THE EFFECT OF AN EMBARGO OF CALIFORNIA PEACHES

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During 1981 there was much in the news about the Medfly (Mediterranean fruit fly) infestation of California. During the summer of 1981, a USDA quarantine on produce from California was imposed by 11 states—North Carolina, Georgia, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, Tennessee, Florida, and South Carolina.

A Medfly infestation destroys the quality of fruit, especially for the fresh market. California is the leading state in the production of fresh peaches, with South Carolina a close second, and Georgia usually third. These three states account for 30–40 percent of annual total freestone production. There is a possibility that the USDA quarantine is not and would not be effective in preventing the spread of the Medfly from California, and that the only effective measure would be an embargo of California peaches.

While an embargo might be justified on the basis of the devastating damage caused by any infestation, including the Medfly, there are, implicitly at least, political reasons for proposing an embargo. Since the Southeast and California are the two primary production areas, producers in the Southeast might visualize an embargo on California production as a means of increasing the price for southeastern production.

OBJECTIVE AND PROCEDURE

This analysis estimates the effects of an embargo of California peaches, both partial and complete, on shipments, prices, and producer revenue. The partial embargo assumes that the 11 states that originally imposed a quarantine will embargo California peaches. The complete embargo assumes that no peaches can be shipped out of California. While the current embargo example is a Medfly infestation, the following analysis could apply to any similar situation in which southern peaches are exposed to threat from peaches shipped into the southern region from California. In addition, this study provides a useful starting point for investigating any embargo on domestic peach shipments.

This study does not propose nor intend to consider the changes in total welfare. The costs of an embargo of California peaches are obviously quite large to that state, and these expenses must be added to those involved with eradication programs. The costs to society resulting from a spread of the Medfly would also be great. An adequate analysis of the welfare issue would call for consideration of all California crops affected by the Medfly. The thrust of this investigation deals only with one crop, peaches, for which the two primary production areas are California and the Southeast, principally South Carolina and Georgia. The basic questions addressed are changes in shipment patterns and the resultant effects on peach producers in terms of revenue and consumer prices throughout the United States. Is there any justification, in terms of profit, for southeastern producers to ask for an embargo of California peaches, i.e., an embargo to gain some "monopoly power?"

Reactive programming, an interregional competition or spatial equilibrium technique, is used as the tool of analysis. A benchmark is first estimated, i.e., given actual shipments of peaches from various producing states and estimated demand relationships in various cities, an optimum solution is determined, given no barriers to free trade. The model was then run with California peaches embargoed in the 11 states that had a USDA quarantine in 1981, and then again with no shipment of California peaches allowed to destinations outside of the state.

The time period considered is the middle two weeks in July, when essentially every peach producing area is at peak production. The analysis was conducted, using 19 producing states and 37 market cities.

MODEL

The reactive programming model used in this analysis utilizes estimated price-dependent demand functions, point supplies, and mileage-based transfer costs. The model was originally developed to analyze changes in transportation costs, transportation technology, and production changes. For a more detailed discussion of the model, see Bauer et al.

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The data employed came from various Department of Commerce publications, i.e., *Statistical Abstract of the U.S.* and the *Survey of Current Business,* and from unpublished data furnished by the Market News Service. The period covered was 1972–76.

The demand relationship estimated for each of the 37 consuming centers is:

$$P = f(Q,P_n,I,B,T,X,Y,Z)$$

where

- P = price of fresh peaches (thousand-pound equivalents),
- Q = quantity of peaches (thousand-pound equivalents),
- P_n = population of the appropriate SMSA,
- I = per capita income in the appropriate SMSA,
- B = dummy variables for 12 biweekly periods during season,
- T = dummy variable for year (1972–1976),
- X = intercept shifters for consuming centers,
- Y = slope shifters for consuming centers,
- Z = slope shifters on income.

The appropriate demand relationship for the middle two-week period in July was used in the reactive programming model. These demand relationships were estimated by using a stepwise regression technique. More detailed results are available from the authors.

The quantities supplied were the 1973–75 average shipments from each state as provided by the Market News Service data. Transfer costs were based on mileage and were estimated with a log linear regression model, total cost as a function of mileage, and with data on particular routes in the eastern United States.

Even though the analysis was carried out with 19 suppliers and 37 market centers, the results are presented in terms of 5 aggregated supply areas and 4 aggregated consumption centers. South Carolina, Georgia, and California are maintained as separate production regions because of their importance in the industry and the potential impact of an embargo on these three states.

RESULTS-SHIPMENTS

The solution of this model yields the shipment pattern that maximizes net revenue to producers. The optimum shipment pattern results when the price in each consuming region exceeds the price in each producing region by only the transfer cost. Thus, the reactive programming algorithm allocates the supplies of producing regions among alternative consuming centers in a manner consistent with spatial equilibrium theory.

Table 1 presents the results of the three scenarios analyzed, i.e., benchmark and partial and complete embargos. With the complete embargo, Georgia shifts shipments from the Texas-Oklahoma-Louisiana area and from the Midwest to western consumption centers. South Carolina production is shifted from the Northeast to midwestern consumption centers. The other southeastern states, primarily those in the south central region, shift shipments from the Northeast to the Texas-Oklahoma-Louisiana consumption centers. The other states, whose largest producers are New Jersey and Pennsylvania, show no change in shipment patterns. These states account for only about 8 percent of the total production included in this analysis.

TABLE 1. Percentage Distribution of Shipments to Four Aggregated Consumption Areas from Five Aggregated Production Areas, Benchmark, Partial and Complete Embargoes

Production Areas	Scenario[a]	Consumption Areas: Northeast (%)	Texas-Oklahoma-Louisiana (%)	Midwest (%)	West (%)
California	I	0	14.2 (2,412.0)[b]	15.0 (2,533.5)[b]	70.8 (12,314.0)[b]
	II	0	0	27.9	72.1
	III	0	0	0	100.0
GA.	I	0	0	100.0 (5,331.5)[b]	0
	II	0	27.3	72.7	0
	III	0	18.0	51.4	30.6
S.C.	I	77.5 (14,521.5)[b]	0	22.5 (4,212.7)[b]	0
	II	80.9	0	19.1	0
	III	62.9	0	37.1	0
Other Southeast	I	39.6 (2,367.8)[b]	31.6 (1,885.3)[b]	28.8 (1,714.4)[b]	0
	II	57.8	42.2	0	0
	III	31.0	42.2	26.1	.7
Other	I	57.4 (2,314.2)[b]	0	34.6 (1,394.6)[b]	8.0 (323.0)[b]
	II	57.4	0	34.6	8.0
	III	57.4	0	34.6	8.0
Total	I	37.7 (19,203.5)[b]	8.4 (4,297.3)[b]	29.8 (15,186.7)[b]	24.1 (12,314.0)[b]
	II	37.7	7.8	30.0	24.6
	III	31.3	6.8	24.8	37.1

[a] I benchmark analysis
II partial embargo
III complete embargo
[b]Benchmark shipments in 1,000 lbs.

Under the partial embargo, California increases shipments to the Midwest, essentially at the expense of South Carolina. Shipments from South Carolina go to the Texas-Oklahoma-Louisiana market from which California production is banned.

The effect of both the partial and complete embargoes is, obviously, to increase the proportion of western production staying in the West, with shipments in the remainder of the country altered to compensate the midwestern and Texas-Oklahoma-Louisiana markets for loss of California peaches. The net result is a relatively small reduction in shipments to the three aggregated consumption areas outside the West, with the exception of a very slight increase in shipments to the Midwest under the partial embargo.

RESULTS-PRODUCER REVENUE

Of primary concern to peach producers is the embargo's impact on revenue. Table 2 shows the percentage changes in revenue for partial and complete embargoes when compared to the free trade benchmark.

The effect of the partial embargo is minimal, even on California producers. The partial embargo, primarily by southeastern states, does not effect California markets because there is no significant overlap of markets served by California and southeastern producers.

As would be expected, the complete embargo does have a large adverse effect on California producers; their revenue, as estimated by the model, is reduced by 22 percent. The effect on other producing areas is much less. The increase in producer revenue in the Southeast is only about 3.5 percent.

The estimated increase in revenue for the Southeast is low, but, given the typical trade pattern for peaches, is understandable. Estimates in Table 1 indicate that the Midwest is the only area where there is significant competition between fruit from California and the Southeast. Actual shipments in 1979 bear this out; 20.7 percent of total shipments from California were to midwestern markets, 16.5 percent to southeastern cities, and only 4.6 percent to eastern markets. When California is removed from these markets, the Southeast attempts to move in, but the quantities involved are not sufficient to raise prices significantly, net of increased transportation costs; therefore, there is no substantial increase in revenue.

RESULTS-CONSUMER PRICES

Table 3 presents changes in consumer prices, relative to the benchmark analysis for selected cities. The partial embargo results in price changes of relatively small magnitude because the states that embargo California fruit do not receive a very large quantity under normal circumstances. The complete embargo results in substantial decreases in prices for California consumers because producers can ship only within California. Cities depending heavily on California production, Denver and Seattle, face price increases reflecting higher total transportation costs for peaches shipped from more distant points in the Southeast. Price changes in other cities are relatively small.

TABLE 2. Estimated Changes in Producer Revenue Partial and Complete Embargo Versus Benchmark Analysis, Five Producing Areas

Production region	Changes in producer revenue from benchmark	
	Partial embargo	Complete embargo
	(%)	(%)
California	-0.4	-22.1
GA.	0	+3.5
S.C.	0	+3.0
Other Southeast	+0.6	+3.6
Other	-0.1	+3.5
Total	-0.1	-4.6

TABLE 3. Estimated Percentage Changes in Consumer Prices, Partial and Complete Embargo Versus Benchmark Analysis, 10 Selected Cities

City	Changes in consumer price from benchmark	
	Partial embargo	Complete embargo
	(%)	(%)
Boston	0	+2.5
Chicago	+0.3	+3.0
Dallas	+0.8	+3.7
Denver	-0.4	+10.7
Los Angeles	-0.4	-18.8
New Orleans	-3.7	-0.8
New York	0	+2.5
Pittsburgh	0	+2.6
San Francisco	-0.4	-20.7
Seattle	-0.4	+8.5

CONCLUSION

The economic effects of either a complete or partial embargo of California peaches on producer revenue and consumer prices outside of California are not great. There is not much overlap in shipments of peaches from California and the Southeast, the two largest fresh-peach producing areas. If California lost its market because of an embargo, the increase in revenue to southeastern producers would be relatively small in view of the increased transportation costs necessary to reach those markets formerly supplied by California production.

The incentive assumed for the embargoes investigated in this paper was a Medfly infestation, but the results are not this restrictive. The results reported here would apply to any embargo applied against California peaches. It is expected that reasons to consider an interstate embargo of

fresh peaches, or, for that matter, any produce, would result only from a disease or insect situation similar to a Medfly infestation.

While the focus here has been primarily on the effects on southeastern producers, the effects of a complete embargo on California producers are obviously devastating. As mentioned previously, this study did not attempt to measure total welfare effects. That would require estimation of all economic costs and benefits, with consideration given to the effects of a spreading infestation of the Medfly.

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