The Potential for Intraseasonal Market Flow Management of Southeastern Sweet Potatoes*

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Abstract

The potential for a marketing order involving management of intraseasonal shipments of southeastern sweet potatoes was examined through a comparison of prices, shipments, and producers' surplus measures for the dynamic competitive equilibria case and the actual market case. The results of the study suggest that supply controls would not be beneficial, at least in the usual sense. The proper strategy would appear to be to increase rather than limit shipments of quality sweet potatoes in all seasons of the year.

Introduction

A marketing order is a self-assistance marketing tool with the purpose of perpetuating orderly marketing by agricultural producers. Orderly marketing involves remunerative collective management by producers of commodities over time, form, and/or space. This legal instrument enabling producers to engage in collective marketing activities was made possible by the Agricultural Adjustment Act of 1933 and the Agricultural Marketing Agreement Act of 1937 (Armbruster et al.; U.S. General Accounting Office).

Marketing orders are authorized only for certain commodities. Chief among them are milk,

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fresh fruits and vegetables, and nuts. Use of marketing orders for milk is widespread, while employment of marketing orders for the other commodities is largely centered in three states-- California, Florida, and Texas (Powers).

Milk marketing orders are unique in that they authorize direct price setting which may provide incentives for a more even seasonal production pattern. The other orders do not provide for the setting of prices or output directly. Rather, the influence is indirect through the management of commodity flows (Powers; Babb et al.).

Order regulations on quality, size, and import restrictions indirectly affect market supply and, therefore, can be used to positively affect prices and returns to producers. Provisions of orders such as research, market development, packaging, and standardization, if successful, influence prices and returns in a similar manner (Jesse; Knutson et al.; U.S. Department of Agriculture (1981); Price).

A major characteristic of agricultural systems is the dynamic lags between changes in market conditions and the responses to these changes (Rausser and Hockman). For example, prices and quantities may not be only a function of variables in a given time period, but may also be a function of prices and quantities in previous time periods. Moreover, when examining the potential for a marketing order, failure to consider the dynamic adjustment path may lead to biases in estimates of economic welfare (Berck and Perloff).

The purpose of this study was to empirically evaluate the potential for a marketing order to facilitate the management of intraseasonal market flows for sweet potatoes produced in the southeastern United States which encompasses Alabama, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina. This region accounts for over 80 percent of the production of sweet potatoes in the United States. Further, based on information obtained from representatives of the sweet potato commissions and the Cooperative Extension Service, there are more than 2,500 sweet potato producers and nearly 100

shippers in the southeast. Sweet potatoes are marketed via private treaty largely through brokers and direct to chain-store buyers without benefit of marketing cooperatives. Reportedly, the major marketing complaint of producers has been periods of low prices. Sweet potatoes as a commodity was the focus of this study because sweet potatoes appear to be marketed in a highly competitive environment seemingly without benefit of an orderly marketing strategy and because sweet potatoes represent a major crop which is eligible for coverage by a marketing order.

The study was carried out in two steps. First, two intraseasonal weekly shipping patterns were obtained. One pattern pertains to the actual case for southeastern sweet potatoes. The other pattern which should reflect the competitive case was the calculated path of dynamic equilibria. Second, the two cases were compared in terms of shipments, prices, and producers' surplus to determine the potential for a supply-control marketing order.

The paper is organized as follows. A dynamic econometric model used in the analysis is depicted. Empirical results follow for the two market scenarios--the actual case and the dynamic competitive equilibria case. The intraseasonal flow results are summarized by season of the year rather than weekly since shipments of sweet potatoes from the southeast occur virtually year-round. Conclusions and implications follow.

Empirical Analysis

Commodity market problems are characterized by uncertainty in climate and supply-demand conditions and, thus, by lagged reactions to price and quantity changes (Pindyck; Just; Newbery and Stiglitz). Thus, dynamic competitive equilibria may be used as a benchmark in the determination of the potential for intraseasonal management of southeastern sweet potato shipments via a marketing order. In order to compute dynamic competitive equilibria prices and quantities, an appropriately specified econometric model is required. Estimation of southeastern and aggregate U.S. supply and demand functions was based on weekly quantities and prices for sweet potatoes from early September to mid August for 1978 through 1988.

Variables used in the empirical estimation are described in Table 1.

Table 1

Definition of Variables for the Empirical Model

Variable	Description
SQ_t	Shipments of sweet potatoes from the southeastern United States in week t (100 cwt.)
SP_t	Real f.o.b. price of sweet potatoes for the southeastern United States in week t ($/100 cwt.)
UQ_t	Total U.S. production of sweet potatoes in week t (100 cwt.)
UP_t	Average real f.o.b. price of sweet potatoes for the United States in week t ($/100 cwt.)
QT_t	Production of sweet potatoes in competing regions in week t (100 cwt.)
SRI_t	Real southeastern per capita income in week t ($)
URI_t	Real U.S. per capita income in week t ($)
PB_t	Real f.o.b. price of fresh irish potatoes in week t ($/100 cwt.)

Dynamic adjustment was introduced through the assumption that shipments cannot change immediately in response to new economic conditions. Thus, the actual change in shipments in week t was a fraction of the planned change in shipments. Similarly, price changes were also assumed to reflect the partial adjustment process.

The supply and demand system was estimated encompassing inverse demand equations

which is similar in approach for a number of studies: for example, Leuthold and Hartmann; Davis and Hise; O'Rourke and Masud; Shonkwiler and Emerson; Eckstein; Seale and Shonkwiler; and Garcia et al. Estimated parameters for the simultaneous structural model for sweet potatoes are presented in Table 2. Sweet potato shipments were used for the Southeast while sweet potato production was used for competing regions and in the aggregate for the purpose of model identification. Some experimentation was conducted with lag lengths for the partial adjustment process in prices and quantities. The choice of lag lengths, which was based on knowledge of the sweet potato industry, was confirmed by goodness of fit. All of the coefficients in the model have the expected sign. Further, the coefficients of the dynamic (lagged) variables are significant at the 0.10 level or better with the exception of the coefficient for the lagged shipment variable (SQ_{t-1}) in the southeastern demand equation.

The system is stable as the eigenvalues of the fundamental dynamic equations are positive and less than one. An explanation for deriving fundamental dynamic equations can be found in Kmenta, pp. 724-726.

The number of weeks for the sweet potato season--50 weeks--was determined empirically. The starting shipping week of the season in each year was identified as the first week in that time series. The data series for sweet potatoes encompassed 489 observations. Weekly shipment and f.o.b. price data were obtained from the U.S. Department of Agriculture. Price data were deflated by the consumer price index (CPI) (1982-84 = 100). The index was obtained from the U.S. Department of Labor.

In order to estimate the aggregate supply and demand functions, total quantities for the United States were obtained by transforming weekly shipment data into weekly production data. This was necessary since the shipment data reported by the Agricultural Marketing Service did not account for total production and since weekly production data were not available (U.S. Department of Agriculture, *Agricultural Statistics*). Per capita income data were obtained from

Table 2

Coefficient Estimates and Asymptotic t-Values ( ) for the Simultaneous
Model for Sweet Potatoes

| | Two-Stage Least Squares | | | |
| | Southeast | | Aggregate | |
Variable	Supply	Demand	Supply	Demand
Constant	-776.8192 (-2.9198)	345.3564 (1.2164)	-1397.0485 (-4.0375)	447.3445 (1.2384)
SQ_t		-0.8266 (-1.3302)	3.6874 (19.4253)	
SQ_{t-1}	1.3467 (4.0056)	0.3622 (1.2319)		
SQ_{t-2}	0.8993 (2.4889)			
SP_t	0.0770 (1.3568)			
SP_{t-1}		0.7954 (17.4007)		
UQ_t	0.0869 (1.9457)			-0.1073 (-2.0243)
UQ_{t-1}			0.3177 (2.7638)	0.0576 (1.9734)
UQ_{t-2}			0.3094 (2.3608)	
UP_t			0.1647 (2.1255)	
UP_{t-1}				0.8045 (26.3745)
QT_t	-0.3196 (-1.8145)		0.2589 (1.2356)	
SRI_t		0.1226 (0.4777)		
URI_t				0.0044 (0.1513)
PB_t		0.03913 (2.0968)		0.0258 (1.3956)
$\hat{\rho}$ [a]	0.8736	-0.5672	0.6939	-0.8367

Note: Supply equations are quantity-dependent specifications, while demand equations are price-depen-
dent specifications. The variables are defined in Table 1.

[a] $\hat{\rho}$ is the sample correlation coefficient, $\hat{\rho} = \dfrac{\sum\limits_{t=2}^{T} \hat{e}_t\, \hat{e}_{t-1}}{\sum\limits_{t=1}^{T} \hat{e}_t^2}$, where $\hat{e}_t$ are residuals (Judge et al., p.

286).

the U.S. Department of Commerce and were deflated by the CPI. Real per capita income in the tth week of year r correspond to reported monthly per capita income. Southeastern per capita income was obtained from the U.S. Department of Commerce.

The results of the study are summarized in Table 3 by season rather than by week since shipping is virtually year-round. Shipments and corresponding prices by season are provided for the two market scenarios examined. In addition, producers' surplus for the year is shown for each of the market cases.

The path of dynamic equilibria for the competitive case was ascertained by solving the structural equations simultaneously for the weekly dynamic competitive equilibria values for the endogenous variables (prices and corresponding shipments). In order to solve the system, lagged values of endogenous variables were obtained from the fundamental dynamic equations, and exogenous variables were set at mean values (Brorsen et al.; LaFrance and de Gorter).

Comparison of the values for the dynamic competitive equilibria case and the actual market case shows surprising differences. Shipments were higher and prices lower, except in the fall season regarding prices, while annual producers' surplus was substantially higher--88 percent higher--for the competitive equilibria case.

According to the results of the study, southeastern sweet potato producers as a whole would be better off by increasing shipments to dynamic competitive equilibria levels in each season rather than restricting shipments. Normally, producers' surplus can be enhanced by limiting shipments in the aggregate by time period, provided the commodity in question is produced in a highly competitive environment. Such a strategy for sweet potatoes would be counterproductive according to the results of this study.

Conclusions and Implications

The potential for a marketing order involving shipment controls was examined through a comparison of prices, shipments, and producers' surplus measures for the dynamic competitive equilibria case and the actual market case. The results of the study suggest that a marketing order involving supply control would not be beneficial to southeastern sweet potato producers, at least in the usual sense. The degree to which the price and quantity values, respectively, varied one from the other with regards to the two cases examined was not expected.

The weekly supply and demand functions estimated in this analysis are linear. As a result, southeastern shipments of sweet potatoes can be in the elastic, unitary, or inelastic portion of the demand curve in any given time period. The analysis reflects southeastern shipments largely in the elastic portion of the demand curve. This is plausible with sweet potato substitution from other regions and other time periods. Given that sweet potatoes are storable, substitution from week to week is feasible.

Results to the contrary would be expected if we had used an aggregate U.S. model based on annual data. Such a model would not allow substitution between regions and across time. Thus, annual shipments would likely be in the inelastic portion of the demand curve. However, the focus of our paper was to ascertain the potential for intraseasonal market flow management for the southeastern sweet potato industry, not for the total United States.

If a supply-control marketing order were established for sweet potatoes, the appropriate marketing strategy would likely be far different from that for previously established marketing orders for other commodities. The proper strategy, given the results of this study, would be to increase rather than limit shipments of quality sweet potatoes with appropriate promotion in all seasons of the year.

Table 3

Competitive Equilibria and Actual Average Shipments and F.O.B. Prices
for Southeastern Sweet Potatoes by Season of the Year and Producers' Surplus

Season[a]	Competitive Equilibria		Actual Average	
	Shipments (SQ)	F.O.B. Price (SP)	Shipments (SQ)	F.O.B. Price (SP)
	(100 cwt)	*($/100 cwt)*	*(100 cwt)*	*($/100 cwt)*
Fall	15,398	1,694	11,650	1,653
Winter	12,749	1,694	5,937	1,871
Spring	10,830	1,742	3,529	2,126
Summer	7,567	1,749	1,059	2,070
Producers' Surplus[b]	74.3[c]		39.5[c]	

[a]Fall starts with the beginning of harvest in September and ends with the Christmas Holidays; winter encompasses January through March; spring includes April through June; and the summer shipping period begins with the end of spring and lasts about six weeks as shipments decline.

[b]Producers' surplus was computed from the structural equations in Table 2 following Gardner's formulation (p. 181).

[c]10^6 dollars.

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