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### Markets Segmented by Regional-Origin Labelling with Quality Control

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# Markets Segmented by Regional-Origin Labelling with Quality Control

## 1 Introduction

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). When the guidelines for State aid for advertising of products were established in 2001 (Commission of the EU 2001), only the promotion of those agricultural products can be supported which are protected designations of origin (PDO) as outlined in Council Regulation No. 2081/92 (Art. 2, Council Regulation No. 2081/1992)<sup>1</sup>. This decision implies that regional-origin labelling has to be associated with a quality-control system that leads to a superior quality, if the program is to be subsidised by the government.

Generic promotion of agricultural products by EU member countries as well as regional marketing initiatives by federal states in line with these regulations have been widespread for years. However, 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. While the economic importance of regional-origin labelled products in consumer demand has been confirmed [BALLING

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<sup>1</sup> There are two kinds of regional origin that are registered and protected under Council Regulation No. 2081/1992: (i) Protected Designation of Origin (PDO) and (ii) Protected Geographical Indication (PGI). Under the first definition - being more advanced - foodstuffs have to be produced, processed and prepared in the designated region. A causal link has to be proven to exist between the regional origin and the quality, which has 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 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.

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4 2000, WIRTHGEN 2005], the question under which conditions the generic promotion  
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6 of regional-origin labelling results in a significant price mark-up for farmers remains  
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8 largely unanswered. As the second pillar of the EU's CAP aims at strengthening the  
9  
10 development of rural areas and providing farmers with diversified opportunities for  
11  
12 the marketing of quality products, supporting regional promotion measures of  
13  
14 produce from remote locations that feature quality-control systems could be of added  
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16 significance. Given this background, it is the objective of this paper to provide a  
17  
18 methodological framework for the analysis of regional marketing programs which  
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20 include regional-origin labelling as well as quality assurance and control. An  
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22 equilibrium-displacement model (EDM) for a segmented market with differential  
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24 qualities is developed that extends most of the existing approaches in the generic  
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26 advertising and country-of-origin literature. We investigate the extent to which a  
27  
28 phased reduction of initial governmental support levels impacts farmer price  
29  
30 premiums and welfare. It could be argued that with increasing producer cost shares  
31  
32 for program participation farmers lack the incentive to participate in regional  
33  
34 marketing activities that meet a growing consumer demand for high-quality foods  
35  
36 from designated regional origins. Results suggest that full governmental support to  
37  
38 regional-marketing programs provide significant price mark-ups at the farm level.  
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41 Our framework can be applied to a variety of regional marketing programs. An  
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43 empirical application of the model is illustrated for a selected European case, i.e.  
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45 "Certified Quality – Bavaria".  
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## 56 **2 Review of Literature**

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58 There is a well-established literature on the economics of generic promotion, starting  
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60 from classical and general contributions (NERLOVE/WAUGH 1961, FORKER/WARD  
1993) to recent and detailed impact analyses applied to selected questions,

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4 commodities and programs (see the contributions in KAISER 2003). Typically, the  
5  
6 economic effects of generic advertising on food demand are statistically modelled  
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8 and the redistributive and welfare impacts elaborated. Especially for the U.S., where  
9  
10 generic advertising is financed by producer levies, cost-benefit ratios are calculated  
11  
12 which relate additional revenues and costs for producers due to program  
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14 participation. Studies have investigated the importance of cross-price effects for  
15  
16 advertising effectiveness (KINNUCAN 1996, KINNUCAN/XIAO/HSIA 1996), the  
17  
18 distribution of impacts of advertising within the marketing chain (KAISER/SCHMIT  
19  
20 2003) and across interrelated markets (KINNUCAN/MIAO 2000). ZHANG and SEXTON  
21  
22 (2002) analyse the implications of market power for the allocative and redistributive  
23  
24 effects of generic promotion. Economic studies on European regional promotion  
25  
26 programs are rare, but some do exist for Germany (e.g., HOFF/CLAES 1997,  
27  
28 HERRMANN/THOMPSON/KRISCHIK-BAUTZ 2002).

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34 A broad literature on the economics of food labeling has developed in recent years  
35  
36 much of which is surveyed in GOLAN/KUCHLER/MITCHELL (2001). This general  
37  
38 literature is related to the theory of food labeling and the role of government in the  
39  
40 labelling process. Within this field, regional-origin labelling and especially  
41  
42 geographical indications have gained increasing attention among economists as a  
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44 number of studies reveal high and increasing consumer appreciation for labels of  
45  
46 origin in Europe and the U.S. (LUSK et al. 2006, ROOSEN/LUSK/FOX 2003).

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51 In this context a growing literature has focused on the economic impacts of the  
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53 country of origin applying models of segmented agricultural markets to measure the  
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55 welfare and market effects of origin labelling (BRESTER/MARSH/ATWOOD 2004). The  
56  
57 country-of-origin labelling (COOL) provision of the 2002 U.S. Farm Sector and  
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59 Rural Investment Act requires from September 30, 2004 that retailers label the  
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country of origin on fresh and frozen foods. CHUNG, ZHANG and PEEL (2004) review

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4 studies that have assessed market level costs and welfare effects of introducing  
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6 COOL in the U.S. meat industry. LUSK and ANDERSON (2004) adapt a WOHLGENANT  
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8 (1993) equilibrium-displacement model specification of vertically segmented  
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10 markets to simulate producer and consumer welfare effects of COOL in the U.S.  
11  
12 meat industry. Their results reveal that demand increases of two to three percent are  
13  
14 sufficient to offset additional costs at the producer level.  
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18 Moreover, an extensive literature has investigated the effects of the country of origin  
19  
20 as a signal of quality to consumers. BECKER (2002) notes that the regional origin is  
21  
22 becoming one of the most important determinants of food demand in the EU. VAN  
23  
24 DER LANS et al. (2001) and VERLEGH and STEENKAMP (1999), in a meta-analysis of  
25  
26 country-of-origin studies, found origin labels to be a significant factor in consumer  
27  
28 product evaluations. Recently, LUSK et al. (2006) differentiate between consumer  
29  
30 motivations for origin labels from the economic and marketing literature to  
31  
32 investigate the reasons behind "why" consumers want COOL and derive causes for  
33  
34 public policy in the U.S.  
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39 Despite the numerous extensions in the generic promotion and origin-labelling  
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41 literature, analyses were mainly carried out within models where one uniform price  
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43 or cost measure at one stage of the marketing chain is determined. In the case of a  
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45 regional marketing program that includes regional-origin labelling and additional  
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47 costs for quality control, as is the case under the EU Council Regulation 2081/1992,  
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49 different qualities have to be distinguished. Market segmentation occurs between a  
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51 higher-quality market for the origin-labelled product and an average-quality residual  
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53 market segment. However, a segmented-market approach that considers the  
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55 regulations for governmental support of regional origin-labelling set by Council  
56  
57 Regulation No. 2081/92 has not yet been developed. For this reason, a flexible  
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59 approach to evaluating the price and welfare effects of state-financed regional-origin  
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4 marketing programs including quality differentiated products and quality-assurance  
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6 systems is developed below.  
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### 10 11 **3 The Model**

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13 The EDM methodology was originally proposed by MUTH (1964) and reviewed by  
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15 PIGGOTT (1992) and ALSTON, NORTON and PARDEY (1995). The objective of the  
16  
17 EDM approach applied in this study is to model the producer price and welfare  
18  
19 effects and their implications for state-financed regional-origin programs of quality-  
20  
21 differentiated products and regionally segmented markets.  
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24  
25 In our general model each region can produce for a uniform standard-quality market  
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27 which we call the "mass" market. Each region can also incur additional program  
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29 participation costs and produce for a high-quality market which is regionally  
30  
31 labelled. The demand for these high quality regional products may be augmented by  
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33 regional promotion expenditures borne within and outside the region.  
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37 As stated earlier, a linkage between improved product quality and regional-origin  
38  
39 labelling is a justification for government-subsidised promotion efforts. So, we seek a  
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41 model that will enable us to evaluate promotional programs designed to send quality  
42  
43 signals based on regional origin. However, as shown by KINNUCAN (1996), when  
44  
45 markets are interrelated, ignoring the cross-price and cross-advertising effects will  
46  
47 yield biased measures of advertising effectiveness. Hence, the model explicitly  
48  
49 accounts for various cross-price and cross-advertising elasticities. Given the nature of  
50  
51 regional-origin labelling, the assumption of perfect product substitutability between  
52  
53 "mass" and labeled products from different regions is resolved in favor of a more  
54  
55 realistic assumption of differentiated products based on their regional origin and  
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57 quality.  
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We extend the existing work and present a general model which allows for interactions between "mass" and regional-origin markets with respect to price, regional advertising, supply response and differing cost structures.

### 3.1 Structure of the Model

A multi-equation market-equilibrium model for two regions engaged in regional-origin labelling 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,  $C$  = 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 and MYRLAND (2003) and PIGGOTT (2003), where  $dx/x = d \ln x$  is the percentage change of any variable  $x$ . 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:

$$d \ln S_M^A = \varepsilon_M^A d \ln P_M + \varepsilon_{MA}^A d \ln P_A \quad (4)$$



$$d \ln S_A^A = \varepsilon_A^A d \ln P_A + \beta_1 d \ln C_A \quad (5)$$

Demand:

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

$$d \ln D_A^A = \eta_A^A d \ln P_A + \eta_{AB}^A d \ln P_B + \eta_{AM}^A d \ln P_M + e_{AA}^A d \ln A_A + e_{AB}^A d \ln A_B \quad (7)$$

$$d \ln D_B^A = \eta_B^A d \ln P_B + \eta_{BA}^A d \ln P_A + \eta_{BM}^A d \ln P_M + e_{BB}^A d \ln A_B + e_{BA}^A d \ln A_A \quad (8)$$

## Region B

Supply:

$$d \ln S_M^B = \varepsilon_M^B d \ln P_M + \varepsilon_{MB}^B d \ln P_B \quad (9)$$

$$d \ln S_B^B = \varepsilon_B^B d \ln P_B + \beta_2 d \ln C_B \quad (10)$$

Demand:

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

$$d \ln D_B^B = \eta_B^B d \ln P_B + \eta_{BA}^B d \ln P_A + \eta_{BM}^B d \ln P_M + e_{BB}^B d \ln A_B + e_{BA}^B d \ln A_A \quad (12)$$

$$d \ln D_A^B = \eta_A^B d \ln P_B + \eta_{AB}^B d \ln P_A + \eta_{AM}^B d \ln P_M + e_{AA}^B d \ln A_A + e_{AB}^B d \ln A_B \quad (13)$$

## Equilibrium Conditions

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

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

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

Superscripts denote the region (A or B), subscripts denote products (mass-quality product M, high-quality product A, or high-quality labelled product B),  $\varepsilon$ 's are own- and cross-price elasticities of supply;  $\eta$ '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>2</sup>. Equilibrium conditions (14) - (16) contain both supply and demand market shares  $h_j^{Si}$  and  $h_j^{Di}$ , respectively<sup>3</sup>. For instance  $h_A^{DA}$  ( $h_A^{DB}$ ) is the market share of the total demand for high-quality product A within region A (B).

As we start from the idea of regional-origin labelling 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 (KINNUCAN/XIAO/HZIA 1996). There also is 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 ( $\varepsilon_{MA}^A < 0$ ,  $\varepsilon_{MB}^B < 0$ ).

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,

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

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.

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

<sup>3</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.

Parameterisation 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 characterise 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.

$$\sum_i \sum_j \Delta PS_j^i = \sum_i \sum_j \left[ p_j^i S_j^i \, d \ln P_j^i \left( 1 + 0.5 d \ln S_j^i \right) \right]. \quad (20)$$

### 3.2 Possible Model Uses

The model presented above has been designed for a combined analysis of regional-origin labelling and quality control. Accordingly, the implications of promotion expenditures for the labelled 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., for beef, 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

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4 the lower-quality market, but perhaps also allow for the possibility of trade between  
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6 markets. Other problem-specific restrictions can be easily imposed.  
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9 The general model may serve other purposes as well. The EDM model could be  
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11 applied to other relevant issues where market segmentation plays a major role. Cases  
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13 in point are strategies of country-of-origin labelling, differentiation of ecological as  
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15 opposed to conventional farming and foods, or the labelling of foods that do not  
16  
17 contain genetically modified organisms (GMOs). Some modelling approaches of  
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19 these markets have already been provided. CHUNG, ZHANG and PEEL (2004), LUSK  
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21 and ANDERSON (2004) and KINNUCAN and MYRLAND (2005) distinguish between  
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23 domestic and foreign product market segments in EDMs of vertical supply chains.  
24  
25 However, their empirical models do not include cross-price effects between the  
26  
27 labelled products. Products from ecological as opposed to conventional farming are  
28  
29 analysed in a segmented equilibrium-displacement model by HAGNER (1997) and the  
30  
31 impacts of governmental policies on the conventional and ecological markets are  
32  
33 elaborated. MOSS, SCHMITZ and SCHMITZ (2004) use a partial-equilibrium  
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35 segregation model in their study of how resistance to the introduction of genetically  
36  
37 modified (GM) crops leads to segregated markets for GM and non-GM crops. Based  
38  
39 on this model, they illustrate the welfare implications of market segregation and the  
40  
41 relevance of segregation costs. To our knowledge the studies of JAMES and ALSTON  
42  
43 (2002) and LUSK and NORWOOD (2005) are the only applications of EDMs that  
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45 explicitly incorporate differentiated product qualities.  
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53 Our model differs from these approaches in the literature in two major respects:

- 54  
55 1. The modelling framework is applied to regional-origin labelling. None of the  
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57 other modelling approaches has been used to study this issue.  
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4 2. Although individual papers go further in other respects than we do, none of the  
5 segmented-market models in the literature cover competition between high-  
6 quality products as does our model with labelled goods of regions A and B.  
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10 We now provide an application of the model to a regional-labelling and quality-  
11 control scheme. The case study is related to the German program "Certified Quality –  
12 Bavaria".  
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## 18 **4 An Empirical Application**

### 19 **4.1 Background**

20 The origin of Bavarian regional-origin labelling dates back to 1985 when the  
21 program "Quality from Bavaria" was established by the Bavarian Ministry for  
22 Nutrition, Agriculture and Forestry (for details, see  
23 HERRMANN/THOMPSON/KRISCHIK-BAUTZ 2002). After first used only for seed  
24 products and breeding cattle, a program for fed beef was introduced in October 1994,  
25 largely influenced by consumer concerns about BSE. To "re-establish and increase  
26 confidence of the strongly insecure consumer especially in Bavarian meat" was the  
27 declared objective of this program (BSTMELF 1999, p. 10). Advertising for the  
28 program occurred in various media and the Bavarian meat-controlling institution,  
29 "Bayerische Fleischpruefung e.V.", was responsible for quality and test regulations.  
30 Activities under the program were suspended in late 2000 when BSE cases were  
31 discovered in Germany.  
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53 In accordance with the EU rules on protected designations of origin, a revised  
54 program was then started in February 2002: "Certified Quality – Bavaria"  
55 (BSTMELF 2002). Participation in the program was open to producers, processors  
56 and retailers who agreed to a detailed system of quality control. This requirement is  
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binding since the regional label may only be EU-supported when a superior quality is guaranteed.

## 4.2 The Bavarian Beef Market

The general model is specified to characterise the "Certified Quality – Bavaria" 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:

$$d \ln S_M^A = \varepsilon_M^A d \ln P_M + \varepsilon_{MA}^A d \ln P_A \quad (21)$$

$$d \ln S_A^A = \varepsilon_A^A d \ln P_A + \beta_I d \ln C_A \quad (22)$$

Demand:

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

$$d \ln D_A^A = \eta_A^A d \ln P_A + \eta_{AM}^A d \ln P_M + e_{AA}^A d \ln A_A \quad (24)$$

### Rest of Germany (Region B)

Supply:

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

Demand:

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

$$d \ln D_A^B = \eta_A^B d \ln P_A + \eta_{AM}^B d \ln P_M + e_{AA}^B d \ln A_A^B \quad (27)$$

**Equilibrium Conditions:**

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

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

Again, superscripts characterise 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 unlabelled 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-labelled Bavarian beef in the high-quality market sector. Thus, we posit that the labelled 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 equation (5)

$$d \ln S_A^A = \varepsilon_A^A d \ln P_A + \beta_1 d \ln C_A,$$

where

$$\begin{aligned} \beta_1 d \ln C_A &= (\partial S_A^A / \partial C_A) (C_A / S_A^A) \cdot d C_A / C_A \\ &= (\partial S_A^A / S_A^A) \\ &= \delta. \end{aligned} \quad (30)$$

Here  $\delta$  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

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

where  $K = \frac{\delta}{\varepsilon_A^A}$  is the relative *vertical* shift in the price direction. Further, the change

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

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

and the level of the producer price is given as

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

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 realised. 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,  $P_A^2 - P_P^2 = \delta$  (or producer cost). Supply could shift leftward as producer costs ( $\delta$ ) 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

### 4.3 Parameterisation

Not all parameters of the empirical model are readily available. Nor do we have complete information on the market segments of labelled and non-labelled 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 labelling. However, there is much we do know. For instance, we have good statistical estimates of the responsiveness of labelled-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 realised 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 labelled and the non-labelled 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 and 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. With respect to the importance of cross-price effects on the welfare implications of regional-origin promotion, the cross-price elasticity of demand

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4 between high quality and "mass" quality beef is 0.1. Some recent econometric studies  
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6 based on demand systems indicate that our price and cross-price elasticities might be  
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8 at the lower end, suggesting that the price elasticity of demand for beef has increased  
9  
10 over time and might now be above unity (WILDNER 2000).

11  
12 Market simulation results can be particularly sensitive to both the advertising  
13  
14 elasticities as well as the marginal cost of participation parameter. Given an  
15  
16 advertising elasticity of 0.04 in both markets, we focus attention over the sensitivity  
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18 of the market impacts of the cost parameter ( $\delta$ ). The price and quantity change  
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20 effects are extended to producer welfare effects in each market segment.  
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### 27 **Table 1: Parameters and Elasticities of the Empirical Model**

#### 32 **4.4 Simulations**

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34 Our benchmark simulations are based on actual segmented-market data for the year  
35  
36 2003. At that time, the mass-quality price ( $P_M$ ) averaged 2.31. While high-quality  
37  
38 certified Bavarian product price premium over the mass-market product varied  
39  
40 considerably, the premium achieved could be as much as ten percent. In Bavaria, the  
41  
42 annual production of labelled and mass market beef was 107,608 and 161,413  
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44 million kgs., respectively. We assume that there exists no competing regional-quality  
45  
46 label in any state of ROG. In the ROG, no high-quality labelled beef was produced.  
47  
48 However, the production of mass-market beef was 1,160,523 kgs. Thus, the market  
49  
50 shares of mass-market beef produced in Bavaria and ROG were 12 and 88 percent,  
51  
52 respectively. Our benchmark assumes the existence of an ongoing promotion  
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54 program in Bavaria which implies that the producer cost of participation are included  
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56 in the existing supply function for the labelled product. Thus, shifts in the supply  
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58 function are due to producer contributions associated with promotional labelling. In  
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our simulations from the baseline, we explore the effects of a 100 percent increase in the promotional expenditures for Bavarian quality-labelled 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 ( $\delta = 0$ ). 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>4</sup>. Since that time, governmental support was scheduled to be reduced by 10% per year.

**Table 2: Price and Quantity Effects of Increased Advertising of High-Quality Bavarian Beef**

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 positive influence on the mass-market price. When the cost parameter  $\delta = 0$ , 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.

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<sup>4</sup> Annual Bavarian advertising expenditure on "Certified Quality – Bavaria" for beef was 0.5 million Euro in 2003. Total program expenditures of the state of Bavaria in 2003 were 2.556 million, which includes advertising expenditures for other products and program costs.

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4 Notwithstanding increased wholesale prices for the Bavarian high-quality product, as  
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6 producers are asked to share in the cost of advertising ( $\delta$  increases), net producer  
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8 price falls as the cost-induced supply function shifts leftward. Producer contributions  
9  
10 act as a wedge between wholesale and producer prices. This wedge can increase until  
11  
12 the added advertising cost exactly equals the benefits. This breakeven point is where  
13  
14 the benefit-cost parameter  $|\alpha| = 1.0$  and the increase in  $P_A$  is 8.0 percent. Different  
15  
16 changes in  $P_A$  and  $P_P$  are observed as the breakeven point ( $\alpha$ ) moves "up or down" in  
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18 Table 2.  
19  
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22  
23 Changes in producer surplus (PS) associated with the promotion of "Certified Quality  
24  
25 – Bavaria" are shown in Table 3. Clearly, the overall change in producer surplus is  
26  
27 greatest when the demand shift is entirely government subsidised  
28  
29 ( $\delta = 0$ ). However, for the profit-maximising producer, it makes sense to share in the  
30  
31 cost of advertising because positive changes in PS continue as producers contribute  
32  
33 up to a breakeven point, again where  $\alpha = 1.0$ ; that is, where the change in producer  
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35 surplus is zero. Also, producers are expected to contribute as scheduled government  
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37 subsidies decrease. The breakeven point increases when the advertising contribution  
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39 of the Bavarian producers rises.  
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**Table 3: Changes in Producer Surplus due to Increased Advertising of High-Quality Bavarian Beef (millions of )**

Welfare changes among markets also occur. Advertising of the Bavarian high-quality 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 gain in ROG is relatively greater than that in the Bavarian mass market. Since the absolute sizes of

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4 the markets differ we calculated producer-surplus changes per beef farmer. For the  
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6 participants of "Certified Quality – Bavaria" the actual number of participating beef  
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8 producers in 2003 is used to calculate PS of "label members". Of course, the change  
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10 in PS is greatest in the "no cost" situation, where  $\delta = 0$ . The last column in Table 3  
11  
12 shows the sum of the high-quality and mass-market effects for Bavaria. On a per-  
13  
14 farm basis clear gains to advertising are seen even as producers share in the cost of  
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16 advertising. Note that these are *changes* in producer surplus, so it is profitable for  
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18 producers to contribute to the advertising effort up to the point where  $\Delta PS = 0$ .  
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## 25 **5 Concluding Remarks**

26  
27 Quality signals of regionally produced products can be economically beneficial to  
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29 producers. The benefits accrued are directly related to the effectiveness to which the  
30  
31 demand for the high-quality product can be augmented with advertising, the cost  
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33 associated with the advertising effort and, of course, the basic economic structural  
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35 characteristics of the market segments under study.  
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38  
39 Policy conclusions arise from the analysis. Quality control for regional products and  
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41 regional-origin labelling are supposed to raise the income of farmers in rural areas  
42  
43 and, thus, contribute to rural development. A pre-condition is that the income effect  
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45 of rising demand outweighs that of increasing costs due to participation in the new  
46  
47 programme. These results are based on computed benefit-cost ratios of regional-  
48  
49 origin labelling from the producers' point of view. Additional analyses are needed as  
50  
51 to whether policies are successful under an extended regional objective function that  
52  
53 includes changes in consumer surplus and additional regional expenditures for the  
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55 labelling scheme. More research is necessary, too, regarding the aggregate  
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57 assessment of regional-origin labelling from the federal or national point of view.  
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4 In this paper we suggest a general economic framework that can be used to examine  
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6 problems of this nature. We illustrate this framework with an empirical examination  
7  
8 of the "Certified Quality - Bavaria" promotion program. This illustration includes  
9  
10 two regions, Bavaria and Rest of Germany (ROG), both of which produce beef for  
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12 the mass-market but only Bavaria produces the higher quality-labelled product of  
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14 pure guaranteed Bavarian origin. We allow for trade in both products between  
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16 regions. We allow for trade in both products between  
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18 regions.

19  
20 The promotion of the Bavarian labelled product in Bavaria positively influences both  
21  
22 regions and products. All market segments can gain. While clearly producer gains are  
23  
24 great when the cost of the advertising the Bavarian labelled product is financed  
25  
26 entirely by the government, it remains rational for profit-maximising producers to co-  
27  
28 finance contributions as well.

29  
30 We found our proposed analytical framework to be a flexible and easy-to-use tool to  
31  
32 simulate market behaviour in response to promoting the Bavarian quality-labelled  
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34 product. We believe it is generally applicable to examine a number of policy-related  
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36 issues in segmented commodity markets.  
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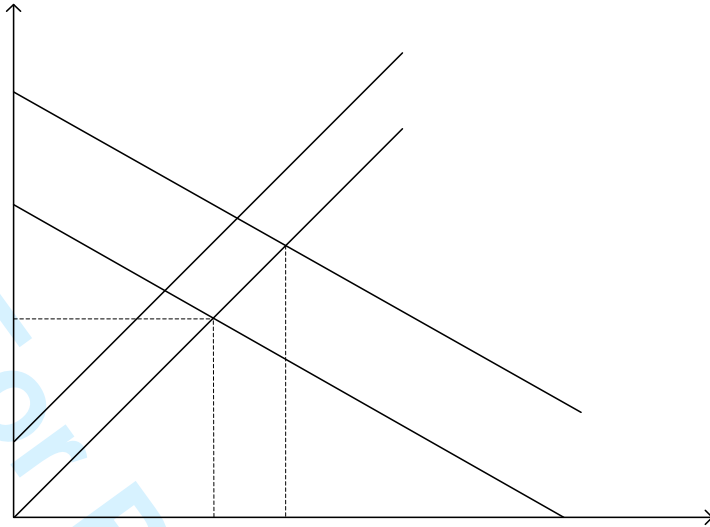
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For Peer Review

Figure 1: High-Quality Beef Market



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