quality control. This requirement is binding since the regional label may only be EU-supported under when a superior quality is guaranteed.

### 3.2 The Bavarian Beef Market

The general model is modified to characterize the “Qualitaet aus Bayern” program. The model structure consists of two regions (Bavaria and Rest of Germany – ROG), a single high-quality product (produced in Bavaria but sold in both regions) and a common mass market product (produced in both regions).

#### Bavaria (Region A)

Supply:

$$(21) \quad d \ln S_M^A = e_M^A d \ln P_M + e_{AM}^A d \ln P_A$$

$$(22) \quad d \ln S_A^A = e_A^A d \ln P_A + b_1 d \ln C_A$$

Demand:

$$(23) \quad d \ln D_M^A = h_M^A d \ln P_M$$

$$(24) \quad d \ln D_A^A = h_A^A d \ln P_A + e_{AA}^A d \ln A_A$$

#### Rest of Germany (Region B)

Supply:

$$(25) \quad d \ln S_M^B = e_M^B d \ln P_M$$

Demand:

$$(26) \quad d \ln D_M^B = h_M^B d \ln P_M$$

$$(27) \quad d \ln D_A^B = h_A^B d \ln P_A + e_{AA}^B d \ln A_A$$

#### Equilibrium Conditions:

$$(28) \quad \sum h_M^S \cdot d \ln S_M = \sum h_M^D \cdot d \ln D_M$$

$$(29) \quad d \ln S_A^A = h_A^{DA} \cdot d \ln D_A^A + h_A^{DB} d \ln D_A^B$$

Again, superscripts characterize regions A and B, and subscripts the high-quality product A and the mass product M. Bavaria is the largest exporter of beef among all German federal states. Bavarian exports occur both under the regional label and for unlabeled beef, i.e. for the high-quality and the mass market. Therefore, there is demand for Bavarian beef in the rest of Germany for both qualities (equations (26) and (27)). As exports from the region go to various regional markets in Germany, Bavarian beef competes with beef under various other labels as well as foreign beef. There is no single competitor of regionally-labeled Bavarian beef in the high-quality market sector. Thus, we posit that the labeled product is of superior quality to that of the mass market. We distinguish only the regional label as the high-quality beef product from the mass (lower-quality) beef product.

In the Bavarian case, the high quality price ( $P_A$ ) is what wholesalers pay producers; it does not include deductions for advertising. The producer contribution to advertising is a cost which must be deducted from  $P_A$  to obtain a net producer price  $P_p$ . We derive  $P_p$  from

$$(5) \quad d \ln S_A^A = e_A^A d \ln P_A + b_1 d \ln C_A,$$

where

$$(30) \quad b_1 d \ln C_A = (\partial S_A^A / \partial C_A)(C_A / S_A^A) \cdot d C_A / C_A$$

$$= (\partial S_A^A / S_A^A)$$

$$= d$$

Here  $d$  is the relative *horizontal* shift in the high-quality supply curve due to the added cost of producing high-quality beef. Substituting (30) into (5) yields

$$(31) \quad d \ln P_A = \left( \frac{1}{e_A} \right) d \ln S_A^A - K$$

where  $K = \frac{d}{e_A}$  is the relative *vertical* shift in the price direction. Further the change

in producer price ( $P_P$ ) is defined when  $K=0$  as

$$(32) \quad d \ln P_P = \left( \frac{1}{e_A} \right) d \ln S_A^A$$

and the level of the producer price is given as

$$(33) \quad P_P = P_M (d \ln P_P + 1).$$

The logic of our comparative static analysis can be followed by referring to Figure 1. With no advertising (and presumably no higher-quality product) we begin with the high-quality market equilibrium point  $P_A^0 (= P_P^0)$  and  $Q_A^0$ . Advertising expenditures shift demand outwardly to  $D^1$  with a new equilibrium point  $P_A^1 (= P_P^1)$  and  $Q_A^1$ . With advertising cost fully provided by the *government*, the producer price ( $P_P^1$ ) exactly equals the wholesale price ( $P_A^1$ ) and positive producer welfare gains are realized. However, with *producer* contributions to the cost of advertising, the supply function shifts to  $S^1$  yielding the new equilibrium point at quantity ( $Q_A^2$ ) corresponding to wholesale and producer prices of ( $P_A^2$ ) and ( $P_P^2$ ), respectively. At this point,  $P_A^2 - P_P^2 = d$  (or producer cost). Supply could shift leftward as producer costs ( $d$ ) increase to such a degree that the welfare gains to producers become negative. In terms of our model the quantity and price changes are  $d \ln S_A^A$ ,  $d \ln P_A$  and  $d \ln P_P$ .

**Figure 1. High-Quality Beef Market**

Source: Authors' presentation.

### **3.3 Parameterization**

Not all parameters of the empirical model are readily available. Nor do we have complete information on the market segments of labeled and non-labeled products as well as reliable price data in the market segments or the additional producer costs due to participation in a program that combines quality standards and control with regional-origin labeling. However, there is much we do know. For instance, we have good statistical estimates of the responsiveness of labeled product sales to advertising effort. Given this somewhat limited knowledge, simulations and sensitivity analyses are particularly important. Simulations can also be used to illustrate stronger changes

of policy than those realized in the past. This is crucial when one is interested in the amount of additional advertising expenditures necessary to induce a defined price difference between the labeled and the non-labeled market.

Table 1 provides the parameters and elasticities of the empirical model. A key parameter of the model for evaluating the impacts of advertising for a regional-origin label is the advertising elasticity of demand. We take the econometric estimate of 0.04 by HERRMANN/THOMPSON/KRISCHIK-BAUTZ(2002) measured for the program “Quality from Bavaria”. It is consistent with most studies from the generic-promotion literature that the advertising elasticity of demand is significantly positive but typically less than 0.1. In this same study, econometric estimates of the own-price elasticities of demand (-0.8 in the high-quality segment and -0.4 on the mass market) were found to be consistent with other estimates for beef demand in Germany. Some recent econometric studies based on demand systems indicate that our price elasticities might be at the lower end, suggesting that the price elasticity of demand for beef has increased over time and might now be above unity (WILDNER 2000).

Market simulation results can be particularly sensitive to both the advertising elasticities as well as the marginal cost of participation parameter. Given an advertising elasticity of 0.04 in both markets, we focus attention over the sensitivity of the market impacts of the cost parameter ( $d$ ). The price and quantity change effects are extended to producer welfare effects in each market segment.

**Table 1: Parameters and Elasticities of the Empirical Model**

Price Elasticities of				Advertising and		Market	
Supply		Demand		Cost Parameters		Shares	
$\varepsilon_M^A$	0.2	$h_M^A$	-0.4	$d \ln A_A^A$	100	$h_M^{SA}$	0.12
$e_{AM}^A$	-0.1	$h_A^A$	-0.8	$d \ln A_A^B$	100	$h_M^{SB}$	0.88
$\varepsilon_A^A$	0.5	$h_A^B$	-1.2	$d \ln C_A$	100	$h_M^{DA}$	0.10
$\varepsilon_M^B$	0.2	$h_M^B$	-0.5	$e_{AA}^A$	0.04	$h_M^{DB}$	0.90
				$e_{AA}^B$	0.04	$h_A^{DA}$	0.6
				$\beta_1$	-0.1	$h_A^{DB}$	0.4

### 3.4 Simulations

Our benchmark simulations are based on actual segmented market data for the year 2003. At that time, the mass-quality price ( $P_M$ ) averaged € 2.31. While high-quality certified Bavarian product price premium over the mass market product varied considerably, the premium achieved could be as much as ten percent. In Bavaria, the annual production of labeled and mass market beef was 107,608 and 161,413 million kgs., respectively. We assume that there exist no competing regional quality label in any state of ROG. In the ROG, no high quality labeled beef was produced. However, the production of mass market beef was 1,160,523 kgs. Thus, the market shares of mass-market beef produced in Bavaria and ROG were 12 and 88 percent, respectively. Our benchmark assumes the existence of an ongoing promotion program in Bavaria which implies that the producer cost of participation are included in the existing supply function for the labeled product. Thus, shifts in the supply function are due to producer contributions associated with promotional labeling. In

our simulations from the baseline, we explore the effects of a 100 percent increase in the promotional expenditures for Bavarian quality-labeled beef.

In Table 2 we show how increased regional quality advertising affects prices, and quantities in the segmented markets and how these change as producers share the cost of advertising with the government. Suppose the situation is that the regional labelling of Certified Quality – Bavaria is subsidised by 100 percent governmental payments ( $d = 0$ ). This is especially likely for the year 2003 where the regional quality label was revised by the EU commission and launched on the market.<sup>3</sup> Since that time, governmental support is scheduled to be reduced by 10% per year.

**Table 2. Price and Quantity Effects of Increased Advertising of High Quality**

**Bavarian Beef**

d	Price Effects						Quantity Effects			B/C
	Wholesale		Producer		Mass Market		S <sub>AM</sub> (%)	S <sub>BM</sub> (%)	S <sub>AA</sub> (%)	α
	P <sub>A</sub> (%)	P <sub>A</sub> (€)	P <sub>P</sub> (%)	P <sub>P</sub> (€)	P <sub>M</sub> (%)	P <sub>M</sub> (€)				
0.04	8.0	2.50	0	2.31	0	2.31	0	0	0	1
0.03	7.2	2.48	1.2	2.34	0.024	2.31	-0.12	0.005	0.6	1.33
0.02	6.2	2.45	2.2	2.36	0.044	2.31	-0.21	0.008	1.1	2
0.01	5.1	2.43	3.1	2.38	0.062	2.31	-0.3	0.012	1.6	4
0	4.1	2.40	4.1	2.40	0.082	2.31	-0.4	0.016	2.0	>4

Source: Authors' computations.

<sup>3</sup> Annual Bavarian state aid is 0.5 million Euro total expenditure of the state of Bavaria on the total program was 2.556 million Euro in 2003.

The simulated advertising-induced outward demand shift increases both the wholesale price of Bavarian beef ( $P_A$ ) and the producer price ( $P_P$ ). Market interrelationships reveal that advertising Bavarian beef has a counterintuitive positive influence on the mass market price. When the cost parameter  $d = 0$ , all costs associated with the advertising-induced demand shift are borne by the government. In this situation, both the wholesale and producer price in the high-quality Bavarian market increase by 4.1 percent over the mass market price. The positive supply response of the high quality Bavarian product shifts the mass market supply leftward in Bavaria, while the marginally higher  $P_M$  encourages a small positive supply response in the ROG mass market.

Notwithstanding increased wholesale prices for the Bavarian high quality product, as producers are asked to share in the cost of advertising ( $d$  increases), net producer price falls as the cost-induced supply function shifts leftward. Producer contributions act as a wedge between wholesale and producer prices. This wedge can increase until the added advertising cost exactly equals the benefits. This breakeven point is where the benefit-cost parameter  $|\alpha| = 1.0$  and the increase in  $P_A$  is 8.0 percent. Different changes in  $P_A$  and  $P_P$  are observed as the breakeven point ( $\alpha$ ) moves “up or down” in Table 2.

Changes in producer surplus (PS) associated with the promotion of “Certified Quality – Bavaria” are shown in Table 3. Clearly, the overall change in producer surplus is greatest when the entire demand shift is entirely government subsidized ( $d = 0$ ). However, for the profit-maximizing producer, it makes sense to share in the cost of advertising because positive changes in PS continue as producers contribute up to a breakeven point, again where  $\alpha = 1.0$ ; that is, where the change in producer surplus is zero. Also, producers are expected to contribute as scheduled government

subsidies decrease. The breakeven point increases when the advertising contribution of the Bavarian producers rises.

**Table 3. Changes in Producer Surplus due to Increased Advertising of High Quality Bavarian Beef (millions of €)**

d	Mass Market		High Quality		Total Bavaria	
	Bavaria		Bavaria			
	PS <sub>AM</sub>	PS <sub>BM</sub>	PS <sub>AA</sub>	PS <sub>“A”</sub>		
0.04	0	0	0	-0		
0.03	99.5	643.4	3,012.6	3,111.1		
	(1.26 €)	(5.8 €)	(291.1 €)	(38.1 €)		
0.02	164.2	1,179.5	5,556.3	5,720.5		
	(2.3 €)	(10.71 €)	(536.8 €)	(70 €)		
0.01	231.5	1,662.0	7,875.8	8,107.3		
	(3.25 €)	(15.1 €)	(761 €)	(99.2 €)		
0	306.3	2,198.1	10,482.8	10,789.1		
	(4.3 €)	(20 €)	(1012.8 €)	(132.1 €)		

\* The numbers in parentheses are changes in PS per beef producer.

Source: Authors' computations.

Welfare changes among markets also occur. Advertising of the high quality Bavarian product in both regions (Bavaria and ROG) results in positive welfare changes in all markets and regions. Even the ROG gains from Bavarian advertising albeit small. In fact, due to substitutability in supply, the mass market welfare in ROG are relatively greater than those in the Bavarian mass market. Since the absolute size of the markets differ we calculated producer surplus changes per beef farmer. For the

participants of Certified Quality – Bavaria the actual number of participating beef producers in 2003 is used to calculate PS of “label members”. Of course, the change in PS is greatest in the “no cost” situation where  $d = 0$ . The last column in Table 3 shows the sum of the high quality and mass market effects for Bavaria. On a per-farm basis clear gains to advertising are seen even as producers share in the cost of advertising. Note that these are *changes* in producer surplus, so for the profit-maximizing producer it is profitable to contribute to the advertising effort up to the point where  $\Delta PS = 0$ .

#### **4 Concluding Remarks**

Quality signals of regionally produced products can be economically beneficial to producers. The benefits accrued are directly related to the effectiveness to which the demand for the high-quality product can be augmented with advertising, the cost associated with the advertising effort and, of course, the basic economic structural characteristics of the market segments under study.

In this paper we suggest a general economic framework that can be used to examine problems of this nature. We illustrate this framework with an empirical examination of the "Certified Quality - Bavaria" promotion program. This illustration includes two regions, Bavaria and Rest of Germany (ROG), both of which produce beef for the mass market but only Bavaria produces the higher quality-labeled product of pure guaranteed Bavarian origin. We allow for trade in both products between regions.

The promotion of the Bavarian labeled product in Bavaria positively influences both regions and products. All market segments can gain. While clearly producer gains are great when the cost of the advertising the Bavarian labeled product is financed entirely by the government, it remains rational for profit-maximizing producers to co-finance contributions as well.

We found our proposed analytical framework to be a flexible and easy-to-use tool to simulate market behavior in response to promoting the Bavarian quality-labeled product. We believe it is generally applicable to examine a number of policy-related issues in segmented commodity markets.

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