Marketing equilibriums for the United States egg industry under alternative levels of production

MARKETING EQUILIBRIUMS FOR THE UNITED STATES EGG INDUSTRY UNDER ALTERNATIVE LEVELS OF PRODUCTION

by

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ABSTRACT

During 1966 high egg prices were accompanied by production increases. By the end of 1967, egg prices were low and unprofitable. The United States egg industry viewed the problem as overproduction. Low prices and overproduction were especially prominent in southern California.

The intent of this thesis is to utilize a reactive programming model for examining prices and trade flows under alternate levels of egg production. Reactive programming is an algorithm which determines spatial equilibriums by combining linear programming and equations which describe functional relationships of the markets. Price and trade flows are investigated for production alternatives for the U. S. as a whole, Southern surplus regions, southern California, and Southwestern and Western deficit regions.

Optimum solutions indicated that the large egg deficits in the Northeastern regions were more efficiently filled by the South and Midwest. Markets offering highest net returns for southern California were the egg deficits in the Western regions, Texas, and Oklahoma.

Results under production alternatives showed that if the entire U. S. increased production, prices would have decreased proportionally more and total revenue would have declined. When production was increased for one region or a segment of the U. S., producers added to

total revenue by increasing production. This occurred in both deficit regions and surplus regions.

CHAPTER I

INTRODUCTION

The United States egg industry has been characterized by fluctuating egg prices. Profitable prices have lead to flock expansion and overproduction which, in turn, has produced low unprofitable prices. During the first half of 1966, high egg prices were accompanied by sharp increases in egg production. As supplies increased, prices started to decline in the latter part of 1966 and the first part of 1967. Production continued to increase because of the imperfect knowledge, the efficiencies of large scale operations, and the gains in technology. The high level of production in the face of stable demand brought the farm price to a decade low by the end of 1967 (Table 1). When production was reduced in 1968, farm prices began to increase.

The price effects of production changes are dependent on the characteristics of the demand for eggs. One important characteristic is the price inelasticity of demand for eggs (Gerra 1959, pp. 81-84). The inelastic demand for eggs means that when production increases, prices decline proportionally more. Consequently, total revenue for the egg industry declines (Table 1). Even though revenue variations tend to be offset from year to year, production increases in the face

Table 1. United States Egg Production, Farm Price, and Cash Receipts.

Year	Total U.S. Production[a]	Farm Price Per Dozen[a]	Total Cash Receipts[b]
	(Millions of Dozen)	(Cents)	(Millions of Dollars)
1964	5,434.5	33.8	1,769.6
1965	5,474.3	33.7	1,788.2
1966	5,540.3	39.1	2,114.4
1967	5,835.9	31.2	1,781.1
1968	5,777.2	34.0	1,922.0

[a]Poultry and Egg Situation, Economic Research Service, U.S.D.A., June 11, 1969, p. 8.

[b]Farm Income, State Estimates 1949-1968, Economic Research Service, U.S.D.A., 1968 Supplement, p. 85.

of an inelastic demand intensify and sustain the down pressure on returns, particularly those of smaller producers (Rogers and Bluestone 1967, p. 9).

The demand for eggs is also characterized by declining per capita egg consumption (Table 2). This decline in demand has offset gains of population growth, intensifying the price impacts associated with production increases. An exception did occur in 1967 when egg production gains and low prices resulted in the first substantial increase in per capita consumption in 15 years (Poultry and Egg Situation November 1967, p. 4).

The low prices and return variations have motivated parts of the egg industry to take the initiative in solving the production problem. The desired effect would be to vary prices by controlling production.

United Egg Producers (U.E.P.), a national egg marketing cooperative, has attempted to control overproduction by restricting credit to egg producers who want to expand, but who have no new markets for the increase. U.E.P. believes that this would help stabilize the egg industry by eliminating the traditional "boom or bust" cycles of the past (A Credit Policy For the Egg Industry 1969, p. 1).

Regionally, the price and return variations have been especially critical in southern California, a surplus area, because of their distance from large egg deficit regions. The Midwest and the South have also been surplus regions, but they are closer to the large deficit regions. As a state, California was first in 1968 egg production, but

Table 2. United States Per Capita Consumption of Shell Eggs, Processed Eggs, and Total Eggs, 1964-68[a].

Year	Shell Eggs	Processed Eggs	Total Eggs	Per Cent Change From Previous Year
	Number	Number	Number	
1964	287	31	318	+.3
1965	285	29	314	-1.3
1966	283	30	313	-.3
1967	289	34	323	+3.2
1968	289	31	320	-1.0

[a]Poultry and Egg Situation, Economic Research Service, U.S.D.A., June 11, 1969, p. 19.

with a farm price 5.5 cents below the U. S. average (Table 3). The California producers have spent over two million dollars trying to remove surplus eggs, but the surpluses have continued to grow (Olson 1969, p. 28).

Some producers in California have considered an egg marketing order to reduce price depressing egg surpluses (Pacific Poultryman March 1969, p. 38). This proposal was as follows:

1. Mandatory registration of all flocks and egg handlers.
2. Information gathering and evaluation.
3. Early kill program of fowl.
4. Check-off for financing.
5. Pooling of surplus eggs.
6. Promotion.

Provisions for quantity limitations and pooling surplus eggs would probably not be included in the proposal.

Southwestern Egg Producers (SWEP), a major egg marketing cooperative in southern California and Arizona, has tried to remove the surplus table eggs from the market and bring production in line with available markets through a production or marketing base system. SWEP was successful during the favorable egg price levels of 1966 and during the first quarter of 1967, but depressed prices afterward became very costly in surplus removal for those who had expanded as well as for those who had not. Robert L. McDonald, SWEP general manager, has emphasized that the depressed farm prices are "influenced by our excess production and that Los Angeles housewives would be willing to

Table 3. Leading States In Egg Production 1968.

State	Production[a]	Farm Price[a]
	(Millions)	Cents Per Dozen
California	8.287	28.4
Georgia	4.992	42.1
Arkansas	3.298	37.8
Pennsylvania	3.149	37.0
Iowa	3.094	24.2
North Carolina	3.034	39.3
Indiana	2.934	31.2
Texas	2.930	39.6
Alabama	2.659	38.6
Mississippi	2.572	40.6

[a]California Egg and Poultry, California Department of Agriculture, Division of Marketing Services, July 1969, p. 11.

pay just as much for eggs as paid by housewives in New York City (Pacific Poultryman June 1969, p. 16)."

Southern California appears to have the most unfavorable position of all the egg surplus regions with production increasing within the region as well as threats of increased production in its adjacent egg markets of Arizona, Colorado, and Texas. A model was developed in this thesis that would indicate the direction of the price impacts and trade flows for alternate levels of production facing producers in southern California and adjacent egg markets. In addition, effects were indicated for other regional producers in the egg industry.

Purpose and Objectives

The purpose of this investigation was to estimate regional equilibrium egg prices and interregional egg shipments under alternate levels of production. Reactive programming was the analytical device used to obtain the equilibrium prices and trade flows. The program required transportation costs between all regions, regional demand functions, and predetermined egg supplies for each region. The output was a spatial equilibrium solution that simultaneously determined the maximum net price (net of transportation cost per dozen) for each production region by equating egg supply and demand through interregional trade.

An equilibrium was determined using 1968 data and the resulting equilibrium prices were compared to Bureau of Labor Statistics prices to evaluate the model's capability of duplicating reality. Comparisons of interregional shipments were not made because actual trade flows

were unavailable. Equilibrium prices under simulated production alternatives were compared to the actual prices and the 1968 equilibrium prices to measure the price impacts of changes in egg production. Trade flows were examined under each simulated production alternative.

Production alternatives were simulated for the United States as a whole, then for the Southern, Western, and Pacific regions. The Southern and Pacific regions have emerged as surplus producing areas challenging the Midwest states as sources for egg deficit states (Rogers and Voss 1969, p. 4). The South has been supplying Northeastern deficits and the Pacific has been filling the Western deficits. The major surplus region in the Pacific, southern California, was of primary concern along with the adjacent Western deficit regions.

Review of Literature

Previous spatial equilibrium analyses of the United States egg industry have utilized either the transportation model of linear programming or the reactive programming model. The basic transportation model was designed to minimize the total cost of transferring a specified amount of goods from each of several supply points to each of several consumer centers (King 1963, p. 47). Reactive programming was designed to obtain solutions to spatial equilibrium problems by maximizing net returns to each of several shippers (King 1963, p. 49). Unlike transportation models, demand equations were incorporated into the mathematical process.

Transportation Models

Judge studied the interregional movement of eggs by developing a spatial equilibrium of the United States egg Market (Judge 1956). A transportation model was used to develop the trade equilibrium. The problem divided the United States into 12 contiguous egg trading regions each separated by transportation cost. Egg supply, population, and disposable income were predetermined variables in each region. With the predetermined variable, market demand relationships, and transportation costs, Judge's model would determine equilibrium prices, consumption, and the trade flows.

The demand equation, $Y = -.276X_1 + .0198X_2 + 137.85$, was used to estimate each regional equilibrium retail price. In the equation, Y equaled United States average retail price per dozen eggs, X_1 equaled United States per capita egg consumption, and X_2 equaled United States per capita disposable income. Judge used 1950 supply and income situations in this equation.

The first case analyzed was a "no trade" situation which was used as a guide in measuring the geographical egg flows and regional prices. Prices ranged from a low of 5.66 cents a dozen to 2.09 dollars a dozen. The second analysis yielded an equilibrium price which varied spatially by the cost of transportation. Optimum trade flows were determined by the transportation algorithm. The West North Central and Northern plain states were exporters while the Pacific area, including California, was an importer of eggs.

Alternative sets of equilibriums and solutions were determined from postulated changes in transportation costs, price and income

elasticities and egg supplies. The change in egg supplies was a 9.5 percent increase which resulted in a 20 percent decline in retail prices. The price change caused a 13.6 percent decrease in revenue relative to 1950 supply conditions.

The Judge analysis has become outdated because of shifts in regional production areas. The level of aggregation, using 12 regions, limits the applicability of the results. Judge's model or problem is now amendable to solution by reactive programming which has the potential to provide more detailed and realistic situations.

Stemberger used a transportation model to deal with the general problem of egg equilibriums among spatially separated markets (Stemberger 1959). He concentrated on the locational advantages of the North Carolina egg industry. The locational advantages were examined by ordering markets in terms of net prices to North Carolina producers.

The study disaggregated the United States into 88 trading areas. Production and consumption were estimated for each area from 1954 statistics. A transportation equation, $Y = 70.2242 + .02142\ X - .0000030829\ X^2$, was developed through regression analysis. In the equation, Y equaled transportation costs in cents per dozen and X equaled distance in miles. This regression explained 90.3 percent of all rate variation in the sample.

The optimum solution for 1954 situations indicated that North Carolina's best markets were in the Southeastern cities. North Carolina's best markets were in the Northern Atlantic seaboard cities when the Southeast was assumed self-sufficient. In all cases, North

Carolina was in competition with Iowa and Illinois; however, no region enjoyed a large locational advantage. These optimum solutions in Stemberger's analysis have been outdated by the changes in surplus regions.

Reactive Programming Models

Seale used reactive programming to develop equilibrium prices and egg flows in the United States for an average week in 1958-60 and for a projected average week in 1970 (Seale 1964). His purpose was to develop guidelines for orderly growth in the egg industry. Weekly supply estimates, demand estimates, and transportation costs were developed for 40 egg marketing areas. Equilibrium prices and trade flows were developed from this data by reactive programming.

The regional supply estimates were determined by subtracting hatching eggs from the total production. Demand equations for each region were defined with three basic parts; (1) quantity consumed (2) prices paid for the quantity consumed, and (3) changes in quantity consumed in response to price changes.

This demand equation was expressed as $\log_e$ price = $\log_e$ a + (-1.81818) $\log_e$ quantity demanded. Price flexibility was estimated as -1.81818 from a price elasticity of demand of -.55. Log_e was solved by estimating regional prices and quantity demanded.

Regression analysis was used to develop a transportation function. The equation, cost per truckload = \$107.21 = \$.419 (air miles), was developed using data supplied by a transportation consultant.

The equilibrium situation under 1958-60 conditions showed Iowa and adjacent areas to have the heaviest concentration of surplus eggs. The Northeastern and Southwestern regions were major deficit areas. Equilibrium flows were from the surplus regions to the Northeast and Southwest.

Seale projected egg supplies, demand equations and transportation costs to 1970. The 1970 projection was characterized by high prices in the Northeast, Florida, the Southwest, Oregon, and Montana. Low prices were predominate in Iowa and adjacent states, the South, and California. Egg flows were the same as the 1958-60 equilibrium, except that Southern states were supplying areas formerly supplied by the Midwest.

Seale concluded that locational advantages in the table egg industry had been virtually eliminated by technical advances in transportation. He concluded that future locational advantages in the United States egg industry would depend upon technology and costs of production.

Wilkins followed the methodology of Seale in developing a spatial equilibrium for the United States egg industry under pure competition (Wilkins 1968). His primary purpose was to provide Southwestern Egg Producers (SWEP) with a guideline to evaluate production policies. The objectives were to define the effects of production changes on prices in the southern California region.

In Wilkins's study, 1965 was the base year. There were 21 egg marketing regions in the United States. Egg supplies, demand

equations, and transportation rates were developed and processed through the reactive program. The solution indicated that the Northeast deficits were filled from the South and the Midwest. Western deficits were filled from northern and southern California and Washington.

Six simulated changes in egg production were examined with regional price impacts recorded for each change. Egg surpluses continued to move to the higher price deficit areas. If SWEP had reduced production 25 percent and all other regions remained at 1965 levels, there would have been a 14 percent increase in the price in southern California and Arizona. This would have been a 2.1 percent decrease in the United States production resulting in a 6.0 percent price increase. The other alternative levels of production were processed with the same results, production increases causing price decreases and vice versa.

Wilkins's study did not fully explain the implications of the price and production changes. The simulated production changes were in the wrong direction as SWEP actually increased production 25 percent. This thesis will attempt to more fully explain the implications by using Seale's and Wilkins's methodology to analyze solutions determined by reactive programming. Of the two studies, Wilkins's thesis is the most important because this thesis concentrates on the same production areas, southern California and Arizona.

CHAPTER II

FORMULATION OF THE MODEL

The framework of the model used in this investigation is presented in this chapter. Three basic parts are included in the discussion. The first part describes reactive programming and its capabilities. The theory and assumptions involved in reactive programming for this investigation are discussed next. The procedure of data collection is examined in the last part.

Reactive Programming

A reactive programming model is defined as a means of obtaining equilibrium flows of a commodity between areas with given transportation cost functions, given demand schedules, and given supply schedules (Seale and Tramel 1959, p. 1012). It is a complex algorithm that was developed by extending the transportation model. The algorithm has the capability of handling spatial equilibrium problems where demand functions have uniform slopes and supplies are predetermined, where demand functions have different slopes and supplies are predetermined, where demand and supply functions have different slopes, and where demand and supply functions have governmental or resource limitations. Problems of multiple time periods or multiple products can also be solved in combination with any of the previous demand and supply functions.

The only restriction on the forms of the functions is that they must be logical in the economic sense (King 1963, p. 48).

This investigation utilized reactive programming techniques that would solve spatial equilibriums under conditions of perfect competition or where demand functions in each region had uniform slopes while supplies were fixed or predetermined. The demand functions and fixed supplies were combined with transportation costs into the reactive program model and processed through a computer for market equilibriums.

Theory of Reactive Programming Under Perfect Competition

The basic principles of a two-regional competitive spatial equilibrium are applicable to reactive programming solutions of a purely competitive market. A uniform price over the area under consideration plus or minus any transportation and handling charges between the buyer and seller is the necessary condition for a spatial equilibrium in a perfect market (Judge and Wallace 1959, pp. 804-5). This is illustrated in Figure 1.

Fixed supplies are represented by S_1 and S_2, and D_1 and D_2 depict linear demand schedules for the two regions. Under no trade conditions, Region 1 would consume quantity A of eggs at price P_1°, Region 2 would consume B quantity of eggs at price P_2°.

Transportation cost between the two regions is C. A joint equilibrium would be established at the intersection of ES_1 and ES_2. ES_1 represents excess supply in Region 1 and ES_2 represents excess demand

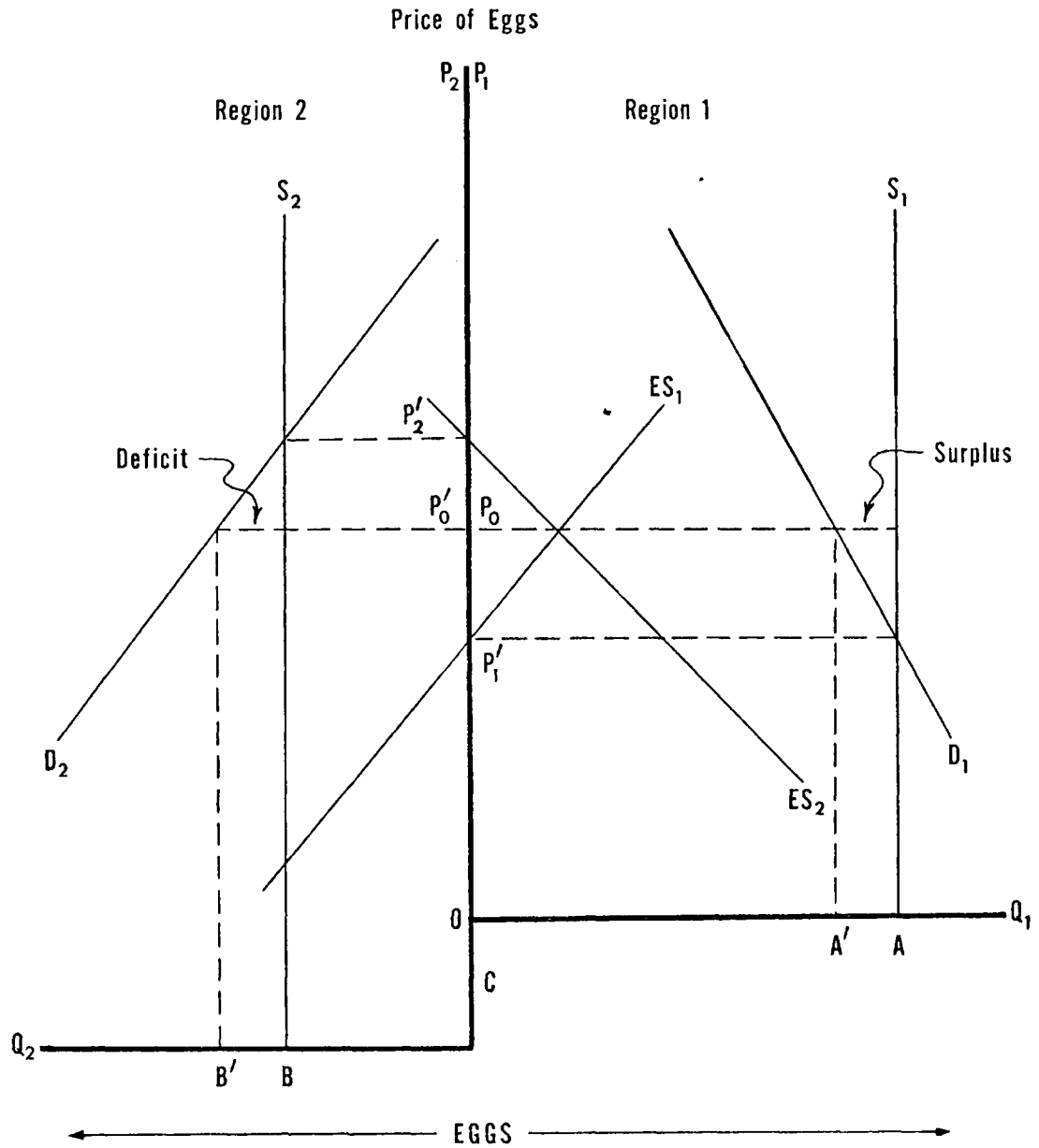

Figure 1. Two-Region Spatial Equilibrium.

in Region 2. (Note that the transportation cost C is accounted for in the horizontal axis so that $P_0' = P_0 + C$ and $P_0' > P_0$.)

Region 1 decreases consumption by $A - A'$ and Region 2 increases consumption to B'; $A' + B' = A + B$ thus $A - A' = B' - B$. Thus, knowledge of the demand and supply schedules as well as the transportation costs permits the determination of regional production, prices, consumption, and the traded amount. The total transportation costs can be estimated by multiplying C times either $B' - B$ or $A - A'$.

Various alternatives can occur. If the price differential $P_1' - P_2'$ is less than C, there would be no movement of the product between regions. Also, if the price differential is equal to the transportation cost, either region would be indifferent to shipping a unit of product.

This explains a simple two region case. Assuming N regions, the reactive programming principles under perfect competition can be examined using the simple case as a basis.

Reactive programming simultaneously determines the equilibrium levels of shipments and demand for N regions. Each region is considered as a shipper. The demand function for each region is solved to establish a series of gross prices. Transportation costs are deducted to obtain a series of net prices. The shipper allocates supplies to each region which offers the highest net prices. Usually, the shipper supplies the demand in its region and ships any surpluses to regions which have deficit egg supplies or excess demand. This allocation is performed for each shipper with each making the most profitable allocation. The shippers who have not allocated their supplies react after

the other shipper has allocated his supplies and search out the next best market. (This is why "reactive" is the name of the program.) When it is not profitable for any shipper to reallocate its supplies, an equilibrium is obtained. At times, the net prices can be equal in several different regions. In this case shippers would be indifferent with respect to the destination of shipments.

Maximization of net prices is the objective of the program. This has a companion problem or dual that minimizes total transportation costs. The total transfer cost is minimized thus one of the conditions for an interregional equilibrium is met. Given perfect competition, the net price is marginal revenue and it is maximized for each shipper. When shippers supply multiple outlets, the net prices are equated. After an equilibrium is reached, any shipment change will reduce the net returns to the shipper making the change, thus there is no incentive for reallocation. The equilibrium solution means that the net revenue to each of the individual shippers contributing to the available supplies at the supply points has been maximized.

The maximization of net revenue or net price under conditions of perfect competition requires some basic assumptions that simplify the model and make the data conform to the requirements of the model. These assumptions are as follows:

1. The U. S. egg industry operates under perfect competition with the accompanied conditions of perfect knowledge of all prices, and the supply and demand situations.

2. There are no government restrictions on interstate trade of eggs.

3. All processed eggs are considered to be in shell egg equivalents. All eggs are homogenous, therefore, no quality differences exist.

4. Egg shipments are made to or from one point in the region. This point is called the trade city.

5. Consumers are indifferent to the source of their eggs.

6. All eggs are produced and consumed in the same time period. Eggs are not stored.

7. Per capita consumption is equal for all regions.

8. Transportation costs vary directly with highway mileage and are independent of volume and direction.

9. Net retail prices include all marketing costs except transportation.

10. Retail prices are uniform for an entire region.

Procedure

The data was obtained from secondary sources and from a transportation consultant for the base year of 1968. Production and consumption were converted to weekly averages in the base year. The main problem with the data was that certain statistics were not available for each individual state.

Trade Regions

There were 44 trading regions in the model, 42 in the continental United States together with Hawaii and Alaska. These were defined by state lines except for six regions.

The New England states were divided into two regions. Maine and New Hampshire were combined because of their egg surplus situation and the small transportation costs within this supply area. Portland,

Maine was the regional trade city. The other New England region represented egg deficit states. Transportation costs within the area were small. This region included Vermont, Massachusetts, Rhode Island, and Connecticut with Boston as the trade city.

The egg deficit states, New York, Pennsylvania, and New Jersey were combined as one region. New York City was the supply point from which intra-regional egg shipments could be made at a small cost. Delaware, Maryland, and the District of Columbia were also egg deficit areas that were considered as one region. Baltimore was the trade city.

California was divided into two regions according to Rand McNally Commercial Atlas and Marketing Guide because southern California ships towards the Southeast while northern California ships towards the North and Northeast. Los Angeles and San Francisco were the trade cities.

The main consideration in selecting the trade regions was to represent actual interstate egg trade. Trade cities were selected for each region according to the Atlas (Table 4). Trade cities shipped or received all eggs for the region represented.

Regional population was obtained from the Atlas in order that egg consumption could be estimated. The figures were for 1968 and were combined in the cases of multiple state regions (Table 4).

Production

Regional egg production was obtained from the USDA publication Chickens and Eggs. For the multiple state regions, the state totals

Table 4. Trade Cities and Population[a].

	Trade City	Population
1.	Portland, Maine	1,676,000
2.	Indianapolis, Indiana	5,084,000
3.	Minneapolis, Minnesota	3,632,000
4.	Des Moines, Iowa	2,745,000
5.	Fargo, North Dakota	663,000
6.	Sioux Falls, South Dakota	670,000
7.	Omaha, Nebraska	1,477,000
8.	Wichita, Kansas	2,323,000
9.	Charlotte, North Carolina	5,114,000
10.	Columbia, South Carolina	2,640,000
11.	Atlanta, Georgia	4,606,000
12.	Miami, Florida	6,216,000
13.	Montgomery, Alabama	3,577,000
14.	Jackson, Mississippi	2,367,000
15.	Little Rock, Arkansas	1,982,000
16.	Los Angeles, California	11,867,000
17.	San Francisco, California	7,874,000
18.	Boston, Massachusetts	9,831,000
19.	New York, New York	36,991,000
20.	Cleveland, Ohio	10,614,000
21.	Chicago, Illinois	11,038,000
22.	Detroit, Michigan	8,790,000

Table 4. (Continued).

23.	Milwaukee, Wisconsin	4,269,000
24.	St. Louis, Missouri	4,665,000
25.	Baltimore, Maryland	5,142,000
26.	Norfolk, Virginia	4,648,000
27.	Charleston, West Virginia	1,791,000
28.	Louisville, Kentucky	3,205,000
29.	Memphis, Tennessee	3,933,000
30.	New Orleans, Louisiana	3,738,000
31.	Oklahoma City, Oklahoma	2,539,000
32.	Dallas, Texas	11,064,000
33.	Great Falls, Montana	700,000
34.	Boise City, Idaho	702,000
35.	Cheyenne, Wyoming	314,000
36.	Denver, Colorado	2,025,000
37.	Albuquerque, New Mexico	1,008,000
38.	Phoenix, Arizona	1,708,000
39.	Salt Lake City, Utah	1,048,000
40.	Las Vegas, Nevada	465,000
41.	Portland, Oregon	2,043,000
42.	Seattle, Washington	3,190,000
43.	Anchorage, Alaska	281,000
44.	Honolulu, Hawaii	775,000
	Total	201,000,000

[a]Rand McNally Commercial Atlas and Marketing Guide, 100th ed. Chicago, 1969.

were combined. Production for northern and southern California was provided by the California Agricultural Extension Service.

The number of eggs produced for consumption was obtained by subtracting hatching eggs from total production. Figures were not available for each state's hatching eggs, therefore, the total number of hatching eggs was allocated to the states in proportion to the number of chickens raised. All eggs were considered to be shell eggs.

Eggs produced for consumption were converted to truckload lots of 18,000 dozen or 600 cases. These lots were divided into a weekly production average for 1968. Regional egg production, consumption, deficits or surpluses are shown in Table 5.

Consumption

Regional population was multiplied by per capita egg consumption to obtain total regional consumption. Per capita consumption was obtained from the USDA publication Poultry and Egg Situation. It was 320 eggs, but was changed to 323.15 eggs in order that total consumption would equal total production. This increase accounted for eggs that were stored, exported and those sold for overseas shipment by government agencies.

Total consumption for multiple state regions was a summation of state consumption. Consumption data was expressed in truckloads for an average week in 1968 (Table 5). It was the same as the production data, 18,000 dozen or 600 cases per truckload.

Table 5. Production, Consumption, Surplus, and Deficit by State in Truckloads for An Average Week 1968.

Region	Trade City	Production	Consumption	Surplus or Deficit
1	Portland, Me.	132.4	48.2	84.1
2	Indianapolis	254.5	146.3	108.2
3	Minneapolis	198.8	104.5	94.3
4	Des Moines	273.1	78.9	194.1
5	Fargo	24.3	19.1	5.2
6	Sioux Falls	99.1	19.3	79.8
7	Omaha	99.7	42.5	57.2
8	Wichita	78.7	66.8	11.9
9	Charlotte	235.2	147.1	88.1
10	Columbia	102.2	75.9	26.3
11	Atlanta	381.9	132.5	249.4
12	Miami	204.9	178.8	26.1
13	Montgomery	192.5	103.1	89.4
14	Jackson	203.3	68.1	135.2
15	Little Rock	242.2	57.0	185.2
16	Los Angeles	468.5	341.4	127.1
17	San Francisco	252.9	226.5	26.4
18	Boston	133.6	282.8	-149.2
19	New York	564.8	1,064.2	-499.4
20	Cleveland	193.2	305.4	-112.2
21	Chicago	162.8	317.6	-154.8
22	Detroit	134.0	252.9	-118.9

Table 5. (Continued).

23	Milwaukee	109.6	122.8	-13.2
24	St. Louis	115.9	134.2	-18.3
25	Baltimore	9.2	147.9	-138.7
26	Norfolk	91.3	133.7	-42.4
27	Charleston	27.2	51.5	-24.3
28	Louisville	61.5	92.2	-30.7
29	Memphis	99.4	113.2	-13.8
30	New Orleans	67.3	107.5	-40.2
31	Oklahoma City	45.9	72.5	-26.6
32	Dallas	237.7	318.3	-80.6
33	Great Falls	18.7	20.1	- 1.4
34	Boise City	17.7	20.2	- 2.5
35	Cheyenne	3.6	9.0	- 5.4
36	Denver	27.2	58.3	-31.1
37	Albuquerque	14.1	29.0	-14.9
38	Phoenix	21.6	49.1	-27.5
39	Salt Lake City	24.6	30.2	- 5.6
40	Las Vegas	.5	13.4	-12.9
41	Portland, Oregon	47.8	58.8	-11.0
42	Seattle	91.0	91.8	- .8
43	Anchorage	.7	8.1	- 7.4
44	Honolulu	18.0	22.3	- 4.3

Demand Equations

Demand equations for this investigation were expressed as linear functions in logs to the base e. The dependent variable, retail price, was a function of quantity demanded. Retail prices were selected rather than farm prices because the calculation of the equilibrium required all costs between the supply point and the level of demand at the consumer center.

The demand equation was as follows; $\log_e$ retail egg price per truckload = $\log_e$ a - 1.81818 ($\log_e$ quantity demanded). This demand equation was used by Seale and Wilkins. The price flexibility, 1.81818, converted to a price elasticity of -.55. Other elasticities were used in Wilkins's study with no significant differences in the equilibrium solutions.

The constant $\log_e$ a was required for each regional demand equation. State retail prices and quantities of eggs demanded were estimated and placed in a computer program that solved for each $\log_e$ a value (Table 6). The retail egg prices were obtained from Estimated Retail Food Prices By Cities 1968 Annual Averages published by the Bureau of Labor Statistics. When two cities were located in the same region, the retail prices were averaged to obtain an estimate. Average state farm price was subtracted from these estimates to derive a farm-retail egg price spread (Table 7). When retail price was unavailable for a region, the region's average annual farm price was added to the price spread of its closest egg market. These two prices were considered

Table 6. Regional Retail Egg Price Estimates, Egg Quantities Demanded, and Log_e a Values.

Region	Retail Price Estimates	Quantities Demanded	Log_e a Value
	Dollars/Truck	Trucks	
1	$10,323	48.2	16.28895
2	10,062	146.3	18.28092
3	8,514	104.5	17.50239
4	8,802	78.9	17.02656
5	7,956	19.1	14.34227
6	7,668	19.3	14.32455
7	8,226	42.5	15.83203
8	8,658	66.8	16.70656
9	8,802	147.1	18.15783
10	8,622	75.9	16.93500
11	9,306	132.5	18.02329
12	9,306	178.8	18.56833
13	8,676	130.1	17.49777
14	9,036	68.1	16.78341
15	8,532	57.0	16.40328
16	8,640	341.4	19.66977
17	7,992	226.5	18.84600
18	10,800	282.8	19.55069
19	10,116	1,064.2	21.89460
20	9,972	305.4	19.61026

Table 6. (Continued).

21	9,792	317.6	19.66326
22	9,342	252.9	19.20217
23	8,982	122.8	17.84972
24	9,252	134.2	18.04061
25	9,828	147.9	18.27801
26	9,828	133.7	18.09438
27	9,936	51.5	16.37134
28	10,260	92.2	17.46152
29	9,990	113.2	17.80703
30	10,404	107.5	17.75518
31	8,694	72.5	16.85977
32	9,558	318.3	19.64335
33	9,990	20.1	14.66871
34	9,396	20.2	14.61255
35	10,170	9.0	13.22900
36	8,874	58.3	16.48160
37	10,098	29.0	15.34244
38	8,460	49.1	16.12428
39	9,180	30.2	15.31790
40	9,234	13.4	13.84630
41	9,576	58.8	16.57383
42	8,838	91.8	17.30381
43	17,982	8.1	13.59692
44	11,322	22.3	14.97896

Table 7. Retail Prices, Farm Prices, and Farm-Retail Price Spreads 1968.

Trade City	Retail Price[a]	Farm Price[b]	Farm-Retail Spread
	Cents Per Dozen	Cents Per Dozen	Cents Per Dozen
Atlanta	51.7	42.1	9.6
Baltimore	54.6	40.6	14.0
Boston	60.0	46.6	13.4
Buffalo	54.8	37.0	17.8
Chicago	54.4	29.7	24.7
Cincinnati	56.3	31.6	23.8
Cleveland	55.4	31.6	23.8
Dallas	53.1	36.9	16.2
Detroit	51.9	33.3	18.6
Honolulu	62.9	39.2	23.7
Houston	55.8	36.9	18.9
Kansas City	48.1	23.4	24.7
Los Angeles	48.0	28.4	19.6
Milwaukee	49.9	30.4	19.5
Minneapolis	47.3	26.0	21.3
New York	56.2	37.0	19.2
Philadelphia	56.0	37.0	19.0
Pittsburg	55.3	37.0	18.3
St. Louis	51.4	25.4	26.0
San Francisco	44.4	28.4	16.0

Table 7. (Continued).

Seattle	49.1	29.7	19.4
Washington D.C.	54.6	38.4	16.2
Norfolk	54.6	40.6	14.0
$\bar{X}$	52.9	34.0	18.9

[a]Estimated Retail Food Prices By Cities 1968 Annual Averages, Bureau of Labor Statistics, April, 1969.

[b]Chickens and Eggs-Production, Disposition, Cash Receipts, and Gross Income, 1968-69, U.S.D.A., SRS, April 1969.

as actual retail prices in this study. The estimate of quantity demanded was per capita consumption multiplied by regional populations.

Transportation Costs

Shipping patterns between regions are usually determined by transportation costs between areas. Most egg shipments are by truck. The carriers are not subject to regulated rates charged, routes traveled, and entry or exit from business by the Interstate Commerce Commission because eggs are exempt from regulation (Hutchinson 1964, p. 1).

A transportation equation was formulated to estimate the costs. A transportation consultant obtained a sample of actual rates for eggs between the trade regions. A regression analysis of the rates estimated a linear transportation equation, cost per truckload = a + b (highway miles). Cost varied directly with highway miles.

The best fit was obtained with the equation, cost per truckload = - \$38.90325 + .56629276 (highway miles). A R^2 of .97 was attained for rates in the contiental United States. A 44 by 44 transportation cost matrix was set up by solving the equation using mileage distance between each point in the contiental United States and by using actual rates for costs between Honolulu and Anchorage and the mainland. The rates between all points had to be solved to meet the requirements of the computer, but only the costs (Table 8) between deficit and surplus regions appear in the equilibrium.

Table 8. Estimated Cost in Cents Per Dozen of Shipping Eggs Between Surplus and Deficit Regions.

Deficit Regions	SURPLUS REGIONS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	0.1	2.7	4.0	3.8	5.8	4.5	4.2	4.8	2.3	2.6	3.1	4.6	3.6	4.2	4.3	9.1	9.6
19	0.7	2.0	3.6	3.3	4.1	4.0	3.7	4.1	1.7	2.0	2.4	4.0	3.0	3.6	3.7	8.4	9.1
20	1.9	7.1	2.1	1.8	2.8	2.5	2.3	2.0	1.5	1.8	1.9	3.8	2.3	2.6	2.4	7.2	7.6
21	3.0	0.4	1.0	0.8	1.8	1.5	1.2	2.0	2.1	2.2	1.9	4.0	2.1	2.1	1.8	6.3	6.5
22	2.5	0.6	1.9	1.6	2.6	2.3	2.0	2.7	1.8	2.1	2.0	4.0	2.3	2.7	2.4	7.1	7.4
23	3.3	0.7	0.8	0.9	1.6	1.4	1.4	2.1	2.4	2.5	2.2	4.3	2.4	2.4	2.0	6.4	6.7
24	3.6	0.5	1.5	0.8	2.3	0.8	1.2	1.2	2.0	2.1	1.5	3.6	1.6	1.3	0.9	5.5	5.4
25	1.4	1.6	3.1	2.7	3.9	3.6	3.3	3.7	1.1	1.4	1.8	3.4	2.4	3.0	3.0	8.0	8.6
26	1.9	2.0	5.2	3.4	4.4	4.1	3.8	4.1	0.7	0.9	1.5	2.9	2.0	2.7	3.0	8.2	0.9
27	2.7	1.5	3.4	2.9	4.1	3.8	3.3	3.2	0.7	0.1	1.3	2.1	1.1	1.8	2.1	7.4	8.4
28	3.1	0.1	1.9	1.6	2.7	2.4	1.9	2.0	1.2	1.3	1.0	3.1	1.2	1.5	1.4	6.4	7.2
29	4.2	1.1	2.4	1.7	3.1	2.4	1.8	1.5	1.7	1.6	0.9	2.9	0.8	0.5	0.1	5.5	6.5
30	4.9	2.3	5.0	2.8	3.9	3.5	3.0	2.4	2.1	2.0	1.3	2.5	0.8	0.3	1.1	5.7	7.2
31	5.1	2.1	3.0	1.4	2.5	1.7	1.2	0.3	3.1	3.0	2.4	4.4	2.3	1.6	0.9	4.0	5.0

Table 8. (Continued)

Deficit Regions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
32	5.6	2.5	2.7	1.9	3.1	2.4	1.8	0.9	3.0	3.0	2.3	3.8	1.8	1.0	0.8	4.1	5.3
33	7.4	4.7	2.9	3.4	2.1	2.3	3.1	3.7	6.4	6.6	6.2	8.3	6.2	5.8	4.9	3.8	3.5
34	8.3	5.5	1.1	4.2	3.6	3.7	3.7	4.0	7.2	6.8	1.2	8.7	6.6	6.1	5.4	2.5	1.8
35	6.0	3.2	2.3	1.8	2.2	1.6	1.3	1.6	4.9	4.9	4.3	6.4	4.3	3.8	3.0	3.4	3.6
36	6.1	3.1	2.4	1.9	2.5	1.8	1.5	1.4	4.7	4.8	4.2	6.2	4.1	3.5	2.8	3.3	3.7
37	6.8	3.7	3.5	2.9	3.7	2.9	2.5	1.6	4.9	4.8	4.1	5.8	3.8	3.0	2.6	2.3	3.9
38	8.2	5.1	4.9	4.2	5.0	4.2	3.8	3.0	6.1	6.1	5.4	7.0	5.6	4.9	4.3	2.0	2.2
39	7.4	4.6	3.7	3.2	3.3	2.9	2.8	2.9	6.2	6.3	5.8	7.7	5.7	4.9	4.3	2.0	2.1
40	8.7	5.6	5.0	4.5	4.6	4.2	4.0	3.5	6.7	6.6	6.0	7.7	8.0	4.9	4.4	0.6	1.6
41	9.6	6.9	5.1	5.5	4.4	4.7	5.1	5.3	8.5	8.7	8.1	10.1	8.0	7.4	6.7	2.8	1.8
42	9.5	6.8	4.9	5.3	4.2	4.5	5.0	5.6	8.5	8.7	8.1	10.2	8.1	7.7	6.9	3.4	2.8
43	24.9	22.2	20.3	20.8	19.6	19.9	20.4	21.0	23.9	23.5	25.5	23.4	23.1	23.1	22.3	18.8	17.8
44	19.4	16.3	15.0	15.4	14.2	14.5	15.0	14.2	17.4	17.4	16.7	18.3	16.2	15.5	15.1	10.0	10.0

CHAPTER III

MARKETING EQUILIBRIUMS FOR 1968 EGG DATA AND A 3 PERCENT PRODUCTION INCREASE

An optimum 1968 solution was processed for the United States egg industry using the base year data as explained in the previous chapter. This situation was programmed to determine equilibrium prices and trade flows for an average week in 1968. The U. S. 1968 production base was then increased 3 percent to measure the price impact of a nationwide production change. Comparisons of Bureau of Labor Statistics actual retail prices were made with equilibrium prices under both production conditions (Table 9).

The shipping patterns for both equilibriums are presented in Tables 10 and 11. These tables show the trade cities representing each region, the weekly quantity of eggs demanded in that region, the trade city or cities that supply the quantities demanded, the amounts supplied by each, and the price per dozen.

Actual 1968 Conditions

A marketing equilibrium for 1968 egg data resulted in an average retail price for the United States of 52.5 cents per dozen. The Bureau of Labor Statistics average retail price was 53.0 cents per dozen. The two major differences in prices were in Anchorage and Honolulu. The actual retail price in Alaska was 99.9 cents per dozen

Table 9. Comparisons of 1968 Bureau of Labor Statistics Retail Egg Prices, 1968 Equilibrium Retail Egg Prices, and Equilibrium Retail Egg Prices with 3 Percent Production Increase.

Region	Trade City	Bureau of Labor Prices 1968	Equilibrium Prices 1968	Equilibrium Price with Production Increase
		Cents/Dozen	Cents/Dozen	Cents/Dozen
1	Portland, Me.	57.4	55.7	53.0
2	Indianapolis	55.9	53.1	50.3
3	Minneapolis	47.3	51.9	49.2
4	Des Moines	48.9	52.1	49.3
5	Fargo	44.2	51.2	48.5
6	Sioux Falls	42.6	51.8	49.0
7	Omaha	51.7	45.7	48.9
8	Wichita	48.1	51.9	49.2
9	Charlotte	48.9	53.5	50.8
10	Columbia	47.9	53.2	50.5
11	Atlanta	51.7	52.8	50.0
12	Miami	51.7	51.3	48.5
13	Montgomery	48.2	52.3	49.5
14	Jackson	50.2	51.6	48.8
15	Little Rock	47.4	51.2	48.9
16	Los Angeles	48.0	48.3	45.5
17	San Francisco	44.4	48.1	45.4
18	Boston	60.0	55.8	53.0
19	New York	56.2	55.2	52.4

Table 9. (Continued).

20	Cleveland	55.4	53.9	51.2
21	Chicago	54.4	52.9	50.1
22	Detroit	51.9	53.3	50.9
23	Milwaukee	49.9	52.7	49.9
24	St. Louis	51.4	52.6	49.8
25	Baltimore	54.6	54.6	51.8
26	Norfolk	55.2	54.1	51.4
27	Charleston	57.0	53.3	50.5
28	Louisville	57.0	53.1	50.3
29	Memphis	55.5	51.9	49.2
30	New Orleans	57.8	51.9	49.1
31	Oklahoma City	48.3	52.2	49.5
32	Dallas	53.1	52.4	49.7
33	Great Falls	55.5	51.5	48.8
34	Boise City	52.2	49.9	47.2
35	Cheyenne	56.5	51.6	48.9
36	Denver	49.3	51.5	48.8
37	Albuquerque	56.1	50.6	47.8
38	Phoenix	48.0	49.2	46.5
39	Salt Lake City	51.0	50.2	47.5
40	Las Vegas	51.3	48.9	46.2
41	Portland	53.2	49.9	47.1
42	Seattle	49.1	49.8	47.3
43	Anchorage	99.9	65.9	63.2
44	Honolulu	62.9	58.1	55.3
	$\bar{X}$	53.0	52.5	49.7

verse an equilibrium price of 62.9 cents. Hawaii's actual retail price was 65.9 cents per dozen verse an equilibrium price of 58.1 cents.

Southern California equilibrium retail price was 48.3 cents per dozen as compared to the Bureau of Labor price of 48.0 cents. The Arizona price was 49.2 cents per dozen as contrasted to the actual price of 48.0 cents per dozen. Other regional price comparisons were made in Table 9.

The USDA average farm price in 1968 for the United States was 34.0 cents per dozen. USDA prices for southern California and Arizona were 28.4 and 27.4 cents. Subtracting the farm-retail price spreads from the equilibrium retail prices, the farm prices per dozen eggs for the United States, southern California, and Arizona were 33.6 cents, 28.7 cents, and 29.6 cents, respectively. For both retail and farm, the equilibrium prices in southern California and Arizona were higher than the actual prices.

The deficit metropolitan regions of the Northeast were New York, Boston, and Baltimore and were supplied from regions in the South and the Midwest (Table 10). The representative trade cities shipping to these deficit regions were Charlotte, Columbia, Atlanta, Montgomery, Jackson, Indianapolis, and Des Moines. The only Northeastern surplus region was Portland, Maine which shipped eggs to Boston. The deficits in the Midwestern areas of Cleveland, Chicago, Milwaukee, and St. Louis were filled by Indianapolis, Omaha, Minneapolis, Des Moines, Fargo, and Sioux Falls. The Atlantic trade city, Norfolk, received eggs from

Table 10. Shipping Patterns for 1968 Market Equilibriums.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
1	Portland, Me.	49.0	Portland, Me.	49.0	.56
18	Boston	294.2	Boston	133.6	.56
			Portland, Me.	83.4	.56
			Indianapolis	57.7	.53
			Des Moines	19.5	.52
19	New York	1074.9	New York	564.8	.55
			Indianapolis	140.0	.53
			Columbia	12.8	.53
			Atlanta	250.9	.52
			Montgomery	68.5	.52
			Jackson	37.9	.51
20	Cleveland	309.9	Cleveland	193.2	.54
			Indianopolis	56.7	.53
			Omaha	60.0	.51
21	Chicago	322.5	Chicago	162.8	.53
			Minneapolis	96.7	.52
			Des Moines	63.0	.52
22	Detroit	248.3	Detroit	134.0	.54
			Des Moines	114.3	.52

Table 10. (Continued) Shipping Patterns for 1968 Market Equilibriums.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
23	Milwaukee	119.2	Milwaukee	109.6	.53
			Minneapolis	2.9	.52
			Fargo	6.7	.51
24	St. Louis	132.6	St. Louis	50.8	.52
			Sioux Falls	81.8	.52
25	Baltimore	147.9	Baltimore	9.2	.55
			Charlotte	95.2	.54
			Jackson	43.5	.51
26	Norfolk	134.3	Norfolk	91.3	.54
			Miami	25.2	.51
			Columbia	17.8	.53
27	Charleston	52.5	Charleston	27.2	.53
			Montgomery	25.3	.52
28	Louisville	95.9	Louisville	61.5	.53
			Little Rock	26.5	.52
			Jackson	7.9	.52
29	Memphis	117.4	Memphis	13.9	.52
			Little Rock	103.5	.52
30	New Orleans	114.1	New Orleans	67.3	.52
			Jackson	46.8	.51

Table 10. (Continued) Shipping Patterns for 1968 Market Equilibriums.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
31	Oklahoma City	69.5	Oklahoma City	45.9	.52
			Los Angeles	8.9	.48
			Wichita	14.7	.52
32	Dallas	320.4	Dallas	237.7	.52
			Little Rock	57.9	.52
			Los Angeles	24.8	.48
33	Great Falls	21.0	Great Falls	18.7	.52
			San Francisco	2.3	.48
34	Boise City	20.7	Boise	17.7	.50
			San Francisco	3.0	.48
35	Cheyenne	9.5	Cheyenne	3.6	.51
			Los Angeles	5.9	.48
36	Denver	56.8	Denver	27.2	.52
			Los Angeles	29.6	.48
37	Albuquerque	30.7	Albuquerque	14.1	.51
			Los Angeles	16.6	.48
38	Phoenix	47.9	Phoenix	21.6	.49
			Los Angeles	26.3	.48

Table 10. (Continued) Shipping Patterns for 1968 Market Equilibriums.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
39	Salt Lake City	30.4	Salt Lake City	24.6	.50
			Los Angeles	2.9	.48
			San Francisco	2.9	.48
40	Las Vegas	13.5	Las Vegas	.5	.50
			Los Angeles	13.2	.48
41	Portland, Ore.	60.9	Portland, Ore.	47.8	.50
			San Francisco	13.1	.48
42	Seattle	91.0	Seattle	91.0	.50
43	Anchorage	10.2	Anchorage	.7	.66
			San Francisco	9.5	.48
44	Honolulu	23.3	Honolulu	18.0	.58
			San Francisco	5.3	.48
2	Indianapolis	150.5	Memphis	85.4	.52
			St. Louis	65.1	.52
3	Minneapolis	99.3	Minneapolis	99.3	.52
4	Des Moines	76.3	Des Moines	76.3	.52
5	Fargo	17.6	Fargo	17.6	.51

Table 10. (Continued) Shipping Patterns for 1968 Market Equilibriums.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
6	Sioux Falls	17.3	Sioux Falls	17.3	.52
7	Omaha	39.7	Omaha	39.7	.51
8	Wichita	64.1	Wichita	64.1	.52
9	Charlotte	139.9	Charlotte	139.9	.54
10	Columbia	71.7	Columbia	71.7	.53
11	Atlanta	131.0	Atlanta	131.0	.52
12	Miami	179.7	Miami	179.7	.51
13	Montgomery	98.7	Montgomery	98.7	.52
14	Jackson	67.1	Jackson	67.1	.51
15	Little Rock	54.4	Little Rock	54.4	.52
16	Los Angeles	340.3	Los Angeles	340.3	.48
17	San Francisco	216.9	San Francisco	216.9	.48
	Total	5782.9		5782.9	

Miami and Columbia. Southern deficit areas, Louisville, Memphis, Charleston, and New Orleans, were shipped eggs from Montgomery, Little Rock, and Jackson. Oklahoma City and Dallas were deficit regions that received eggs from Los Angeles, Wichita, and Little Rock.

The egg deficits in the Western regions were filled by Los Angeles and San Francisco. Los Angeles or southern California shipped eggs to Cheyenne, Denver, Albuquerque, Las Vegas, Salt Lake City, and Phoenix. San Francisco or northern California filled deficits in Boise, Great Falls, Portland, Oregon, Salt Lake City, Anchorage, and Honolulu.

A 3 Percent Production Increase

Egg production in 1968 was increased 3 percent for the United States. This was a uniform increase in the production base of every region. The impact of this change resulted in an average U. S. retail price of 49.7 cents per dozen eggs (Table 9). This is a 6.2 percent decline in the Bureau of Labor retail price and a 5.3 percent decline in the 1968 equilibrium price.

Retail prices in southern California and Arizona decreased as production increased. The new equilibrium prices were 45.5 and 46.5 cents per dozen, respectively. Southern California price declined 5.2 percent below actual price and 5.8 percent below the 1968 equilibrium price. The resulting impact in Arizona was a 3.1 percent decline in actual price and 5.5 percent decline in the 1968 equilibrium price.

The farm-retail price spreads were subtracted from these new equilibrium prices to obtain farm prices in southern California of 25.9

cents per dozen eggs and 26.9 cents in Arizona. For southern California, a 9.8 percent fall occurred in the USDA farm price and a 8.8 percent fall in the 1968 equilibrium farm price. Arizona farm price declined 3.0 percent below the USDA farm price and 9.1 percent below the 1968 equilibrium farm price.

When production increased, the shipping patterns were basically the same as the 1968 equilibrium (Table 11). One change was Wichita supplying the deficit region of Cleveland rather than Oklahoma City. In addition, Little Rock discontinued shipments to Louisville and increased quantities shipped to Dallas and Memphis. Los Angeles increased egg shipments to Dallas and Oklahoma City.

When production increased, lower prices resulted at the farm and retail level. In most cases, the percentage decrease in price was greater than the percentage increase in production, therefore, total revenue would had declined as production increased.

Table 11. Shipping Patterns - A 3 Percent Production Increase.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
1	Portland, Me.	50.4	Portland, Me.	50.4	.53
18	Boston	302.7	Boston	137.6	.53
			Portland, Me.	86.0	.53
			Indianapolis	59.0	.50
			Des Moines	20.1	.49
19	New York	1105.7	New York	581.7	.52
			Indianapolis	159.9	.50
			Columbia	13.1	.50
			Atlanta	258.5	.50
			Montgomery	70.6	.49
			Jackson	21.9	.49
20	Cleveland	319.1	Cleveland	199.00	.51
			Indianapolis	43.2	.50
			Omaha	61.8	.49
			Wichita	15.1	.49
21	Chicago	332.2	Chicago	167.7	.50
			Minneapolis	99.6	.49
			Des Moines	64.6	.49
22	Detroit	255.6	Detroit	138.0	.51
			Des Moines	117.6	.49
23	Milwaukee	122.7	Milwaukee	112.9	.50
			Minneapolis	3.0	.49
			Fargo	6.8	.48

Table 11. (Continued) Shipping Patterns - A 3 Percent Production Increase.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
24	St. Louis	136.6	St. Louis	52.3	.50
			Sioux Falls	84.3	.49
25	Baltimore	152.3	Baltimore	9.5	.52
			Charlotte	98.2	.51
			Jackson	44.6	.49
26	Norfolk	138.3	Norfolk	94.0	.51
			Columbia	18.5	.50
			Miami	25.8	.48
27	Charleston	54.1	Charleston	28.0	.51
			Montgomery	26.1	.49
28	Louisville	98.8	Louisville	63.3	.50
			Jackson	25.5	.49
29	Memphis	120.9	Memphis	14.5	.49
			Little Rock	106.4	.49
30	New Orleans	117.6	New Orleans	69.3	.49
			Jackson	48.3	.49
31	Oklahoma City	71.5	Oklahoma City	47.3	.50
			Los Angeles	24.2	.46
32	Dallas	330.1	Dallas	244.8	.50
			Little Rock	77.0	.49
			Los Angeles	8.3	.46

Table 11. (Continued) Shipping Patterns - A 3 Percent Production Increase.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
33	Great Falls	21.6	Great Falls	19.3	.49
			San Francisco	2.3	.45
34	Boise City	21.4	Boise City	18.2	.47
			San Francisco	3.2	.45
35	Cheyenne	9.8	Cheyenne	3.7	.49
			Los Angeles	6.1	.46
36	Denver	58.6	Denver	28.0	.49
			Los Angeles	30.6	.46
37	Albuquerque	31.7	Albuquerque	14.5	.48
			Los Angeles	17.2	.46
38	Phoenix	49.4	Phoenix	22.2	.47
			Los Angeles	27.2	.46
			Salt Lake City	25.3	.47
39	Salt Lake City	31.4	Los Angeles	3.8	.46
			San Francisco	2.3	.45
40	Las Vegas	14.2	Las Vegas	.5	.46
			Los Angeles	13.7	.46
41	Portland	62.8	Portland	49.2	.47
			San Francisco	13.6	.45
42	Seattle	93.7	Seattle	93.7	.47

Table 11. (Continued) Shipping Patterns - A 3 Percent Production Increase.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
43	Anchorage	10.4	Anchorage	.7	.61
			San Francisco	9.7	.45
44	Honolulu	23.9	Honolulu	18.5	.55
			San Francisco	5.4	.45
2	Indianapolis	155.0	St. Louis	67.1	.50
			Memphis	87.9	.49
3	Minneapolis	102.3	Minneapolis	102.3	.49
4	Des Moines	78.6	Des Moines	78.6	.49
5	Fargo	18.1	Fargo	18.1	.48
6	Sioux Falls	17.8	Sioux Falls	17.8	.49
7	Omaha	40.9	Omaha	40.9	.49
8	Wichita	66.0	Wichita	66.0	.49
9	Charlotte	144.1	Charlotte	144.1	.51
10	Columbia	73.8	Columbia	73.8	.50
11	Atlanta	134.9	Atlanta	134.9	.50

Table 11. (Continued) Shipping Patterns - A 3 Percent Production Increase.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
12	Miami	185.2	Miami	185.2	.49
13	Montgomery	101.7	Montgomery	101.7	.49
14	Jackson	69.2	Jackson	69.2	.49
15	Little Rock	56.0	Little Rock	56.0	.49
16	Los Angeles	351.5	Los Angeles	351.5	.46
17	San Francisco	224.0	San Francisco	224.0	.45
	Total	5,956.6		5,956.6	

CHAPTER IV

MARKETING EQUILIBRIUMS UNDER ALTERNATE EGG PRODUCTION LEVELS IN SURPLUS REGIONS

Egg production was varied for several surplus regions in order to determine price impacts of supply changes. The first alternative level of production examined was a 10 percent production increase in the Southern surplus regions. The second situation involved various production increases and decreases in southern California. These regions represented the major egg surplus areas in the United States in 1968.

Regions

A 10 Percent Production Increase In the Southern Surplus Regions

The Southern states of Georgia, Alabama, Mississippi, Arkansas, North Carolina, South Carolina, and Florida have increased production 10 percent annually since 1957-59 (Rogers and Bluestone 1967). These Southern states have had the largest increases of any regions of the country, over a 50 percent increase since 1957-59 (Wilkins 1968, p. 63). The Southern regions as represented by these states accounted for 30 percent of total 1968 egg production.

For the simulated egg production change, the weekly 1968 base production figure for each region was increased 10 percent (Table 12). The regional changes represented an increase of 156.2 trucks per week or a 2.7 percent increase in total U. S. production.

Table 12. Production Increases For 10 Percent Increase in Southern Surplus Regions.

Region	Production Increase	Total Production
	Trucks/Week	Trucks/Week
Georgia	38.2	420.1
Alabama	19.3	211.8
Mississippi	20.3	223.6
Arkansas	24.2	266.4
North Carolina	23.5	258.5
South Carolina	10.2	112.2
Florida	20.5	225.5

When production changed in these seven regions, the retail prices in all 44 regions fell below the 1968 equilibrium prices (Table 13). The U. S. average retail price fell 4.6 percent while the new farm price would have been 31.2 cents per dozen, a 7.1 percent decline in the 1968 equilibrium farm price. Although the average U. S. price decreased more than production increased, the prices in the 7 regions fell less than the 10 percent regional production increases.

A 4.9 percent decline occurred in Georgia, North Carolina, and South Carolina. Mississippi and Alabama had a 5.0 percent decline in price, while Miami and Little Rock experienced price falls of 5.1 percent and 4.3 percent. The farm prices would have declined along the same pattern. If their production costs per dozen remained constant or declined, Southern producers would have increased their revenue and profits at the expense of all other regional producers whose prices decreased while production was unchanged. An illustration of this was the impact of the production increase on southern California and Arizona prices. There was a 5.0 percent fall in southern California price and a 4.8 percent fall in Arizona price. With egg production unchanged, the two regions would have received less total revenue.

The production increase caused some changes in the 1968 equilibrium shipping patterns (Table 14). Columbia, Atlanta, Montgomery, and Jackson increased egg shipments to New York while Indianapolis decreased shipments to there. Little Rock had new markets in Louisville and Oklahoma City and shipped more eggs to Memphis. Little Rock also became

Table 13. Retail Price Equilibriums - Production Increases in Southern Surplus Regions.

Region	Trade City	Price Per Dozen Eggs	Percentage Change in 1968 Equilibrium Price
		Cents	
1	Portland, Me.	53.1	-4.7
2	Indianapolis	50.5	-4.9
3	Minneapolis	49.2	-5.2
4	Des Moines	49.5	-5.0
5	Fargo	48.5	-5.3
6	Sioux Falls	49.0	-5.4
7	Omaha	49.1	-5.0
8	Wichita	49.6	-4.4
9	Charlotte	50.9	-4.9
10	Columbia	50.6	-4.9
11	Atlanta	50.2	-4.9
12	Miami	48.7	-5.1
13	Montgomery	49.7	-5.0
14	Jackson	49.0	-5.0
15	Little Rock	49.1	-4.3
16	Los Angeles	45.9	-5.0
17	San Francisco	46.2	-4.0
18	Boston	53.2	-4.7
19	New York	52.6	-4.7
20	Cleveland	51.3	-4.8
21	Chicago	50.3	-4.9

Table 13. (Continued).

22	Detroit	51.1	-4.1
23	Milwaukee	50.0	-5.1
24	St. Louis	49.9	-5.1
25	Baltimore	51.9	-4.9
26	Norfolk	51.6	-4.6
27	Charleston	50.7	-4.9
28	Louisville	50.5	-4.9
29	Memphis	49.3	-5.0
30	New Orleans	48.9	-5.8
31	Oklahoma City	49.9	-4.4
32	Dallas	49.9	-4.8
33	Great Falls	49.6	-3.7
34	Boise	48.1	-3.6
35	Cheyenne	49.3	-4.5
36	Denver	49.2	-4.5
37	Albuquerque	48.2	-4.7
38	Phoenix	46.9	-4.8
39	Salt Lake City	47.9	-4.6
40	Las Vegas	46.6	-4.7
41	Portland, Ore.	48.0	-3.8
42	Seattle	48.6	-2.4
43	Anchorage	64.0	-2.9
44	Honolulu	56.0	-3.6
	$\bar{X}$	50.1	-4.6

Table 14. Shipping Patterns - A 10 Percent Production Increase in the Southern Surplus Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
1	Portland, Me.	50.3	Portland, Me.	50.3	.53
18	Boston	302.1	Boston	133.6	.53
			Portland, Me.	82.1	.53
			Indianopolis	86.4	.51
19	New York	1103.7	New York	564.4	.53
			Indianapolis	96.3	.51
			Columbia	32.8	.51
			Atlanta	285.4	.50
			Montgomery	83.6	.50
			Jackson	40.8	.49
20	Cleveland	318.4	Cleveland	193.2	.51
			Indianapolis	71.8	.51
			Omaha	53.4	.49
21	Chicago	331.5	Chicago	162.8	.50
			Minneapolis	89.7	.49
			Des Moines	73.6	.49
			Omaha	5.4	.49
22	Detroit	255.0	Detroit	134.0	.51
			Des Moines	121.0	.49

Table 14. (Continued). Shipping Patterns - A 10 Percent Increase in Southern Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
23	Milwaukee	122.6	Milwaukee	109.6	.50
			Minneapolis	6.9	.49
			Fargo	6.1	.49
24	St. Louis	136.4	St. Louis	55.2	.50
			Sioux Falls	81.2	.49
25	Baltimore	152.0	Baltimore	9.2	.52
			Charlotte	114.9	.51
			Jackson	27.9	.49
26	Norfolk	138.0	Norfolk	91.3	.52
			Columbia	6.0	.51
			Miami	40.7	.49
27	Charleston	54.0	Charleston	27.2	.51
			Montgomery	26.8	.50
28	Louisville	98.5	Louisville	61.5	.51
			Jackson	35.8	.49
			Little Rock	1.2	.49
29	Memphis	120.7	Memphis	5.4	.49
			Little Rock	115.3	.49
30	New Orleans	117.3	New Orleans	67.3	.49
			Jackson	50.0	.49

Table 14. (Continued). Shipping Patterns - A 10 Percent Increase in Southern Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
31	Oklahoma City	71.2	Oklahoma City	45.9	.50
			Los Angeles	10.0	.46
			Little Rock	2.3	.49
			Wichita	13.0	.50
32	Dallas	329.3	Dallas	237.7	.50
			Little Rock	91.6	.49
33	Great Falls	21.4	Great Falls	18.7	.50
			San Francisco	2.7	.46
34	Boise City	21.1	Boise City	17.7	.48
			San Francisco	3.4	.46
35	Cheyenne	9.7	Cheyenne	3.6	.49
			Los Angeles	6.1	.46
36	Denver	58.3	Denver	27.2	.49
			Los Angeles	31.1	.46
37	Albuquerque	31.5	Albuquerque	14.1	.48
			Los Angeles	17.4	.46
38	Phoenix	49.2	Phoenix	21.6	.47
			Los Angeles	27.6	.46

Table 14. (Continued). Shipping Patterns - A 10 Percent Increase in Southern Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
39	Salt Lake City	31.2	Salt Lake City	24.6	.48
			Los Angeles	6.6	.46
40	Las Vegas	14.1	Las Vegas	.5	.47
			Los Angeles	13.6	.46
41	Portland, Ore.	62.2	Portland	47.8	.48
			San Francisco	14.4	.46
42	Seattle	92.3	Seattle	91.0	.49
			San Francisco	1.3	.46
43	Anchorage	10.3	Anchorage	.7	.64
			San Francisco	9.6	.46
44	Honolulu	23.9	Honolulu	18.0	.56
			Los Angeles	5.9	.46
2	Indianapolis	154.7	St. Louis	60.7	.50
			Memphis	94.0	.49
3	Minneapolis	102.3	Minneapolis	102.3	.49
4	Des Moines	78.5	Des Moines	78.5	.49
5	Fargo	18.1	Fargo	18.1	.49

Table 14. (Continued). Shipping Patterns - A 10 Percent Increase in Southern Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
6	Sioux Falls	17.8	Sioux Falls	17.8	.49
7	Omaha	40.9	Omaha	40.9	.49
8	Wichita	65.7	Wichita	65.7	.49
9	Charlotte	143.8	Charlotte	143.8	.51
10	Columbia	73.7	Columbia	73.7	.51
11	Atlanta	134.7	Atlanta	134.7	.50
12	Miami	184.8	Miami	184.8	.49
13	Montgomery	101.4	Montgomery	101.4	.50
14	Jackson	69.0	Jackson	69.0	.49
15	Little Rock	55.9	Little Rock	55.9	.49
16	Los Angeles	349.9	Los Angeles	349.9	.46
17	San Francisco	221.7	San Francisco	221.7	.46

the only supplier of the deficit in Dallas, this meant Los Angeles had to divert eggs to Honolulu. When Jackson shipped more eggs to New York, fewer shipments from Jackson were made to Baltimore. Charlotte took up this deficit and shipped more eggs into Baltimore. The Norfolk deficit was filled with fewer eggs from Columbia and more from Miami.

In summary, the lower egg prices and different trade flows were caused by the South's production increase. Each region's price dropped as consumption equaled production. Other surplus regions were forced out of their higher priced markets by the increased flow of surplus eggs from the seven regions, causing them to ship to their best alternative markets at lower prices.

Production Increases and Decreases For Southern California

Egg production in California has increased an average of 5.03 percent a year since 1960 (California Egg and Poultry 1969, p. 10). The farm price has dropped from 35.6 cents per dozen eggs in 1960 to 28.4 cents in 1968 (Poultry Parade 1965, p. 7, California Egg and Poultry 1969, p. 11). This increase of 5 percent as well as a 1 and 10 percent increase was applied to southern California's 1968 production base to measure the changes in egg prices and trade flows. In addition, production was decreased 5 and 10 percent to measure and compare changes in prices and trade flows to those occurring with production increases.

The production increases and decreases in southern California caused relatively small changes in total U. S. production, but the changes in the Bureau of Labor retail prices and the 1968 equilibrium

retail prices depicted the total inelastic demand for eggs in the U. S. (Table 15). When total U. S. production increased, both actual and equilibrium prices fell more, while the opposite occurred with production decreases.

Changes in southern California egg prices did not follow the same pattern as the United States. When production was increased, the corresponding price declines were less while the opposite occurred with production reductions (Table 16).

Southern California producers were able to increase production and ship surplus eggs without lowering total revenue. The southern California surplus eggs upset the 1968 equilibrium decreasing retail prices in all regions (Table 17), however, the opposite occurred when production was decreased (Table 18). This occurred in Arizona where the retail prices fell .6 and 1.6 percent with the 5 and 10 percent production increases. A 1 and 3 percent increase in price occurred as production moved in the other direction.

Shipping patterns for southern California changed only with the 10 percent production decrease. Under this simulated production alternative, Los Angeles did not ship to Oklahoma City, Dallas, or Salt Lake City (Table 19). When production increases were simulated, the bulk of additional eggs were shipped to Dallas (Table 20).

These predictions follow the same results as Wilkins's study. A 25 percent production decrease in southern California caused a 14 percent price increase while a 7.0 percent increase was associated with a 2 percent price drop.

Table 15. Changes in U.S. Egg Production and Prices to Corresponding Changes in Southern California Production.

Percent Change In S. California Production	Percent Change In Total U.S. Production	Percent Change In 1968 Bureau of Labor Price	Percent Change In 1968 Equilibrium Retail Price
+1.0	+0.08	-1.1	-0.2
+5.0	+0.4	-1.7	-0.7
+10.0	+0.81	-2.4	-1.5
-5.0	-0.4	- 0 -	+0.8
-10.0	-0.81	+0.8	+1.7

Table 16. Comparisons of Southern California Egg Prices Under Alternate Production Levels of the 1968 Base.

Production Level	Cents Per Dozen		Percent Change In 1968 Bureau of Labor Price		Percent Change In 1968 Equilibrium Price	
	Retail	Farm	Retail	Farm	Retail	Farm
+1 %	48.1	28.5	+0.2	+0.7	-0-	-.7
+5 %	47.8	28.2	-0.4	-0.7	-0.6	-1.7
+10 %	47.3	27.7	-1.5	-2.5	-1.7	-3.5
-5 %	48.7	29.1	+1.5	+2.5	+1.2	+1.4
-10 %	49.7	30.1	+3.5	+6.0	+3.3	+4.9

Table 17. Price Changes for the U.S. Egg Industry - Production Increases in Southern California.

Region	Trade City	Percentage Change In 1968 Equilibrium Retail Price		
		1% Increase	5% Increase	10% Increase
1	Portland, Me.	-0.2	-0.5	-1.3
2	Indianapolis	-0.4	-0.9	-1.7
3	Minneapolis	-0.2	-0.6	-1.3
4	Des Moines	-0.2	-0.6	-1.3
5	Fargo	-0.2	-0.6	-1.4
6	Sioux Falls	-0.4	-1.2	-1.5
7	Omaha	-0.2	-0.8	-1.4
8	Wichita	-0.2	-0.8	-1.4
9	Charlotte	-0.2	-0.7	-1.3
10	Columbia	-0.2	-0.6	-1.3
11	Atlanta	-0.2	-0.8	-1.3
12	Miami	-0.2	-0.8	-1.4
13	Montgomery	-0.2	-0.8	-1.5
14	Jackson	-0.2	-0.6	-1.4
15	Little Rock	-0.8	-1.0	-1.0
16	Los Angeles	0.0	-0.6	-1.7
17	San Francisco	-0.2	-1.0	-1.5
18	Boston	-0.2	-0.5	-1.2
19	New York	-0.2	-0.5	-1.4
20	Cleveland	-0.2	-0.7	-1.5
21	Chicago	-0.2	-0.6	-1.5

Table 17. (Continued)

22	Detroit	-0.5	-0.5	-0.8
23	Milwaukee	0.0	-0.6	-1.3
24	St. Louis	-0.4	-1.0	-1.7
25	Baltimore	-0.2	-0.7	-1.5
26	Norfolk	-0.0	-0.6	-1.1
27	Charleston	0.0	-0.6	-1.3
28	Louisville	-0.2	-1.1	-1.9
29	Memphis	-0.2	-1.0	-1.7
30	New Orleans	-0.2	-0.6	-1.2
31	Oklahoma City	0.0	-0.8	-1.5
32	Dallas	0.0	-0.8	-1.5
33	Great Falls	0.0	-0.8	-1.4
34	Boise	-0.2	-1.0	-1.6
35	Cheyenne	0.0	-0.8	-1.6
36	Denver	0.0	-0.2	-1.6
37	Albuquerque	-0.2	-1.0	-1.8
38	Phoenix	0.0	-0.6	-1.6
39	Salt Lake City	0.0	-1.0	-1.6
40	Las Vegas	0.0	-1.0	-1.6
41	Portland	-0.2	-1.0	-1.6
42	Seattle	0.0	0.0	-0.2
43	Anchorage	-0.2	-0.6	-1.1
44	Honolulu	-0.2	-0.9	-1.4

Table 18. Price Changes for the U.S. Egg Industry - Production Decreases in Southern California.

Region	Trade City	Percentage Change in 1968 Equilibrium Retail Price - 5% Decrease	- 10% Decrease
1	Portland, Me.	+0.7	+1.1
2	Indianapolis	+0.6	+1.3
3	Minneapolis	+0.8	+1.0
4	Des Moines	+0.6	+1.2
5	Fargo	+0.8	+1.0
6	Sioux Falls	+0.4	+1.4
7	Omaha	+0.8	+1.2
8	Wichita	+1.0	+2.1
9	Charlotte	+0.2	+1.5
10	Columbia	+0.8	+1.3
11	Atlanta	+0.8	+1.3
12	Miami	+0.8	+1.4
13	Montgomery	+0.8	+1.3
14	Jackson	+0.8	+1.4
15	Little Rock	+1.7	+2.7
16	Los Angeles	+1.2	+3.3
17	San Francisco	+0.8	+2.7
18	Boston	+0.7	+1.3
19	New York	+0.7	+1.3
20	Cleveland	+0.7	+1.1
21	Chicago	+0.8	+0.9

Table 18. (Continued).

22	Detroit	+1.3	+1.7
23	Milwaukee	+0.9	+0.9
24	St. Louis	+0.4	+1.3
25	Baltimore	+0.7	+1.3
26	Norfolk	+0.9	+1.5
27	Charleston	+0.8	+1.3
28	Louisville	+0.8	+1.3
29	Memphis	+0.8	+1.5
30	New Orleans	+0.8	+1.5
31	Oklahoma City	+1.0	+1.9
32	Dallas	+1.5	+1.7
33	Great Falls	+0.8	+2.7
34	Boise	+0.8	+2.6
35	Cheyenne	+0.8	+2.7
36	Denver	+1.0	+2.9
37	Albuquerque	+0.8	+2.8
38	Phoenix	+1.0	+3.0
39	Salt Lake City	+0.8	+2.8
40	Las Vegas	+0.8	+2.9
41	Portland, Ore.	+0.8	+2.6
42	Seattle	+0.0	+0.2
43	Anchorage	+0.6	+2.1
44	Honolulu	+0.7	+2.2

Table 19. Shipping Patterns for Southern California Eggs - 1, 5, and 10 Percent Production Increases.

Region	Destination	Quantity Eggs Demanded Per Week			Quantity Eggs Supplied Per Week Via Los Angeles			Price Per Dozen Eggs		
		+1 %	+5 %	+10 %	+1 %	+5 %	+10 %	+1 %	+5 %	+10 %
		Trucks			Trucks			Dollars		
16	Los Angeles	340.6	342.3	343.9	340.6	342.3	343.9	.47	.48	.47
31	Oklahoma City	69.5	69.8	70.1	9.0	9.7	10.1	.48	.48	.47
32	Dallas	320.7	322.1	323.5	28.7	42.6	61.9	.48	.48	.47
35	Cheyenne	9.5	9.5	9.6	5.9	5.9	6.0	.48	.48	.47
36	Denver	56.9	57.1	57.4	29.7	29.9	30.2	.48	.48	.47
37	Albuquerque	30.7	30.9	31.0	16.6	16.8	16.9	.48	.48	.47
38	Phoenix	47.9	48.1	48.4	26.3	26.6	26.8	.48	.48	.47
39	Salt Lake City	30.4	30.6	30.7	3.2	5.0	6.0	.48	.48	.47
40	Las Vegas	13.7	13.8	13.9	13.2	13.3	13.4	.48	.48	.47

Table 20. Shipping Patterns for Southern California Eggs - 5, and 10 Percent Production Decreases.

Region	Destination	Quantity Eggs Demanded Per Week - 5 %	Quantity Eggs Demanded Per Week - 10 %	Quantity Eggs Supplied Per Week - 5 %	Quantity Eggs Supplied Per Week - 10 %	Price Per Dozen Eggs - 5 %	Price Per Dozen Eggs - 10 %
		Trucks		Trucks		Dollars	
16	Los Angeles	338.8	335.1	338.8	335.1	.49	.50
31	Oklahoma City	69.1	68.7	8.4	--	.49	--
32	Dallas	319.1	317.7	5.8	--	.49	--
35	Cheyenne	9.4	9.4	5.8	3.0	.49	.50
36	Denver	56.6	56.0	29.4	28.8	.49	.50
37	Albuquerque	30.6	30.2	16.5	16.2	.49	.50
38	Phoenix	47.7	47.1	26.1	25.6	.49	.50
39	Salt Lake City	30.3	30.0	1.2	--	.49	--
40	Las Vegas	13.7	13.5	13.2	13.0	.49	.50

CHAPTER V

MARKETING EQUILIBRIUMS UNDER ALTERNATE EGG PRODUCTION LEVELS IN SOUTHWESTERN AND WESTERN REGIONS

Alternate egg production levels in the Southwestern and Western egg deficit regions were examined to investigate price and trade changes. Southern California was included in the investigation because it supplied most of the deficits in this part of the United States.

Respective Production Increases In Arizona, Colorado, and Texas

Arizona, Colorado, and Texas were primary markets for southern California surplus eggs in 1968. This was depicted by the reactive programming equilibrium for 1968. Respective production increases were examined in the deficit regions with regard to intra-regional and inter-regional price and trade changes.

Arizona

Egg production was changed so that Arizona supplied 85 percent of their 1968 consumption. Then production was changed so that it equaled 1968 consumption. The first alternative increased 1968 weekly egg production of 21.6 trucks to 41.7 trucks per week, a 93 percent increase. The second alternative was a 127 percent change increasing total production to 49.1 trucks per week.

The first alternative produced a retail price of 48.9 cents per dozen or a .6 percent decline in the 1968 equilibrium. The farm price would have been 29.3 cents, a 1.0 percent fall. The second alternative had a retail price of 48.5 cents per dozen, a 1.4 percent decline in the 1968 equilibrium price. The corresponding farm price would have declined 2.4 percent to 28.9 cents per dozen. Southern California retail and farm prices declined with both alternatives (Table 21).

The change in the trade flows for the first alternate had Los Angeles shipping more eggs to Dallas and only 6.3 trucks per week to Phoenix. When Arizona was self-sufficient, Los Angeles shipped even more eggs to Dallas (Appendix Tables).

The price impacts indicated that Arizona producers would have increased their total revenue. This would have occurred if all other regional production remained unchanged.

Colorado

Colorado egg production was increased 31.1 trucks per week so that Colorado was self-sufficient. This 114 percent change was accompanied by a 3.0 percent decline in the 1968 equilibrium retail price (Table 21). The retail price was 50.0 cents per dozen with a 30.9 cents a dozen farm price.

Eggs that were shipped from Los Angeles to Denver were diverted to Dallas as in the Arizona case.

Table 21. Price Changes for Arizona, Colorado, Texas, and Southern California - Respective Egg Production Increases.

Production Situation	Percent Change in 1968 Regional Price Equilibrium							
	Arizona		Colorado		Texas		S. California	
	Farm	Retail	Farm	Retail	Farm	Retail	Farm	Retail
+ 93% Arizona	-1.0	-0.6	-0.6	-0.4	-1.1	-0.7	-1.4	-0.8
+127% Arizona	-2.4	-1.4	-1.6	-1.0	-1.4	-0.9	-2.4	-1.4
+114% Colorado	-1.7	-1.0	-3.0	-3.0	-1.7	-1.1	-2.4	-1.4
+ 34% Texas	-4.3	-2.6	-3.8	-2.3	-5.0	-3.4	-4.9	-2.9

The price prediction indicated that Colorado producers would have also increased their revenue. As in the Arizona situation, production was held constant at the 1968 level for all other regions.

Texas

Texas, unlike Arizona and Colorado, received eggs from Little Rock as well as Los Angeles under the 1968 equilibrium. When egg production was increased 34 percent, Texas was self-sufficient. The retail price, 50.6 cents per dozen, was a 3.4 percent decrease in 1968 equilibrium price. Farm price would have been 34.4 cents, a 5 percent drop.

Los Angeles eggs would have been diverted to Honolulu, Los Angeles, and Oklahoma City. Little Rock eggs would have been shipped to St. Louis.

In summary, the respective egg production increases had corresponding price drops that were very small relative to the production changes (Table 21). Southern California producers would have been forced out of these markets and would have loss revenue by shipping to other markets.

Simultaneous Production Increases In Arizona, Colorado, Texas, and Southern California

Changes in prices and trade flows were examined for simultaneous production increases in Arizona, Colorado, Texas, and southern California. This was investigated to obtain a more realistic view of the price impacts. The three deficit regions became self-sufficient while Southern California had a 5 percent production increase (Table 22).

Table 22. Egg Production for Simultaneous Increases in Arizona, Colorado, Texas, and Southern California.

Region	Production	Percentage Change in 1968 Production
	Trucks/Week	
Arizona	49.1	127
Colorado	58.3	114
Texas	318.3	34
Southern California	491.9	5

Table 23. Farm and Retail Prices, and Percentage Changes in 1968 Equilibrium Prices for Arizona, Colorado, Texas, and Southern California - Simultaneous Increases.

Region	Farm Price	% Change	Retail Price	% Change
	Cents/Dozen		Cents/Dozen	
Arizona	26.6	-10.1	46.2	-6.1
Colorado	28.8	- 9.7	48.4	-6.0
Texas	33.1	- 8.6	49.3	-6.0
Southern Calif.	25.5	-11.1	45.1	-7.0

The price impacts that occurred in the three deficit regions were of greater magnitude than when production was increased separately (Table 23). The price impacts in southern California were larger when compared to the previous situations.

The shipping patterns were quite different than the 1968 equilibrium trade flows (Table 24). Los Angeles filled all of the deficit in Oklahoma City. They also shipped to Great Falls, Albuquerque, and Phoenix who shipped their production increase to Wichita. Los Angeles also filled the deficit in Honolulu as San Francisco shipped more eggs to Seattle, Boise, Anchorage, and Portland, Oregon.

In summary, producers in Arizona, Colorado, and Texas would have gained revenue as they increased production. Southern California producers would have loss revenue as egg production increased in adjacent egg markets. The Arizona producers would have been shipping to Wichita because the net prices in Arizona and Kansas were equal thus Arizona was indifferent.

Simultaneous Production Increases In Southwestern and Western Deficit Regions

Production alternatives were simultaneously simulated in Southwestern and Western deficit regions of Texas, New Mexico, Arizona, Colorado, Wyoming, Utah, Idaho, Montana, Oregon, and Washington to investigate resulting price and trade changes, both intra-regional and interregional. Southern and northern California changes were examined closely as they supplied most of the deficits. These alternatives equated regional production and 1968 consumption except in Washington

Table 24. Shipping Patterns - Simultaneous Production Increases in Arizona, Colorado, Texas, and South California.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
1	Portland, Me.	50.3	Portland, Me.	50.3	.53
18	Boston	302.1	Boston	133.6	.53
			Portland, Me.	82.1	.52
			Indianapolis	86.4	.51
19	New York	1102.6	New York	564.8	.53
			Indianapolis	154.9	.51
			Columbia	2.6	.51
			Atlanta	247.4	.51
			Montgomery	64.4	.50
			Jackson	68.5	.49
20	Cleveland	318.5	Cleveland	193.2	.51
			Indianapolis	13.2	.51
			Omaha	54.2	.49
			Wichita	57.9	.49
21	Chicago	331.4	Chicago	160.8	.50
			Minneapolis	90.2	.49
			Des Moines	73.8	.50
			Omaha	4.6	.49
22	Detroit	254.9	Detroit	134.0	.51
			Des Moines	120.9	.50

Table 24. (Continued) Shipping Patterns - Simultaneous Production Increases.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
23	Milwaukee	122.4	Milwaukee	109.6	.50
			Minneapolis	6.6	.49
			Fargo	6.2	.49
24	St. Louis	136.1	St. Louis	25.9	.50
			Sioux Falls	81.3	.49
			Little Rock	28.9	.49
25	Baltimore	151.8	Baltimore	9.2	.52
			Charlotte	126.5	.51
			Jackson	16.1	.49
26	Norfolk	137.8	Norfolk	91.3	.52
			Columbia	26.1	.51
			Miami	20.4	.50
27	Charleston	53.9	Charleston	27.2	.51
			Montgomery	26.7	.50
28	Louisville	98.4	Louisville	61.5	.51
			Little Rock	36.9	.49
29	Memphis	120.5	Little Rock	120.5	.49
30	New Orleans	117.1	New Orleans	67.3	.49
			Jackson	49.8	.49
31	Oklahoma City	71.8	Oklahoma City	45.9	.49
			Los Angeles	25.9	.45

Table 24. (Continued) Shipping Patterns - Simultaneous Production Increases.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
32	Dallas	331.6	Dallas	318.3	.49
			Los Angeles	13.3	.45
33	Great Falls	21.6	Great Falls	18.7	.49
			Los Angeles	2.9	.45
34	Boise City	21.3	Boise City	17.7	.48
			San Francisco	3.6	.46
35	Cheyenne	9.8	Cheyenne	3.6	.49
			Los Angeles	6.2	.45
36	Denver	58.8	Denver	58.3	.48
			Los Angeles	.5	.45
37	Albuquerque	31.8	Los Angeles	31.8	.45
38	Phoenix	49.6	Phoenix	18.1	.46
			Los Angeles	31.5	.45
39	Salt Lake City	31.5	Salt Lake City	24.6	.47
			Los Angeles	6.9	.45
40	Las Vegas	14.2	Las Vegas	.5	.46
			Los Angeles	13.7	.45
41	Portland	62.5	Portland	47.8	.48
			San Francisco	14.7	.46

Table 24. (Continued) Shipping Patterns - Simultaneous Production Increases.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
42	Seattle	92.8	Seattle	91.0	.48
			San Francisco	1.8	.46
43	Anchorage	10.4	Anchorage	.7	.63
			San Francisco	9.7	.46
44	Honolulu	24.0	Honolulu	18.0	.50
			Los Angeles	6.0	.45
2	Indianapolis	154.5	St. Louis	90.0	.50
			Memphis	64.5	.49
3	Minneapolis	102.0	Minneapolis	102.0	.49
4	Des Moines	78.4	Des Moines	78.4	.50
5	Fargo	18.1	Fargo	18.1	.49
6	Sioux Falls	17.8	Sioux Falls	17.8	.49
7	Omaha	40.8	Omaha	40.8	.49
8	Wichita	66.0	Wichita	20.8	.49
			Phoenix	31.0	.46
			Albuquerque	14.2	.48
9	Charlotte	143.6	Charlotte	108.7	.51
			Memphis	34.9	.49

Table 24. (Continued). Shipping Patterns - Simultaneous Production Increases.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
10	Columbia	73.6	Columbia	73.6	.51
11	Atlanta	134.6	Atlanta	134.5	.51
12	Miami	184.5	Miami	184.5	.50
13	Montgomery	101.3	Montgomery	101.3	.50
14	Jackson	68.9	Jackson	68.9	.49
15	Little Rock	55.8	Little Rock	55.8	.49
16	Los Angeles	353.1	Los Angeles	353.1	.45
17	San Francisco	223.1	San Francisco	223.1	.46

where the increase was greater to investigate the possibility of shipping from there to Alaska (Table 25). The total increase was 188.0 trucks per week, a 3.3 percent increase in total United States egg production.

Equilibrium retail prices in all regions were lower than the 1968 equilibrium prices (Table 26). The average U. S. retail price declined 5.9 percent. The retail price impacts within each of the deficit regions that increased production were less than the production increases, except in Washington. Both northern and southern California had substantial retail price declines with unchanged production.

Regional farm prices would have followed the same pattern as regional retail prices. Comparisons were made for the regions that changed production and for both parts of California (Table 27). The declines were less than the production changes except in Washington and Montana.

The trade flows were similar to the ones under the previous production alternatives in this chapter (Table 28). Phoenix and Albuquerque both shipped eggs to Wichita as they were indifferent because of equal prices. Los Angeles continued to ship eggs into these two regions as well as supplying all of the deficits in Oklahoma City and Las Vegas. San Francisco egg shipments went to Anchorage and Honolulu with some small shipments going to Montana, Wyoming, Utah, and Portland, Oregon. Washington eggs did not flow to Anchorage, but to Sioux Falls.

This production alternative would have resulted in increased revenues for those regions increasing production with the exception of Washington and Montana. Producers in both sections of California would have suffered substantial losses under this production situation.

Table 25. Egg Production for Simultaneous Increases in Southwestern and Western Deficit Regions.

Region	Production	Percentage Change in 1968 Production
	Trucks/Week	
Texas	318.3	34.0
New Mexico	29.0	106.0
Arizona	49.1	127.0
Colorado	58.3	114.0
Wyoming	9.0	150.0
Utah	30.1	22.0
Idaho	20.2	14.0
Montana	20.1	7.5
Oregon	58.8	23.0
Washington	99.9	9.5

Table 26. Retail Price Comparisons for the U.S. - 1968 Equilibrium and Equilibrium with Southwestern and Western Production Changes.

Region	Trade City	1968 Equilibrium Price	Equilibrium Price-Production Changes	% Change in 1968 Price
		Cents/Dozen	Cents/Dozen	
1	Portland, Me.	55.7	53.0	-4.8
2	Indianapolis	53.1	50.2	-5.5
3	Minneapolis	51.9	49.1	-5.4
4	Des Moines	52.1	49.3	-5.4
5	Fargo	51.2	48.4	-5.5
6	Sioux Falls	51.8	48.8	-5.8
7	Omaha	51.7	48.9	-5.4
8	Wichita	51.9	49.0	-5.6
9	Charlotte	53.5	50.7	-5.2
10	Columbia	53.2	50.4	-5.3
11	Atlanta	52.8	50.0	-5.3
12	Miami	51.3	48.6	-5.3
13	Montgomery	52.3	49.5	-5.4
14	Jackson	51.6	48.9	-5.2
15	Little Rock	51.2	48.8	-4.7
16	Los Angeles	48.3	44.9	-7.0
17	San Francisco	48.1	44.4	-7.8
18	Boston	55.8	53.0	-5.0
19	New York	55.2	52.4	-5.1

Table 26. (Continued).

Region	Trade City	1968 Equilibrium Price	Equilibrium Price-Production Changes	% Change in 1968 Price
		Cents/Dozen	Cents/Dozen	
20	Cleveland	53.9	51.1	-5.2
21	Chicago	52.9	50.1	-5.3
22	Detroit	53.3	50.9	-4.5
23	Milwaukee	52.7	49.9	-5.3
24	St. Louis	52.6	49.7	-5.5
25	Baltimore	54.6	51.8	-4.4
26	Norfolk	54.1	51.4	-5.0
27	Charleston	53.3	50.5	-5.2
28	Louisville	53.1	50.2	-5.5
29	Memphis	51.9	49.0	-5.6
30	New Orleans	51.9	49.2	-5.2
31	Oklahoma City	52.2	48.9	-6.3
32	Dallas	52.4	49.0	-6.5
33	Great Falls	51.5	47.9	-7.0
34	Boise City	49.9	46.2	-6.6
35	Cheyenne	51.6	48.0	-7.0
36	Denver	51.5	48.2	-6.4
37	Albuquerque	50.6	47.2	-6.7
38	Phoenix	48.2	45.9	-6.7
39	Salt Lake City	50.2	46.6	-7.2
40	Las Vegas	48.9	45.6	-6.7

Table 26. (Continued).

Region	Trade City	1968 Equilibrium Price	Equilibrium Price-Production Changes	% Change in 1968 Price
		Cents/Dozen	Cents/Dozen	
41	Portland, Ore.	49.9	46.2	-7.4
42	Seattle	49.8	44.3	-10.0
43	Anchorage	65.9	62.2	-5.6
44	Honolulu	58.1	54.4	-6.4
	U.S.	X = 52.5	X = 49.4	-5.9

Table 27. Farm Price Comparisons for Western and Southwestern Regions - 1968 Equilibrium and Equilibrium with Southwestern and Western Production Changes.

Region	Trade City	1968 Equilibrium	Equilibrium-Production Changes	% Change in 1968 Price
		Cents/Dozen	Cents/Dozen	
32	Dallas	36.2	32.8	-9.4
33	Great Falls	32.1	28.5	-11.2
34	Boixe City	30.5	26.8	-12.1
35	Cheyenne	32.0	28.4	-11.2
36	Denver	31.9	28.6	-10.3
37	Albuquerque	34.4	31.0	- 9.9
38	Phoenix	29.6	26.3	-11.1
39	Salt Lake City	30.6	27.0	-11.8
41	Portland, Ore.	30.5	26.8	-12.1
42	Seattle	30.4	24.9	-18.1
16	Los Angeles	28.7	25.3	-11.8
7	San Francisco	32.1	28.4	-11.5
	U.S. X	33.6	30.5	- 9.2

Table 28. Shipping Patterns - Simultaneous Production Increases in Southwestern and Western Deficit Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
1	Portland, Me.	50.4	Portland, Me.	50.4	.53
18	Boston	302.7	Boston	133.6	.53
			Portland, Me.	82.0	.53
			Indianapolis	87.1	.50
19	New York	1105.8	New York	564.8	.52
			Indianapolis	161.8	.50
			Columbia	1.4	.50
			Atlanta	247.0	.50
			Montgomery	63.9	.50
			Jackson	66.9	.49
20	Cleveland	319.4	Cleveland	193.2	.51
			Indianapolis	5.6	.50
			Omaha	51.6	.49
			Wichita	69.0	.49
21	Chicago	332.3	Chicago	162.8	.50
			Minneapolis	89.4	.49
			Des Moines	73.0	.49
			Omaha	7.1	.49
22	Detroit	255.5	Detroit	134.0	.51
			Des Moines	121.5	.49

Table 28. (Continued). Increases in Southwestern and Western Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
23	Milwaukee	122.8	Milwaukee	109.6	.50
			Minneapolis	7.0	.49
			Fargo	6.2	.48
24	St. Louis	136.8	St. Louis	25.3	.50
			Sioux Falls	84.0	.49
			Little Rock	27.5	.49
25	Baltimore	152.2	Baltimore	9.2	.52
			Charlotte	126.0	.51
			Jackson	17.0	.49
26	Norfolk	138.2	Norfolk	91.3	.51
			Columbia	27.1	.49
			Miami	19.8	.49
27	Charleston	54.1	Charleston	27.2	.50
			Montgomery	26.9	.50
28	Louisville	98.9	Louisville	61.5	.50
			Little Rock	37.4	.49
29	Memphis	121.1	Little Rock	121.1	.49
30	New Orleans	117.5	New Orleans	67.3	.49
			Jackson	50.2	.49
31	Oklahoma City	72.0	Oklahoma City	45.9	.49
			Los Angeles	26.1	.45

Table 28. (Continued). Increases in Southwestern and Western Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
32	Dallas	332.5	Dallas	318.3	.49
			Los Angeles	14.2	.45
33	Great Falls	21.8	Great Falls	20.1	.48
			San Francisco	1.7	.44
34	Boise City	21.6	Boise City	20.2	.46
			San Francisco	1.4	.44
35	Cheyenne	9.9	Cheyenne	9.0	.48
			San Francisco	.9	.44
36	Denver	58.3	Denver	58.3	.48
37	Albuquerque	31.9	Los Angeles	31.9	.45
38	Phoenix	49.7	Phoenix	21.7	.46
			Los Angeles	28.0	.45
39	Salt Lake City	31.7	Salt Lake City	30.1	.47
			San Francisco	1.6	.44
40	Las Vegas	14.3	Las Vegas	.5	.46
			Los Angeles	13.8	.45
41	Portland, Ore.	63.5	Portland, Ore.	58.8	.46
			San Francisco	4.7	.44

Table 28. (Continued). Increases in Southwestern and Western Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
42	Seattle	97.1	Seattle	97.1	.44
43	Anchorage	10.5	Anchorage	.7	.62
			San Francisco	9.8	.44
44	Honolulu	24.1	Honolulu	18.0	.54
			San Francisco	6.1	.44
2	Indianapolis	155.1	St. Louis	90.7	.50
			Memphis	64.4	.49
3	Minneapolis	102.4	Minneapolis	102.4	.49
4	Des Moines	78.6	Des Moines	78.6	.49
5	Fargo	18.1	Fargo	18.1	.48
6	Sioux Falls	17.9	Sioux Falls	15.1	.49
			Seattle	2.8	.44
7	Omaha	40.9	Omaha	40.9	.49
8	Wichita	66.1	Wichita	9.7	.49
			Albuquerque	29.0	.48
			Phoenix	27.4	.46
9	Charlotte	144.2	Charlotte	109.2	.51
			Memphis	35.0	.49

Table 28. (Continued). Increases in Southwestern and Western Regions.

Region	Trade City	Quantity Eggs Demanded Per Week	Suppliers	Quantity Eggs Supplied Per Week	Price Per Dozen Eggs
		Trucks		Trucks	Dollars
10	Columbia	73.8	Columbia	73.8	.50
11	Atlanta	134.9	Atlanta	134.9	.50
12	Miami	185.1	Miami	185.1	.49
13	Montgomery	101.5	Montgomery	101.7	.50
14	Jackson	69.1	Jackson	69.1	.49
15	Little Rock	56.1	Little Rock	56.1	.49
16	Los Angeles	354.0	Los Angeles	354.0	.45
17	San Francisco	226.4	San Francisco	226.4	.44

CHAPTER VI

SUMMARY

The purpose of this thesis has been to estimate regional equilibrium egg prices and interregional egg shipments under alternate levels of production. The production alternatives simulated were as follows: a uniform three percent production increase in the U. S., a ten percent production increase in Southern surplus regions, production increases and decreases in southern California, and selected production increases in Southwestern and Western deficit regions.

Southern California and adjacent Western regions were of primary concern. Southern California has been faced with problems of overproduction, low prices, and high transportation costs for shipping eggs to the large Northeastern deficit regions. In addition, there have been possibilities of production increases in deficit regions that are primary markets for southern California's surplus eggs.

The prices estimated by the reactive programming model for 1968 conditions compared favorably with actual prices (Table 9). The 1968 equilibrium prices and the actual prices were used as standards of comparison when measuring price impacts resulting from production changes. Data on actual trade flows was unavailable, therefore, no realistic comparisons could be made with the model's interregional egg shipments.

Optimum interregional egg shipments for 1968 showed the Northeastern deficit regions to be the best markets for the South and the Midwest. Metropolitan regions along the Great Lakes were also the best markets for the Midwest. Variances in these shipping patterns were small under all production alternatives because the large population centers always had a strong demand for eggs and the Midwest and the South were close to these deficit regions in terms of transportation costs.

Markets for southern California's surplus eggs changed as production was varied. For 1968 conditions, Arizona, Colorado, Nevada, New Mexico, Oklahoma, and Texas were the best markets for the excess supply. When only southern California production was increased, the bulk of the additional eggs were shipped to Texas and Oklahoma. Egg shipments to these two regions were reduced when production was decreased. Separate production increases in Arizona and Colorado caused the southern California eggs to be diverted to Texas and Oklahoma. A production increase in Texas diverted the southern California eggs to Hawaii.

Simultaneous production increases in Arizona, Colorado, Texas, and southern California, varied the shipping patterns greatly. Colorado and Texas continued to receive small shipments of eggs from southern California. The big change was Arizona shipping eggs to Kansas. Southern California continued to ship a large quantity of eggs to Arizona as well as more eggs to Oklahoma, Utah, and Hawaii.

Production increases in all of the Southwestern and Western deficit regions did not change the shipping patterns appreciably from

the previous equilibrium. The best markets for Southern California were Oklahoma, Arizona, and Nevada. Arizona continued to ship to Kansas.

The price impacts varied for each production alternative. When production increases were measured as a change in total U. S. production, average price decreased proportionally more. When production was decreased and measured as change in total production, average price increased proportionally more. The effects of production changes on prices were characteristic of the inelastic demand for eggs.

Production changes in only one region or a segment of several regions caused price effects that were characteristic of an elastic demand. Production increases were accompanied by price decreases that were proportionally less. If production was held constant in all other regions, surplus regions increasing production were able to retain market shares in deficit regions while prices declined proportionally less. Deficit regions increasing production were able to force out other regions' surplus eggs with only small price declines.

In the model, Southern surplus regions increased production 10 percent with only an average price decline of 4.9 percent, thus increasing total revenue. Southern California was also able to add to total revenue by increasing production. For example, a 10 percent production increase was accompanied by a 3.5 percent decline in farm price and a 1.7 percent decline in retail price. Total revenue would have declined when production decreased as prices did not increase proportionally more.

For example, a 10 percent production decrease was accompanied by only a 3.3 percent increase in farm price and a 4.9 percent increase in retail price.

Production increases in the deficit regions of Arizona, Colorado, and Texas indicated that total revenue would have increased in the regions as prices declined proportionally less. Southern California was adversely affected under the conditions of respective and simultaneous production increases in the three regions. Farm and retail prices in southern California declined from 1.0 to 3.0 percent with the respective increases. Farm price declined 11.1 percent and retail price 7.0 percent when simultaneous increases occurred.

Production increases in all of the Southwestern and Western deficit regions indicated that total revenue would have increased in every region except Washington and Montana. Prices fell proportionally less than the production increases. Again, southern California was adversely affected as they were forced out of some of the markets. Its farm price decreased 11.5 percent and its retail price 7.0 percent.

The investigations of production alternatives indicated that the U. S. egg industry as a whole would experience lower prices and total revenue when production increased. The converse occurred when production decreased. However, price impacts for the production alternatives indicated that both surplus and deficit region would increase total revenue when they increased production. The restraining factors for the surplus regions would be constant production in all other regions and

the accuracy of the optimum interregional trade flows, which do appear to be logical and realistic. Deficit regions would be able to increase production to at least equal consumption before any adverse affects would occur.

The surplus situation would apply to southern California producers while the deficit situation would apply to Arizona producers.

APPENDIX

TABULATED DATA, OPTIMUM INTERREGIONAL EGG SHIPMENTS IN TRUCKLOADS PER WEEK

Optimum egg trades are presented here in tables from the egg exporters' point of view. Equilibrium egg shipments from each exporting region are shown. Optimum egg trades for actual 1968 production data and then optimum egg trades under the alternate levels of production are presented.

The first column of the table shows the origin of the eggs. The following columns show the destination and quantity of eggs shipped.

Appendix Table 1. Optimum Interregional Egg Shipments in Truckloads Per Week - 1968 Equilibrium.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.4				
Indianapolis	Boston	57.7	New York	140.0	Cleveland	56.7
Minneapolis	Chicago	96.7	Milwaukee	2.9		
Des Moines	Boston	19.5	Chicago	63.0	Detroit	114.3
Fargo	Milwaukee	6.7				
Sioux Falls	St. Louis	81.8				
Omaha	Cleveland	60.0				
Wichita	Oklahoma City	14.6				
Charlotte	Baltimore	95.2				
Columbia	New York	12.8	Norfolk	17.8		
Atlanta	New York	250.9				
Miami	Norfolk	25.2				
Montgomery	New York	68.5	Charleston	25.3		
Jackson	Louisville	7.9	New York	37.9	Baltimore	43.5

Appendix Table 1. (Continued).

Jackson	New Orleans	46.8					
Little Rock	Louisville	26.4	Memphis	103.4	Dallas	57.9
Los Angeles	Oklahoma City	8.9	Dallas	24.7	Cheyenne	5.9
Los Angeles	Denver	29.7	Albuquerque	16.6	Phoenix	26.3
Los Angeles	Salt Lake City	2.9	Las Vegas	13.2		
San Francisco	Great Falls	2.3	Boise	3.0	Salt Lake	2.9
San Francisco	Portland	13.1	Anchorage	9.5	Honolulu	5.3
St. Louis	Indianapolis	65.1				
Memphis	Indianapolis	85.4				

Appendix Table 2. Optimum Interregional Egg Shipments in Truckloads Per Week - A 3 Percent Increase in 1968 Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	86.0				
Indianapolis	Boston	59.0	New York	159.9	Cleveland	43.2
Minneapolis	Chicago	99.5	Milwaukee	3.0		
Des Moines	Boston	20.1	Chicago	65.0	Detroit	117.6
Fargo	Milwaukee	6.9				
Sioux Falls	St. Louis	84.3				
Omaha	Cleveland	61.8				
Wichita	Cleveland	15.1				
Charlotte-	Baltimore	98.2				
Columbia	New York	13.1	Norfolk	18.5		
Atlanta	New York	258.5				
Miami	Norfolk	25.8				
Montgomery	New York	70.6	Charleston	26.1		
Jackson	New York	21.9	Baltimore	44.6	Louisville	25.5

Appendix Table 2. (Continued)

Jackson	New Orleans	48.3					
Little Rock	Louisville	10.0	Memphis	106.5		Dallas	77.0
Los Angeles	Oklahoma City	24.3	Dallas	8.4		Cheyenne	6.1
Los Angeles	Denver	30.6	Albuquerque	17.2		Phoenix	27.2
Los Angeles	Salt Lake City	3.8	Las Vegas	13.7			
San Francisco	Great Falls	2.3	Boise	3.2		Salt Lake City	2.3
San Francisco	Portland	13.6	Anchorage	9.7		Honolulu	5.4
St. Louis	Indianapolis	67.1					
Memphis	Indianapolis	88.0					

Appendix Table 3. Optimum Interregional Egg Shipments in Truckloads Per Week - A 10 Percent Production Increase in Southern Surplus Regions.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	82.1				
Indianapolis	Boston	86.4	New York	96.3	Cleveland	71.8
Minneapolis	Chicago	89.7	Milwaukee	6.9		
Des Moines	Chicago	73.6	Detroit	121.1		
Fargo	Milwaukee	6.2				
Sioux Falls	St. Louis	81.3				
Omaha	Cleveland					
Wichita	Cleveland	65.7	Oklahoma City	5.4		
Charlotte	Baltimore	114.8				
Columbia	New York	32.8	Norfolk	6.0		
Atlanta	New York	285.4				
Miami	Norfolk	25.8				
Montgomery	New York	83.6	Charleston	26.7		
Jackson	New York	40.8	Baltimore	28.0	Louisville	35.8

Appendix Table 3. (Continued).

Jackson	New Orleans	50.0					
Little Rock	Louisville	1.2	Memphis	115.4		Oklahoma City	2.3
Little Rock	Dallas	91.6					
Los Angeles	Oklahoma City	10.0	Cheyenne	6.1		Denver	31.1
Los Angeles	Albuquerque	17.4	Phoenix	27.6		Salt Lake City	6.6
Los Angeles	Honolulu	5.8	Las Vegas	13.6			
San Francisco	Great Falls	2.4	Boise	3.4		Anchorage	14.4
San Francisco	Seattle	1.3	Honolulu	9.6			
St. Louis	Indianapolis	60.7					
Memphis	Indianapolis	94.0					

Appendix Table 4. Optimum Interregional Egg Shipments in Truckloads Per Week - Simultaneous Production Increases in Arizona, Colorado, Texas and Southern California.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	82.1				
Indianapolis	Boston	86.4	New York	154.9	Cleveland	13.2
Minneapolis	Chicago	90.2	Milwaukee	6.6		
Des Moines	Chicago	73.8	Detroit	120.9		
Fargo	Milwaukee	6.2				
Sioux Falls	St. Louis	81.3				
Omaha	Cleveland	54.2	Chicago	4.6		
Wichita	Cleveland	57.9				
Charlotte	Baltimore	126.5				
Columbia	New York	2.6	Norfolk	26.1		
Atlanta	New York	247.4				
Miami	Norfolk	20.4				
Montgomery	New York	64.4	Charleston	26.7		
Jackson	New York	16.0	New Orleans	49.8		

Appendix Table 4. (Continued).

Little Rock	St. Louis	28.9	Louisville	36.9	Memphis	120.5
Los Angeles	Oklahoma City	25.9	Dallas	13.3	Great Falls	2.9
Los Angeles	Cheyenne	6.2	Denver	5.2	Albuquerque	31.8
Los Angeles	Phoenix	31.5	Salt Lake City	6.9	Las Vegas	13.7
Los Angeles	Honolulu	6.0				
San Francisco	Boise	3.6	Portland, Ore.	14.7	Seattle	1.8
San Francisco	Anchorage	9.8				
St. Louis	Indianapolis	90.0				
Memphis	Indianapolis	64.4				
Albuquerque	Wichita	14.1				
Phoenix	Wichita	31.0				

Appendix Table 5. Optimum Interregional Egg Shipments in Truckloads Per Week - Simultaneous Production Increases in Southwestern and Western Deficit Regions.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	82.0				
Indianapolis	Boston	87.1	New York	161.8	Cleveland	5.6
Minneapolis	Chicago	89.4	Milwaukee	7.0		
Des Moines	Chicago	73.0	Detroit	121.5		
Fargo	Milwaukee	6.2				
Sioux Falls	St. Louis	84.0				
Omaha	Cleveland	51.6	Chicago	7.2		
Wichita	Cleveland	69.0				
Charlotte	Baltimore	126.0				
Columbia	New York	1.4	Norfolk	27.1		
Atlanta	New York	247.0				
Miami	Norfolk	19.9				
Montgomery	New York	63.9	Charleston	26.9		
Jackson	New York	66.9	Baltimore	17.1	New Orleans	50.2

Appendix Table 5. (Continued).

Little Rock	St. Louis	27.5	Louisville	37.4	Memphis	121.1
Los Angeles	Oklahoma City	26.1	Dallas	14.2	Albuquerque	31.9
Los Angeles	Phoenix	28.1	Las Vegas	13.8		
San Francisco	Great Falls	1.7	Boise	1.4	Cheyenne	1.0
San Francisco	Salt Lake City	1.6	Portland, Ore.	4.7	Anchorage	9.8
San Francisco	Honolulu	6.1				
St. Louis	Indianapolis	90.6				
Memphis	Charlotte	34.9	Indianapolis	64.5		
Albuquerque	Wichita	29.0				
Phoenix	Wichita	27.4				
Seattle	Sioux Falls	2.8				

Appendix Table 6. Optimum Interregional Egg Shipments in Truckloads Per Week - A 5 Percent Decrease in Southern California Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.6				
Indianapolis	Boston	52.8	New York	146.3	Cleveland	55.4
Minneapolis	Chicago	97.7	Milwaukee	2.2		
Des Moines	Boston	23.1	Chicago	60.6	Detroit	113.3
Fargo	Milwaukee	6.8				
Sioux Falls	St. Louis	81.8				
Omaha	Cleveland	60.2				
Wichita	Oklahoma City	14.9				
Charlotte	Baltimore	95.8				
Columbia	New York	14.6	Norfolk	16.3		
Atlanta	New York	251.4				
Miami	Norfolk	26.1				
Montgomery	New York	69.2	Charleston	25.1		
Jackson	New York	24.2	Baltimore	42.2	New Orleans	46.3

Appendix Table 6. (Continued).

Little Rock	Louisville	10.5	Memphis	102.0	Dallas	75.6
Los Angeles	Oklahoma City	8.4	Dallas	5.8	Cheyenne	5.8
Los Angeles	Denver	29.4	Albuquerque	16.5	Phoenix	26.1
Los Angeles	Salt Lake City	1.2	Las Vegas	13.2		
San Francisco	Great	2.2	Boise City	2.9	Salt Lake City	4.5
San Francisco	Portland, Ore.	12.8	Anchorage	9.4	Honolulu	5.2
St. Louis	Indianapolis	65.5				
Memphis	Indianapolis	84.5				

Appendix Table 7. Optimum Interregional Egg Shipments in Truckloads Per Week - A 10 Percent Decrease in Southern California Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.7				
Indianapolis	Boston	50.8	New York	149.0	Cleveland	54.7
Minneapolis	Chicago	97.9	Milwaukee	2.2		
Des Moines	Boston	24.4	Chicago	60.0	Detroit	112.9
Fargo	Milwaukee	6.8				
Sioux Falls	St. Louis	81.9				
Omaha	Cleveland	60.2				
Wichita	Oklahoma City	15.3				
Charlotte	Baltimore	96.2				
Columbia	New York	15.7	Norfolk	15.4		
Atlanta	New York	251.9				
Miami	Norfolk	26.6				
Montgomery	New York	69.6	Charleston	24.9		
Jackson	New York	16.4	Baltimore	41.5	Louisville	33.0

Appendix Table 7. (Continued).

Jackson	New Orleans	45.9					
Little Rock	Memphis	100.1	Oklahoma	7.5	Dallas	80.0	
Los Angeles	Cheyenne	3.0	Denver	28.8	Albuquerque	16.1	
Los Angeles	Phoenix	25.5	Las Vegas	13.0			
San Francisco	Great Falls	1.9	Boise City	2.7	Cheyenne	2.7	
San Francisco	Salt Lake City	5.4	Portland, Ore.	12.2	Anchorage	9.3	
San Francisco	Honolulu	5.0					
St. Louis	Indianapolis	66.3					
Memphis	Indianapolis	83.1					

Appendix Table 8. Optimum Interregional Egg Shipments in Truckloads Per Week - A 10 Percent Increase in Southern California Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.1				
Indianapolis	Boston	67.1	New York	127.8	Cleveland	59.6
Minneapolis	Chicago	94.8	Milwaukee	3.9		
Des Moines	Boston	12.7	Chicago	67.4	Detroit	116.1
Fargo	Milwaukee	6.6				
Sioux Falls	St. Louis	81.6				
Omaha	Cleveland	59.7				
Wichita	Oklahoma City	14.1				
Charlotte	Baltimore	114.8				
Columbia	New York	10.0	Norfolk	20.0		
Atlanta	New York	249.9				
Miami	Norfolk	23.9				
Montgomery	New York	67.4	Charleston	25.7		
Jackson	New York	63.1	Baltimore	25.1	New Orleans	47.6

Appendix Table 8. (Continued).

Little Rock	St. Louis	9.4	Louisville	35.4	Memphis	118.5
Little Rock	Dallas	24.0				
Los Angeles	Oklahoma City	10.1	Dallas	61.8	Cheyenne	6.0
Los Angeles	Denver	30.2	Albuquerque	16.9	Phoenix	26.8
Los Angeles	Salt Lake City	6.1	Las Vegas	13.4		
San Francisco	Great Falls	2.4	Boise City	3.2	Portland, Ore.	13.6
San Francisco	Anchorage	9.5	Honolulu	5.2		
St. Louis	Indianapolis	73.1				
Memphis	Indianapolis	78.7	Charlotte	20.7		

Appendix Table 9. Optimum Interregional Egg Shipments in Truckloads Per Week - A 5 Percent Increase in Southern California Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.3				
Indianapolis	Boston	61.8	New York	134.5	Cleveland	58.2
Minneapolis	Chicago	95.8	Milwaukee	3.3		
Des Moines	Boston	16.5	Chicago	65.0	Detroit	115.0
Fargo	Milwaukee	6.6				
Sioux Falls	St. Louis	81.7				
Omaha	Cleveland	59.8				
Wichita	Oklahoma City	14.4				
Charlotte	Baltimore	99.7				
Columbia	New York	11.4	Norfolk	18.9		
Atlanta	New York	250.4				
Miami	Norfolk	24.5				
Montgomery	New York	68.0	Charleston	25.5		
Jackson	New York	49.4	Baltimore	39.5	New Orleans	47.1

Appendix Table 9. (Continued).

Little Rock	Louisville	34.9	Memphis	110.7	Dallas	41.9
Los Angeles	Oklahoma City	9.6	Dallas	42.6	Cheyenne	5.9
Los Angeles	Denver	29.9	Albuquerque	16.7	Phoenix	26.5
Los Angeles	Salt Lake City	5.0	Las Vegas	13.3		
San Francisco	Great Falls	2.4	Boise City	3.1	Salt Lake City	1.0
San Francisco	Portland, Ore.	13.4	Anchorage	9.5	Honolulu	5.4
St. Louis	Indianapolis	64.3				
Memphis	Indianapolis	86.9	Charoltte	5.2		

Appendix Table 10. Optimum Interregional Egg Shipments in Truckloads Per Week. A 1 Percent Increase in Southern California Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.4				
Indianapolis	Boston	58.6	New York	138.8	Cleveland	57.1
Minneapolis	Chicago	96.5	Milwaukee	2.9		
Des Moines	Boston	18.9	Chicago	63.4	Detroit	114.4
Fargo	Milwaukee	6.7				
Sioux Falls	St. Louis	81.7				
Omaha	Cleveland	60.0				
Wichita	Oklahoma City	14.6				
Charlotte	Baltimore	95.1				
Columbia	New York	12.6	Norfolk	17.9		
Atlanta	New York	250.8				
Miami	Norfolk	25.2				
Montgomery	New York	68.4	Charleston	25.4		
Jackson	New York	40.4	Baltimore	43.8	Louisville	5.0

Appendix Table 10. (Continued).

Jackson	New Orleans	46.9					
Little Rock	Louisville	29.5	Memphis	103.9		Dallas	54.3
Los Angeles	Oklahoma City	9.0	Dallas	28.7		Cheyenne	5.9
Los Angeles	Denver	29.7	Albuquerque	16.6		Phoenix	26.3
Los Angeles	Salt Lake City	3.2	Las Vegas	13.2			
San Francisco	Great Falls	2.9	Boise City	3.0		Salt Lake City	2.6
San Francisco	Portland, Ore.	13.1	Anchorage	9.5		Honolulu	5.3
St. Louis	Indianapolis	64.8					
Memphis	Indianapolis	85.9					

Appendix Table 11. Optimum Interregional Egg Shipments in Truckloads Per Week. - A 127 Percent Increase In Arizona Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.2				
Indianapolis	Boston	62.7	New York	133.3	Cleveland	58.5
Milwaukee	Chicago	95.7	Milwaukee	3.4		
Des Moines	Boston	15.9	Chicago	65.4	Detroit	115.2
Fargo	Milwaukee	6.6				
Sioux Falls	St. Louis	81.7				
Omaha	Cleveland	59.8				
Wichita	Oklahoma City	15.1				
Charlotte	Baltimore	102.2				
Columbia	New York	11.1	Norfolk	19.2		
Atlanta	New York	250.3				
Miami	Norfolk	24.4				
Montgomery	New York	67.9	Charleston	25.5		
Jackson	New York	51.7	Baltimore	37.1	New Orleans	47.2

Appendix Table 11. (Continued).

Little Rock	Louisville	35.1	Memphis	113.5	Dallas	38.9
Los Angeles	Oklahoma City	8.9	Dallas	45.8	Cheyenne	5.9
Los Angeles	Denver	30.0	Albuquerque	16.8	Salt Lake City	5.0
Los Angeles	Las Vegas	13.3				
San Francisco	Great Falls	2.4	Boise City	3.1	Salt Lake City	1.0
San Francisco	Portland, Ore.	13.4				
St. Louis	Indianapolis	64.3				
Memphis	Indianapolis	87.1				

Appendix Table 12. Optimum Interregional Egg Shipments in Truckloads Per Week - A 93 Percent Increase in Arizona Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.3				
Indianapolis	Boston	62.5	New York	134.0	Cleveland	58.1
Minneapolis	Chicago	95.6	Milwaukee	3.4		
Des Moines	Boston	15.9	Chicago	65.4	Detroit	115.2
Fargo	Milwaukee	6.6				
Sioux Falls	St. Louis	81.7				
Omaha	Cleveland	59.8				
Wichita	Oklahoma City	14.5				
Charlotte	Baltimore	99.5				
Columbia	New York	11.6	Norfolk	18.8		
Atlanta	New York	250.4				
Miami	Norfolk	24.8				
Montgomery	New York	68.0	Charleston	25.5		

Appendix Table 12. (Continued).

Jackson	New York	49.2	Baltimore	39.7	New Orleans	47.1
Little Rock	Louisville	34.8	Memphis	110.4	Dallas	42.4
Los Angeles	Oklahoma City	9.3	Dallas	41.6	Cheyenne	5.9
Los Angeles	Denver	29.8	Albuquerque	16.7	Phoenix	6.3
Los Angeles	Salt Lake City	3.9	Las Vegas	13.3		
San Francisco	Great Falls	2.3	Boise City	3.1	Salt Lake City	2.0
San Francisco	Portland, Ore.	13.3	Anchorage	9.5	Honoululu	5.3
St. Louis	Indianapolis	64.2				
Memphis	Indianapolis	87.0				

Appendix Table 13. Optimum Interregional Egg Shipments in Truckloads Per Week - A 115 Percent Increase In Colorado Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	83.2				
Indianapolis	Boston	63.7	New York	132.2	Cleveland	58.6
Minneapolis	Chicago	95.4	Milwaukee	3.6		
Des Moines	Boston	15.1	Chicago	65.9	Detroit	115.4
Fargo	Milwaukee	6.6				
Sioux Falls	St. Louis	81.7				
Omaha	Cleveland	59.8				
Wichita	Oklahoma City	15.0				
Charlotte	Baltimore	104.6				
Columbia	New York	11.1	Norfolk	19.2		
Atlanta	New York	250.2				
Miami	Norfolk	24.5				
Montgomery	New York	67.8	Charleston	25.6		

Appendix Table 13. (Continued).

Jackson	New York	53.7	Baltimore	34.9	New Orleans	47.2
Little Rock	Louisville	35.1	Memphis	116.2	Dallas	36.2
Los Angeles	Oklahoma City	9.0	Dallas	48.7	Cheyenne	5.9
Los Angeles	Albuquerque	16.8	Phoenix	26.6	Salt Lake City	5.3
Los Angeles	Las Vegas	13.3				
San Francisco	Great Falls	2.4	Boise City	3.1	Portland, Ore.	13.5
San Francisco	Anchorage	9.5	Honolulu	5.4		
St. Louis	Indianapolis	64.1				
Memphis	Indianapolis	87.4				

Appendix Table 14. Optimum Interregional Egg Shipments in Truckloads Per Week - A 34 Percent Increase In Texas Production.

Origin	Destination	Qty.	Destination	Qty.	Destination	Qty.
Portland, Me.	Boston	82.8				
Indianapolis	Boston	75.3	New York	120.0	Cleveland	59.2
Minneapolis	Chicago	93.0	Milwaukee	4.9		
Des Moines	Boston	6.5	Chicago	71.4	Detroit	117.8
Fargo	Milwaukee	6.4				
Sioux Falls	St. Louis	81.5				
Omaha	Cleveland	59.4				
Wichita	Cleveland	2.4	Oklahoma City	11.3		
Charlotte	Baltimore	134.7				
Columbia	New York	7.4	Norfolk	22.2		
Atlanta	New York	249.1				
Miami	Norfolk	22.6				
Montgomery	New York	66.4	Charleston	26.0		

Appendix Table 14. (Continued).

Jackson	New York	80.9	Baltimore	6.0	New Orleans	48.3
Little Rock	St. Louis	31.9	Louisville	35.9	Memphis	119.2
Los Angeles	Oklahoma City	13.3	Dallas	7.0	Cheyenne	6.0
Los Angeles	Denver	30.4	Albuquerque	17.1	Phoenix	27.0
Los Angeles	Salt Lake City	6.2	Las Vegas	13.4	Honolulu	2.4
San Francisco	Great Falls	2.5	Boise City	3.3	Portland, Ore.	13.9
San Francisco	Anchorage	9.6	Honolulu	3.2		
St. Louis	Indianapolis	94.8				
Memphis	Indianapolis	58.0	Charlotte	41.4		

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