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INTERREGIONAL PRICE FLEXIBILITIES FOR THE BEEF INDUSTRY

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Previous research in the area of interregional competition in the beef industry has been, in the main, concerned with finding an "optimum" solution to a mathematical programming model [1,2,3,5].

In this paper the emphasis will be on investigating the economic relationships among regions implied by an interregional competition model not on finding a single optimum solution. Of specific interest is the influence of changes in production in a region upon the fat cattle price level in all regions.

Method

In order to illustrate the concept of price flexibilities within the construct of an interregional competition model, a simplification of King and Schrader's model was used [3]. The simplified model had components of linear demand functions for each region, fixed production of beef by regions, and transportation costs of shipping beef among regions.[1/] The total transportation cost was minimized subject to the restraints that the solution be a spatial equilibrium solution. Tramel's formulation of reactive programming was utilized to obtain the solutions [4].

To develop a measure of the influence of changes in production in a region upon the prices of beef in other regions, a systematic variation of the level of production in each region was undertaken. For example, the production for the Arizona region was varied in 10 percent increments from 10 to 200 percent of its actual production. The production of the other regions was held constant at the actual levels. For each level of Arizona production a solution of the reactive programming model was generated. The information contained in the solutions included the prices resulting in each region for each level of production in the region being investigated. From this information a set of 20 regressions were run relating the price in a region to the production in Arizona. The forms of these regressions were: $\ln Y = a + b \ln X$ where Y is price, X is level of production, and b is the resulting estimate of price flexibility.

Results

The price flexibilities (defined here as the percentage change in price for a specific region resulting from a 1 percent change in production in a specific region) for all regions calculated for changes in Arizona production are displayed in Table 1. The R^2 for the regressions ranged from .86 to .92 indicating a "reasonable" degree of fit. Consistent with expectations the price flexibility for the West Coast regions, the Idaho-Utah region, Nevada, and Arizona were higher than the price flexibilities for the other regions. The price flexibilities for these six regions ranged from -.0396 to -.0326. The price flexibilities for the other regions ranged from -.0273 to -10212. It can be easily seen from Table 1 that the most important impact of changes in Arizona's fat cattle production is in the West Coast region.

The significance to producers of this type of information lies in the area of evaluating the impact of changes in the locational structure of the industry upon their own operation. Obviously, producers in the West Coast regions would consider changes in Arizona production of more importance than producers in other regions. However, for producers in Arizona to have complete information they need to know the relationship between changes in production in all regions and prices of fed beef in Arizona.

To provide information of this type the procedure described above was repeated for each of the 20 regions. The influence of changes in production in each region holding production levels constant in all other regions is presented in Table 1. From this table it can be seen that the Corn Belt, High Plains, and Texas are the production areas which have the greatest impact upon Arizona fat cattle prices for a given percentage change in production. The respective flexibilities were: -.247, -.115, and -.102, i.e., a 10 percent increase in production of fat cattle in the Corn Belt region (region 14) would result in a 2.47 percent decline in the price of cattle in Arizona other factors equal.

Table 1. Price Flexibilities

Region	Area Included	Arizona's Impact	Impact on Arizona
1	Washington-Oregon	-.034	-.036
2	Northern California	-.040	-.064
3	Southern California	-.039	-.045
4	Nevada	-.039	-.005
5	Idaho-Utah	-.033	-.039
6	Arizona	-.039	-.030
7	Montana-Wyoming	-.023	-.044
8	Colorado	-.022	-.046
9	New Mexico	-.027	-.011
10	North Dakota-South Dakota	-.022	-.056
11	Nebraska-Kansas	-.022	-.115
12	Oklahoma-Texas	-.022	-.102
13	Minnesota-Wisconsin	-.022	-.087
14	Iowa-Illinois-Missouri	-.022	-.247
15	Arkansas-Louisiana-Mississippi-Alabama	-.022	-.059
16	Michigan-Indiana-Ohio	-.022	-.072
17	Kentucky-Tennessee-West Virginia	-.022	-.061
18	Maine-New Hampshire-Vermont-New York-Connecticut-Massachusetts-Rhode Island-Pennsylvania-New Jersey-Maryland-Delaware-District of Columbia	-.021	-.075
19	Virginia-North Carolina-Georgia	-.021	-.033
20	Florida	-.021	-.012

Potential

Investigating the economic relationships among regions implied by traditional inter-regional competition models in terms of price flexibilities between regions has potential for providing information useful to producers in their long-term planning process, e.g., the information is in a form which producers can readily understand and use. In addition the relationships developed above are descriptive of the structure of the industry. Specifically, the way in which the regions are connected in terms of price determination can be measured by the set of price flexibilities. Investigation of structural change is possible by comparing the set of price flexibilities for two time periods for an industry. Measures of the isolation of a region can be developed from the set of price flexibilities generated. It is possible, for example, to classify a region as not isolated if the price flexibilities relating changes in its production to prices in other regions are of a similar magnitude.

Investigation of logical regional boundaries can be accomplished by using this method in conjunction with cluster analysis. By grouping (clustering) regions with similar price flexibilities, new and, of course, larger regions can be formed which would be expected to be homogeneous in terms of the response of prices in the region to changes in production throughout the industry. Further work utilizing current data and the concepts above is now underway.

FOOTNOTES

1/ The demand function, transportation costs, and estimates of actual production were those contained in King and Schrader [3]. Their data were used in the preliminary investigation to allow a direct comparison of the type of information generated by the two approaches.

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