# ASSESSMENT OF THE PRICE IMPACT OF THE SOUTH CAROLINA CUCUMBER MARKETING ORDER

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In 1970 a marketing order, made possible by a 1968 state enabling act, was formed for South Carolina fresh market cucumbers. This legislation is similar to current federal legislation, but South Carolina has no federal marketing order for cucumbers. Order provisions that affect price formation are the subject of this article. Price posting and adoption of statewide USDA inspection requirements are the order provisions that yield the largest and most direct price impact (S.C. Cucumber Board.)[1] The apparent goal of these provisions is higher and more stable prices.

The objective of our research is to investigate the success of the South Carolina marketing order in achieving its goal of higher and more stable fresh market cucumber prices.

A brief description of the price posting and inspection provisions is followed by information about the order's mandatory grower assessments. A model and empirical results are presented.

## PRICE POSTING, INSPECTION PROVISIONS, AND GROWER ASSESSMENTS

The price posting provision of the South Carolina Cucumber Marketing Order enables the S.C. Cucumber Board to require handlers "to file at the office of the Board a complete schedule of prices at which each handler will quote, offer for sale, or sell cucumbers during the regulated period" (S.C. Cucumber Board, p. 4). The Cucumber Board in return provides each handler with a current list of prices posted by all handlers. Growers also can obtain access to this price information. Handlers are allowed to revise their posted prices after giving at least two hours notice to the Board. The regulations do not cover cucumbers offered at auction or shipped on consignment.

Price posting probably has enhanced the price discovery process for producers by reducing the number of price changes. If we assume that South Carolina cucumber prices are determined as part of a national cucumber market which is competitive, price posting within South Carolina should reduce the frequency of South Carolina price changes but not substantially alter the price determination process. Less frequent price changes should reflect changed market conditions—mainly shifts in the supply curve—more accurately because market participants have more time and more information for making adjustments. Therefore, the dynamic price adjustment process has been altered within South Carolina by the price posting provision, and a reasonable hypothesis is that price variability is reduced for South Carolina cucumbers.

Another force is present, however, which tends to increase price variability. For example, if a series of numbers are doubled the variance is increased by a factor of four. Therefore if price posting increases the price level, the variance tends to increase. It is reasonable to hypothesize that within the limits of national price movements the average South Carolina price level for cucumbers will increase with the increased availability of price information. Inflation also increases the price variability. A relative variability measure is used to compensate for this mechanical aspect of the increased variability. Therefore, given more accurate searching out of a new equilibrium price, increased market information, and compensation for the mechanical increase in variability, reasonable hypotheses seem to be that the net effect of the order's price provision is to reduce the price variability in relation to what it would have been otherwise and to increase the price level for South Carolina cucumbers.

In addition to price posting, the marketing order requires uniform USDA inspection of all

[1]Other provisions of the order are (1) packaging, (2) labeling, (3) advertising, (4) research, (5) control of unfair competition, (6) market development, (7) educational programs, and (8) regulation of the selling period. Some or all of these provisions could possibly influence prices, but many are not functional and others are given only token attention.

cucumbers sold in South Carolina. The inspection provision effectively prevents the sale of culls, and should therefore have a direct impact on average prices if the marketing of lower cucumber grades is prevented. However, we believe the direct impact of preventing the sale of below-grade cucumbers is relatively minor for South Carolina producers. Before uniform grading and inspection most cucumbers that would be classified as culls are sorted and dumped. Probably the major price impact of mandatory inspection is the result of increased uniformity of pack. Without inspection, growers who do provide a uniform pack often do not receive maximum prices because buyers lack cucumber quality information. This indirect inspection impact will influence the price level primarily by preventing the sale of lots suspected to contain below-grade cucumbers. These mixed lots tend to drive buyers out of the region, thereby penalizing growers providing uniform lots. The penalty appears as a break in the market price. Therefore the primary impact of uniform USDA inspection is hypothesized to be a higher price level for South Carolina cucumbers. Inspection will also affect price variability as a result of the change in price level, but the adjustment to the variability mentioned before will also compensate for this change.

In the following empirical analysis we do not attempt to separate the impacts of price posting from those of implementing grading standards. Instead, the net price impact of the formation and operaton of the marketing order is investigated.

Other aspects of the marketing order that should be considered are grower assessments and inspection fees. Each grower is charged a per-bushel fee by the order. The assessments provide the funds necessary to administer and staff the order and to carry out order provisions such as advertising. The assessments have a direct impact on net prices. They have been levied by the Board since 1970 and have ranged from zero to 5 cents per bushel, the maximum assessment allowed. The assessment has generally been lower for the fall harvest than for the spring harvest. In addition to paying the grower assessments, growers must pay for the USDA inspection. As a large proportion of cucumbers were inspected prior to order formation, this order provision has an impact only through additional inspection fees. Any success by the marketing order in increasing grower prices therefore must be adjusted by the amount of the assessment and the additional inspection fees.

## MODEL

A straightforward before-and-after analysis is used to estimate the impact of the marketing order on the price level. The prices of fresh market cucumbers in South Carolina are hypothesized to depend on production in South Carolina, real income, prices of cucumbers from adjoining states sharing market seasons with South Carolina, the month within the harvest season, and the implementation of the marketing order.[2] That is

(1)   PSC = f(PROD, GNP, OP, MO, ORDER)

where

> PSC = S.C. cucumber price, by month, $/cwt
> PROD = S.C. production by season, 1000 cwt
> GNP = U.S. real gross national product, $B
> OP = other prices, $/cwt; during May-July OP = North Carolina's cucumber price and during August-November OP = Virginia's cucumber price
> MO = 1 if May, 2 if June, 3 if July, 4 if September, 5 if October, 6 if November
> ORDER = 1 after adoption of the pricing provision of the order, zero otherwise.[3]

The choice of South Carolina production by season is expected, but the other independent variables need to be justified. U. S. real gross national product is used because South Carolina cucumbers flow into the national market chain and therefore the demand is influenced by consumers in more than one region of the country. Prices from neighboring producing regions are used in lieu of national prices because of the problems of forming an appropriate national price measure and because prices in nearby states should better reflect trends that would affect the entire production region. North Carolina and Virginia are among South Carolina's major competitors during the spring and fall harvests, respectively. The month variable is included to capture the downward trend in prices observed as the harvest season draws to a close. This type linear time trend is discussed by Draper and Smith (p. 137-8). The formulation of the variable ORDER is based on the assumption that the impact of order formation occurs at one point

[2]Price flexibility developed by Houck suggests that other quantities instead of other prices should be used as an independent variable. In our application, consistent quantity data were not available for many production regions; therefore, the other price variable is used as a proxy.

[3]Various interactions and slope shifts were utilized for the season and the ORDER variables, but the formulation in equation 1 was found to reflect best the formation of the marketing order.

in time. Given the nature of the provisions of the South Carolina marketing order, this assumption is plausible. Ordinary least squares estimation of equation 1 is presented in the next section.

## EMPIRICAL RESULTS

Equation 1 was estimated by means of regression analysis. Data from 1960 to 1978 were used in the analysis. PSC values were taken from the S.C. Crop and Livestock Reporting Service, PROD and OP values from various USDA publications, and GNP values from the Commerce Department. The primary objective of the estimation was to investigate the impact of the formation of the South Carolina marketing order on the price level of cucumbers marketed in the state. The estimated equation is

$$(2) \quad PSC = 5.47 - .0083*PROD + .236*GNP +$$
$$\qquad\qquad (.002) \qquad\quad (.136)$$

$$.471*OP - .639*MO + 1.07*ORDER$$
$$(.069) \qquad (.138) \qquad (.537)$$

$R^2 = .73$ (standard errors are in parentheses).

Each estimated coefficient is significant at the 10 percent level or better, and each variable has the expected sign. The results indicate that the marketing order has had an impact of approximately $1.07 per 100 pounds on the price South Carolina producers receive for their cucumbers. To obtain this price increase, producers pay assessments of up to 10 cents per hundred weight (5 cents per bushel). In addition, USDA inspection fees must be paid on all cucumbers sold within the state. The additional inspection charge is difficult to determine because some cucumbers were inspected prior to formation of the order, but it would not negate the estimated gain. Therefore, we conclude that formation of the South Carolina marketing order for cucumbers has had a positive impact on the price level for growers.

As an additional check on the price impact of order formation, an F-test was conducted. The test compared an equation estimated with observations prior to order formation with the same equation estimated with observations covering the period before and after order formation. Equation 1 with the ORDER variable omitted was used in this analysis. The F-test is described by Johnston (p. 207). The calculated F-value with 48 and 60 degrees of freedom is 2.16. This value is significant at the 1 percent level. The implication is that order formation did have a price impact.

## PRICE VARIABILITY ANALYSIS

The hypothesis of reduced price variability was investigated by means of two measures of variability. The standard deviation and coefficient of variation are calculated for several variables for the periods before and after the formation of the order. These variables are (1) the before and after monthly prices, (2) error terms from before and after regression estimations of equation 1, i.e., without the ORDER term, (3) average before and after prices for the spring and fall crops, i.e. average seasonal prices, and (4) before and after within-season average price for South Carolina in relation to the North Carolina price during spring and in relation to the Virginia price during fall (Table 1). Both the standard deviation and coefficient of variation are presented because the hypothesized price level increase and inflation tend to inflate the standard deviation. The coefficient of variation is the standard deviation in relation to the mean, and in essence adjusts for the increase of the standard deviation caused by higher prices. Several authors discuss the use of the coefficient of variation as an appropriate measure of the relative variability in such cases (e.g., Snedecor and Cochran, p. 62-5; Sanders, Murph, and Eng, p. 84-5). The coefficient of variation declined after order formation for each of the four variables considered (Table 1). In contrast, three of the six standard deviations increased, indicating greater absolute variability (Table 1). Two of the three standard deviations that increased applied to nominal price measures whereas the third applied to the error term of an equation with a

TABLE 1. BEFORE AND AFTER S.C. CUCUMBER MARKET ORDER FORMATION COMPARISONS OF COEFFICIENTS OF VARIATION AND STANDARD DEVIATION FOR FOUR CUCUMBER PRICE-RELATED VARIABLES

| | Across Months | | Avg. w/in Spring | | Avg. w/in Fall | |
|---|---|---|---|---|---|---|
| | Std. Dev. | Coeff. Variation | Std. Dev. | Coeff. Variation | Std. Dev. | Coeff. Variation |
| I. Monthly Price | | | | | | |
| Before | 1.59 | .27 | | | | |
| After | 2.40 | .24 | | | | |
| II. Error Term (Before & after equations) | | | | | | |
| Before | 1.26 | .21 | | | | |
| After | 1.87 | .19 | | | | |
| III. Within Season Price | | | | | | |
| Before | | | 1.28 | .22 | .69 | .12 |
| After | | | 1.18 | .11 | .75 | .08 |
| IV. Within Season Relative Price | | | | | | |
| Before | | | .39 | .29 | .18 | .16 |
| After | | | .13 | .11 | .10 | .08 |

nominal price term as the dependent variable. Therefore the impact of an increased price level may well explain the increased standard deviation from before to after order formation in these three cases. Note, however, that the standard deviation of the relative price terms declined in both spring and fall. This result is expected because the impact of inflation is removed via the relative price terms. Given these considerations, we can conclude that the use of a relative variation measure such as the coefficient of variation is appropriate.

## SUMMARY AND CONCLUSIONS

We investigate the impact of a market order established in 1970 on the level and variability of South Carolina fresh market cucumber prices. The major provisions of the order that have an impact on price are price posting by handlers and uniform USDA inspection. A time series regression model that covers and accounts for periods before and after formation of the order indicates that the order did have a positive impact on the South Carolina cucumber price level.

Further analysis using the coefficient of variation as a measure of price variability indicates that order formation reduced price variability. Four variables were used to estimate before and after price variability: (1) monthly price, (2) the errors of the estimated before and after regression equations, (3) within-season price variability, and (4) within-season price variability in relation to the prices in neighboring producing regions.

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