An economic analysis of the marketing order for lemons and its impact on the domestic consumer, 1954-1975

AN ECONOMIC ANALYSIS OF THE MARKETING ORDER FOR LEMONS AND ITS IMPACT ON THE DOMESTIC CONSUMER, 1954-1975

by

Stephen Jon Nicolatus

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APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Roger W. Fox

ROGER W. FOX
Professor of Agricultural Economics

March 15, 1977

Date

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TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF ILLUSTRATIONS

ABSTRACT

The objective of this study was to examine the impact of the Lemon Marketing Order on the domestic consumer.

The major criticism of the Order has been that of "undue price enhancement" by means of the rate of flow provision.

Analyses of prices indicated the real retail price of fresh lemons has increased an average of 1.2 percent annually from 1954 through 1974. The data also indicated that although the on-tree price has shown a slightly higher annual percentage increase, the absolute differential between the price levels is increasing. About 68 percent of the retail price increase can be attributed to the marketing margins.

The shipment of fresh lemons into the domestic market has declined, especially for summer lemons. Per capita consumption of and expenditures on fresh lemons have declined.

The estimated retail price elasticities were elastic for summer lemons and near unity for winter lemons. Both seasons' on-tree elasticities were inelastic.

The significance of the estimated elasticities suggest that the Lemon Administrative Committee, making one set of decisions cannot simultaneously satisfy the domestic consumer and the grower.

CHAPTER I

INTRODUCTION

Marketing orders and agreements, which are a type of government involvement in agriculture are not new ideas. Although there is a legal difference between marketing orders and agreements, initially they will be treated as though they are synonymous; their differences will be discussed later. Marketing orders were part of the programs and policies initiated by the Agricultural Adjustment Act of 1933 (AAA). A primary goal of this act was to restore purchasing power to the farmer via higher farm prices, and marketing orders were one of the means proposed for reaching that goal. It's important to note that the complement to the A.A.A. of 1933 was the National Industrial Recovery Act (N.I.R.A.) which pertained to the nonfarm population. Both of these acts increased the government's role in American business, both agricultural and nonagricultural.

The basic provisions of the Agricultural Adjustment Act of 1933, with respect to marketing orders, were the result of the Peek Amendment. This amendment authorized the Secretary of Agriculture to enter into marketing agreements with producers, handlers, and processors of farm products. The amendment as drafted into the Act was more inclusive than originally proposed. The original plan was only to include basic commodities, such as wheat, cotton, corn, milk and its products and others designated basic by Congress, but with the urging of the American Farm

Bureau Federation the plan was extended to nonbasic crops such as fruits and vegetables. The influence of the California members was important in determining the actions of the American Farm Bureau. The California group represented many specialty crop growers who had already used the California Prorate Act as a means of orderly marketing (Benedict and Stine 1956).

The more inclusive plan also included a provision allowing the Secretary of Agriculture to issue licenses which compelled processors, associations of producers or others engaged in handling any agricultural product in interstate or foreign commerce to comply with the declared policy of the A.A.A. of 1933 or risk the loss of their business license (Benedict and Stine 1956, p. 369). The licensing provision of marketing agreements drew the brunt of the early criticism of the A.A.A. Many business groups opposed this provision, and violations became more prevalent and harder to deal with. For instance, any handler or processor who signed the marketing agreement was bound by the provisions contained in such an agreement whereas nonsignatories were bound to operate under licenses with similar provisions (Davis 1939, p. 254). The Secretary of Agriculture after determining that a particular offender had not complied with such provisions had the power to revoke the violator's business license. Not only did the legality of the Secretary's power to revoke business licenses draw skepticism from both sides, but other provisions in the A.A.A. were questioned such as processing taxes levied on processors, and floor taxes, which taxed stocks of floor (inventory) goods. This floor tax provided the Secretary the power to tax the inventory of goods that existed before the application of the processing tax.

It is also important to note that while certain provisions in the A.A.A. were questioned with respect to their legality, the same was true with some of the provisions in the National Industrial Recovery Act. A confrontation seemed likely and did occur in the case A. L. A. Schechter Poultry Corporation versus the United States in May of 1935. The Supreme Court ruled in favor of Schechter, and this virtually terminated the National Industrial Recovery Act. The concurring opinion of the Court was that Congress could not abdicate or transfer its legislative functions. It also sought to clarify the use of interstate commerce in many of the N.I.R.A. programs (Bartholomew 1968, p. 260).

Due to the similarity of the legal concepts used in N.I.R.A. and the A.A.A. the ruling in the Schechter case provided a stimulus to the amendments to the A.A.A. in 1935. The amendments sought to provide a clearer and broader definition of interstate commerce. Perhaps the most important change was the replacing of the licensing provision with that of an order. The Secretary could now issue orders in the regulation of marketing either as implementation of a marketing agreement or without a marketing agreement. The Secretary could no longer refuse or revoke a handler or processor's license for noncompliance. The punitive action consisted only of a fine, and not the loss of business. The amendments also sought to clarify the line of authority and remove the original vagueness that occurred in the A.A.A. of 1933 (Benedict and Stine 1956 p. 374).

In 1936, the A.A.A. encountered further legal entanglements with the case of United States versus Butler commonly known as the Hoosac Mills case. Fundamentally, the issue was whether or not the Secretary

of Agriculture, under the A.A.A. of 1933, had the right to assess a processing tax on the processors of cotton and a floor tax on inventories. In a 6-3 decision, the Supreme Court ruled that federal taxing in this case was not properly exercised. The opinion of the court was that the Act violated the rights reserved to the states and that a "statutory plan to regulate and control agricultural production" was a matter beyond the authorized power delegated to the Federal government (Bartholomew 1968, p. 308).

The Department of Agriculture held that the above case, though it partly invalidated the A.A.A. of 1933, did not apply to the provisions pertaining to marketing orders and agreements. For reassurance and in an effort to show the separability of the crop control features of the Act and the marketing features, the Agricultural Marketing Agreement Act (Public Law No. 137) was passed in 1937 (Benedict and Stine 1956, p. 375). This is the basic piece of legislation which governs all Federal marketing orders and agreements today.

States can create state marketing order programs under state legislation. The most important state in respect to state marketing order programs is California in which numerous programs have been established.

Marketing Orders and Agreements

Marketing orders authorized several types of activities. The principal types are listed and described below (U. S. Department of Agriculture 1975):

Regulation of Quality -- This regulation stipulates the quality that must be met before a commodity can be shipped to market. To accomplish this, minimum standards for grade, size, or maturity may be imposed before shipment into regulated trade channels. These requirements are subject to change, dependent upon supply, demand, or seasonal adjustments.

Regulation of Quantity -- Three general methods are used: (1) controlling the short-term rate of flow; (2) allocation of supplies between primary and other markets for the season; (3) alloting market shares to producers based upon sales during a base period.

Standardization of Containers or Packs -- Some orders permit regulations covering size, weight, capacity, and dimensions or pack of containers used by the industry.

Research and Development Programs -- This provision allows the industry to use marketing order funds to engage in production research, marketing research, and development projects which will improve the production, marketing distribution, and consumption of the commodity covered.

Unfair Trade Practices -- The terms of a marketing order may specify unfair methods of competition and trade practices which are prohibited.

Price Posting -- Handlers may be required to file their selling prices and give advance notice before changing them.

Marketing Information -- The Market Order Administrative Committee may be authorized to collect any statistical information needed in operating a marketing order program.

Up to this point, marketing orders and agreements have been treated as one in the same. More often than not both marketing orders and agreements are established together. If that is the case, the regulation and terminology is the same. There is, however, a difference. Marketing agreements are a contractual type of arrangement between handlers and the U. S. Department of Agriculture. The provisions of the marketing agreement are binding only on the signatories of the contract. Marketing orders, on the other hand, apply to all handlers and are established only after a required percentage of growers approve of such an order and after the Secretary conducts hearings on the proposed order.

Each marketing order is designed specifically for the needs of the particular industry. Marketing orders normally do not contain all of the provisions that were mentioned. For an example, the lemon marketing order utilizes the size, flow to market, and the research and development provisions. Other orders such as the California-Arizona grapefruit order utilize grade, size and research and development provisions. Some orders may be similar but usually each order is unique in its formulation, policies, and operations.

Controversy Over Marketing Orders

As was stated above, the main purpose of marketing orders is to insure a reasonable or fair return to the producer by means of the provisions authorized under such an order. This in turn is thought to insure a stable market for the consumer with a reasonable price and uniform quality standards.

In economic terms the concept of a perfectly competitive market is the only concept that can simultaneously satisfy producers and consumers interests and result in a Pareto optimal equilibrium, given that externalities are not present (Ferguson and Gould 1975, p. 472-73). It appears as though some marketing orders may create cartel types of arrangements (Jamison and Brandt 1965). That is, the order may lead to collaboration among producers and handlers of a particular commodity and the reduction of competition. Surely all the interests of the consumer cannot be fully satisfied under such an arrangement. The government's implied approval in allowing the possibility of cartel type arrangements seems in conflict with anti-trust legislation and much criticism has been leveled at the marketing order programs for this very reason.

Marketing orders have recently come under attack as a means of price enhancement and as a factor contributing to high food costs and inflation. Current investigations into marketing orders indicate growing public concern. Investigation is being conducted under the auspices of the Federal Trade Commission, The General Accounting Office, the anti-trust division of the Justice Department and others. Former Secretary Earl Butz appointed a panel comprised of producer, consumer, processor and government representatives to review regulatory programs and determine how they contribute to orderly marketing and the extent of their impact on farm prices and consumer prices (Marcy 1976).

Legislation that will affect marketing orders is being considered. Bills before Congress in 1976 that could affect marketing orders include the Competition Improvement Act, The Food Industry Anti-trust Reports Act, the Consumer's Cost Evaluation Act, the Consumer Protection Act and

a proposed establishment of a National Commission on Food Costs and Pricing (Baker 1976).

Analyses of the impacts of marketing orders on the domestic consumer would provide part of the information needed in order to evaluate effectively the marketing orders place in agricultural policy. It would be impossible to look at all marketing orders and their impacts on the domestic consumer so research was undertaken with respect to one specific order, the Lemon Marketing Order.

Prior research of the Lemon Marketing Order is virtually nonexistent. Hoos and Seltzer's (1952) investigation in respect to lemons is twenty-five years old and its main concern was the f.o.b. price level and optimum distribution between the fresh and processed markets. Smith (1961) investigated the long-run impact of the rate-of-flow provision on lemon supply. Jamison (1971) analyzed several commodities which operated under marketing order programs, including the lemon. His study dealt mainly with market structure and organization. He investigated product distribution, grower return, and total revenue. He did little analysis of the retail price of fresh lemons. A more recent government investigation initiated at President Ford's request unfortunately did not undertake any detailed empirical analysis (Godwin 1975). However, the report did label the Lemon Marketing Order as having the potential, if it hasn't already, "unduly enhanced prices."

The Lemon Marketing Order has been in existence since 1941. The basic provisions of the Lemon Marketing Order that affect the marketing of lemons are the minimum size requirements and the rate of flow provision. Although neither of these provisions directly affects the total

quantity produced, the lemons that enter the domestic market are under a minimum size requirement and the quantity which enters the domestic market is regulated on a weekly basis under the rate of flow provision. The Lemon Marketing Order is administered by the Lemon Administrative Committee. The Committee is composed of thirteen members and alternates for each member. Included on the Committee are eight growers, four handlers, and one member who is neither a grower or handler and is generally not associated with the lemon industry. Nominations are received by the Secretary of Agriculture who in turn selects the Committee members for a two-year term of office.

The Lemon Administrative Committee has the potential under the Lemon Marketing Order to "unduly enhance" the price of fresh lemons. Research into this area will help shed some light on the impact of the Lemon Order on the domestic consumer of fresh lemons.

Objectives and Procedures

The overall objective of this research is to evaluate the impact of the Lemon Marketing Order on domestic consumers in the fresh market. Specific objectives and procedures are dealt with on a chapter basis, with Chapter I serving as the introduction and background of the study.

Chapter II contains analyses of price movements over time at the retail, f.o.b., and on-tree-level for fresh lemons. The time period under observation was from 1953-54 through 1974-75. Price movements were analyzed using ordinary least-squares regressions. Price movements were also investigated with respect to movements in the general price level.

With the data on prices at the three levels, investigation was undertaken in Chapter III with respect to marketing margins. The main purpose was to isolate the affect the marketing margins had on the retail price. Margins were examined over time by the use of ordinary least-squares regressions in order to determine if any trend movements were discernable.

Analyses of price movements and margin movements were also conducted in three specific markets: New York, Atlanta, and Chicago. The three cities represented areas geographically separated from each other and also major consumption areas of fresh lemons.

Marketing orders purport to give the producer a reasonable price and in turn guarantee a stable supply for the consumer. Because of this, Chapter IV investigated changing quantities allocated into the domestic market in relation to the total quantity produced. Allocation into the export and processed market was also examined over time. The objective was to determine if there is any trend in the domestic allocation of lemons.

Per capita consumption was also examined in Chapter III in respect to trend movement over time both in a quantity sense and in a value sense.

The Lemon Marketing Order has a provision which authorizes the Lemon Administrative Committee the right to establish minimum size requirements. Chapter IV also investigated the size requirement provision and the distribution of different sizes of lemons into the fresh market over time.

The purpose of Chapter V was to determine the significant variables that affect the retail price of fresh lemons. The main concern of this study is on the domestic consumer so emphasis was placed on the retail level.

Ordinary least-squares regressions were run using the retail price of fresh lemons as the dependent variable. Price equations were run using linear and natural logarithmic functions with different combinations of independent variables in order to obtain the best fitted equation. Relevant flexibilities and elasticities such as price elasticity of demand and income elasticity were computed. Flexibilities and elasticities are important in studying the association between changing values of price, quantity, and income. The significance and the effect of the quantity consumed is especially important in analyzing the marketing orders impact on the retail price.

The last chapter, Chapter VI, draws together the results of the previous chapters and presents the conclusions. Chapter VI also discussed the limitations of the research and presents some considerations that must be dealt with in future studies of this type.

CHAPTER II

PRICE TRENDS AND RELATIONSHIPS

One of the most important aspects in the analysis of the Lemon Marketing Order is the examination of changes that have occurred with respect to price. The fact that the marketing order has existed since 1941 limits any useful analysis of price movements before and after the orders' existence, but analysis can help in determining the price changes and relationships over the last twenty-two years while operating under the marketing order.

There are four basic objectives in this chapter dealing with prices. The first is to determine the association between the price movements at all three levels: on-tree, f.o.b. and retail. Ordinary least-squares regressions using the price at one level as a function of another price level indicates how close price movements between the three levels are associated.

The second objective is to determine the year to year percentage price changes at all three levels. This was chosen as one measure of stability, in that large percentage price changes indicate less stability than small percentage price changes. The idea is to examine comparatively the stability of each of the price levels during the past two decades.

The third objective is to establish price trends at all three levels. Ordinary least-squares regressions in single equation form will

indicate whether the price has trended upward, downward or remained fairly constant over time. The examination of price trends while under the marketing order are not only important in establishing movements over time, but also in a comparative sense they indicate how each price level has moved with respect to the other price levels.

The last basic objective is to determine the association of lemon price movements and the general price level. The general price level was chosen as an indicator of overall inflation in the economy. Ordinary least-squares regressions with the general price level as the independent variable should indicate how strong the relationship is between overall inflation and lemon price movements.

Three price levels in both real and current dollars were investigated: the retail, f.o.b., and on-tree prices of fresh lemons. The retail price represents the weighted average annual price found in leading U. S. cities for fresh lemons (Appendix A). Retail price data were obtained in unpublished form from the Economic Research Service of the United States Department of Agriculture. The f.o.b. price is reported by the Statistical Reporting Service of the U. S. Department of Agriculture (1962-75) in their publication "Agricultural Prices, Citrus Prices" as the f.o.b. packed price. The on-tree price used in this study (also from "Agricultural Prices, Citrus Prices") represents the per carton return to the grower for the sale of fresh lemons. The important point to note is that all prices represent fresh sales. The Statistical Reporting Service also publishes prices and returns for processed lemons and all lemons, a combination of processed and fresh sales. In this study

on-tree returns to farmers indicate returns just from fresh sales, not all sales.

The common volume unit in this analysis is the carton. A carton of fresh lemons weighs approximately 38 pounds. This unit was chosen because it is most commonly referred to by the industry and in price reporting.

Price Relationships

Ordinary least-squares regressions were run, and as expected, the correlations between the various price levels were high. All prices in this case are in current dollars and the time period under observation ran from 1953-54 through 1974-75. Equations 1-3 in Table 1 indicate the results of the regressions.

In current dollars the explanatory power of the equations, represented by the high R^2 values indicate a rather close association between all three price levels. The strongest association was between the fresh on-tree price and the f.o.b. price level. All estimated "b" coefficients were significantly different from zero at a one percent level of significance.

Price movements were also examined using "real" prices instead of current. The deflator used was the G.N.P. implicit price deflator. Since the crop season under study differs from a calendar year, the use of an annual G.N.P. deflator based on the calendar year did not seem appropriate. The deflator used was computed by taking an average of the fourth, first, second and third quarter G.N.P. implicit price deflator (see Appendix B). The deflator, therefore, represents the months of

Table 1. Least square regressions of the retail, f.o.b. and on-tree prices of fresh lemons as a function of each other in real and current dollars -- 1953-54 through 1974-75.

Equation No.	Dependent Variable [a]		Constant Term	Independent Variable	R^2
Current:					
(1)	X_1	=	-.37847	+ .65155 X_2	.970
			(4.0605)	(26.131)*	
(2)	X_1	=	-.20411	+ .22226 X_3	.877
			(1.1080)	(12.264)*	
(3)	X_2	=	.17306	+ .35086 X_3	.959
			(1.0789)	(22.235)*	
Real:					
(4)	X_4	=	-1.72238	+ .92964 X_5	.969
			(-10.614)	(25.548)*	
(5)	X_4	=	-1.66198	+ .33897 X_6	.628
			(-2.4602)	(6.0352)*	
(6)	X_5	=	.03895	+ .36680 X_6	.657
			(.05668)	(6.4197)*	

a. X_1 = on-tree fresh price in current dollars
X_2 = f.o.b. price in current dollars
X_3 = retail fresh price in current dollars
X_4 = on-tree fresh price in real dollars
X_5 = f.o.b. price in real dollars
X_6 = retail fresh price in real dollars
"T" = statistics in parenthesis

* = significantly different from zero at a one percent level of significance.

October through the following September which is closer to the crop season used in the study (November - October) than a calendar year deflator. The results of the regression also are indicated in Table 1.

The association between the deflated on-tree and f.o.b. prices remained as strong as the case in which current dollars were used. The estimated "b" coefficients were significantly different from zero at a one percent level of significance in all cases, but the R^2 values dropped in the other two regressions.

In real dollars the explained variation is weakest in terms of the on-tree price movement and the retail price. The R^2 of this particular equation (4) was .628 contrasted to an R^2 of .877 which was obtained by running the same regression in current dollars. Similar results were obtained in the relationship between the f.o.b. price and the retail price (Equation 6). Generally, the weaker associations experienced in the later regression indicates the importance of other variables, especially with respect to movements in the retail price. The effect of the wholesale-retail margin may serve as a partial explanation. All margins will be examined later in this study.

Another way of studying the basic relationships between the three price levels is by looking at the f.o.b. and on-tree prices as a percentage of the retail price.

Table 2 shows that both f.o.b. and on-tree prices as a percentage of the retail price fluctuated from year to year with no discernible trend. Using three-year averages, the f.o.b.-retail price ratio (X_3) ranged from a high of 41.5 percent average for the period 1954-56 to a low of 35.0 percent for the period 1963-65. The average of the

Table 2. California and Arizona lemons: deflated retail, f.o.b. and on-tree prices for fresh use, 1953-54 through 1974-75.[a]

Year	X_1	X_2	X_3	X_4	X_5
1953-54	$11.64	$4.76	40.8%	$2.74	23.5%
1954-55	11.24	4.59	40.8	2.44	21.7
1955-56	11.25	4.80	42.6	2.63	23.3
1956-57	11.19	3.99	35.6	1.90	17.0
1957-58	10.75	3.75	34.9	1.70	15.8
1958-59	10.50	3.98	47.8	1.98	18.8
1959-60	10.46	3.81	36.4	1.87	17.8
1960-61	11.00	3.78	34.3	1.77	16.1
1961-62	10.50	3.73	35.5	1.77	16.8
1962-63	12.66	4.63	35.5	2.68	21.1
1963-64	10.89	3.64	33.4	1.77	16.2
1964-65	12.17	4.25	34.9	2.18	17.9
1965-66	11.82	4.18	35.3	2.17	18.3
1966-67	11.72	4.32	36.8	2.38	20.3
1967-68	12.45	4.68	37.6	2.67	21.4
1968-69	12.59	5.09	40.4	3.05	24.4
1969-70	13.06	4.91	37.5	3.05	23.3
1970-71	13.09	5.08	38.8	3.02	23.1
1971-72	13.22	4.85	36.7	2.77	20.9
1972-73	13.55	4.70	34.7	2.55	18.8
1973-74	14.02	5.28	37.7	3.16	22.5
1974-75	13.71	4.68	34.1	2.50	18.2

a. X_1 = deflated annual retail price, $ per 38 pound carton.

X_2 = deflated annual f.o.b. price, $ per 38 pound carton.

X_3 = percent of retail price (f.o.b. level) $(X_2 \div X_1 \cdot 100)$

X_4 = deflated annual on-tree price for fresh lemons, $ per 38 pound carton.

X_5 = percent of retail price (on-tree level) $(X_4 \div X_1 \cdot 100)$

Sources: U. S. Department of Agriculture, 1962-75 and 1962.

twenty-two years under study showed that the f.o.b. price composed 37 percent of the retail price.

The on-tree price and retail price ratio (X_5) ranged from a high of 23.5 percent average for the period 1969-71 to a low of 16.9 percent average for the period 1960-62. The average for the twenty-two years indicated that overall about 20.0 percent of the retail price gets back to the farmer.

Since the yearly fluctuations obviate any trend in price ratios, eleven year averages of the real prices were calculated in order to get a better idea if any significant changes had occurred. Eleven year periods divided the total observations in half and overall they should give a better perspective in respect to significant changes than a three or four year average.

Eleven year averages of the real retail price were $11.10 per carton for the period 1953-54 through 1963-64 and $12.86 per carton for the period 1964-65 through 1974-75. The mean values for the two periods were significantly different from each other at the 5 percent level of significance. The f.o.b. price average was $4.14 and $4.73 per carton for the same time periods above. The means in this case were significantly different at the 10 percent level of significance. The f.o.b.-retail price ratio was 37.8 from 1953-54 through 1963-64 and 36.8 from 1964-65 through 1974-75.

Eleven year averages of the on-tree price in real dollars were $2.12 per carton and $2.68 per carton for the respective time periods. These values were significantly different at a 5 percent level of significance. The percentage of the retail price that the on-tree price

represented was 19.1 and 20.8 percent for the respective eleven year periods 1953-54 through 1963-64 and 1964-65 through 1974-75.

All real price levels have shown an upward movement when examined as eleven-year averages. The retail price exhibited the greatest increase ($1.76) with the f.o.b. and on-tree price showing an increase of $.59 and $.56, respectively.

As a percentage of the retail price, the f.o.b. price indicated a slight decline while the on-tree price showed a slight increase. Further analysis of these trends will be presented in a later section.

Price Stability

As a rough measure of price stability, percentage changes were calculated on an annual basis in both real and current dollars. Small percentage changes indicated more stability than large percentage changes. It is also important to look at the overall direction of the changes and the fluctuation from positive to negative percentage movements.

Table 3 shows the average annual percent change over the twenty-one years at the retail, f.o.b. and on-tree level in both current and real dollars. Table 3 also shows the mean decrease and increase with an overall average at all three levels.

Table 3 indicates that the retail price is more stable than f.o.b. and on-tree prices in a relative sense. Not only did the f.o.b. and on-tree prices change direction more often than the retail price, the percentage changes were greater with the on-tree price showing the largest percentage movements.

Table 3. Percent changes in lemon prices per carton at the retail, f.o.b. and on-tree level, 1954-55 to 1974-75.[a]

Year	Current Price[b]			Real Price[b]		
	Percent Change in Retail	Percent Change in F.O.B.	Percent Change in On-Tree	Percent Change in Retail	Percent Change in F.O.B.	Percent Change in On-Tree
1954-55	- 1.6	- 1.8	- 9.6	- 3.5	- 3.7	-11.5
1955-56	2.9	7.3	10.3	0	4.4	7.4
1956-57	3.1	-14.7	-28.6	- .5	-18.2	-32.1
1975-58	- 2.2	- 4.4	- 9.4	- 4.0	- 6.2	-11.2
1958-59	- .3	7.8	17.1	- 2.3	5.8	15.1
1959-60	1.5	- 2.3	- 3.8	- .4	- 4.2	- 5.7
1960-61	6.0	0	- 4.8	4.9	- 1.0	- 5.8
1961-62	- 3.1	.4	1.6	- 4.6	- 1.2	.1
1962-63	20.2	23.0	42.5	18.6	21.4	41.0
1963-64	-13.5	-22.2	-39.5	-15.0	-23.8	-41.0
1964-65	13.0	17.3	22.8	11.1	15.4	21.0
1965-66	0	1.3	2.5	- 2.9	- 1.7	- .5
1966-67	2.2	6.4	12.5	- .9	3.3	9.5
1967-68	10.0	11.9	15.3	6.1	8.0	11.4
1968-69	5.9	13.2	18.0	1.1	8.4	13.2
1969-70	8.9	1.6	5.2	3.7	- 3.7	0
1970-71	5.2	8.4	4.3	.2	3.4	- .8
1971-72	5.2	- .4	- 4.6	1.0	- 4.6	- 8.8

Table 3. (Continued)

Year	Current Price[b]			Real Price[b]		
	Percent Change in Retail	Percent Change in F.O.B.	Percent Change in On-Tree	Percent Change in Retail	Percent Change in F.O.B.	Percent Change in On-Tree
1972-73	7.4	1.9	- 3.3	2.5	- 3.1	- 8.3
1973-74	11.8	20.1	29.6	3.4	11.7	21.3
1974-75	7.2	- 2.7	-13.8	-2.2	-12.2	-23.1

a. Mean decreases and increases in price.

	Retail		F.O.B.		On Tree	
	Current	Real	Current	Real	Current	Real
Decrease	-4.1	-3.6	-6.9	-7.0	-13.0	-12.4
Increase	+7.4	+5.3	+9.3	+9.1	+15.1	+15.6

b. All percent changes were calculated in the following manner:

$$\text{Percent change} = x_t - x_{t-1} \,/\, \frac{x_t + x_{t-1}}{2}$$

t = time period

In real dollars, mean percentage increases were 5.3, 9.1 and 15.6 for the respective retail, f.o.b. and on-tree price changes, while the respective mean percentage decreases were 3.6, 7.0 and 12.4. Figure 1 illustrates the percentage changes in lemon prices from 1963-64 through 1974-75 in real dollars.

Comparisons of percentage changes among the three price levels may be misleading because of the different bases. One technique that takes into consideration different bases and also indicates variation is the coefficient of variation. The coefficient of variation is a relative measure that expresses the standard deviation as a percentage of the mean (Steel and Torrie 1960). The coefficient of variation for the real retail price series was 9.4 percent while the coefficients for the real f.o.b. and real on-tree prices were 33.7 percent and 30.0 percent, respectively. This further establishes that the retail price is relatively more stable than both f.o.b. and on-tree prices.

Some of the large percentage changes in price can be explained by weather conditions that affected the production of lemons in California and Arizona. For example, the large price rise experienced in 1962-63 was partially caused by a severe winter condition and freezes in late December which resulted in substantial fruit loss. By the same token, the following year in which prices decreased by about the same percentage as they had risen the year before may be partially attributed to a mild winter with no abnormal cold periods (Rock 1970).

Another explanation of the relative instability of the farm price when compared to the retail price is the different elasticities of demand at each price level. Thus a given change in supply will affect

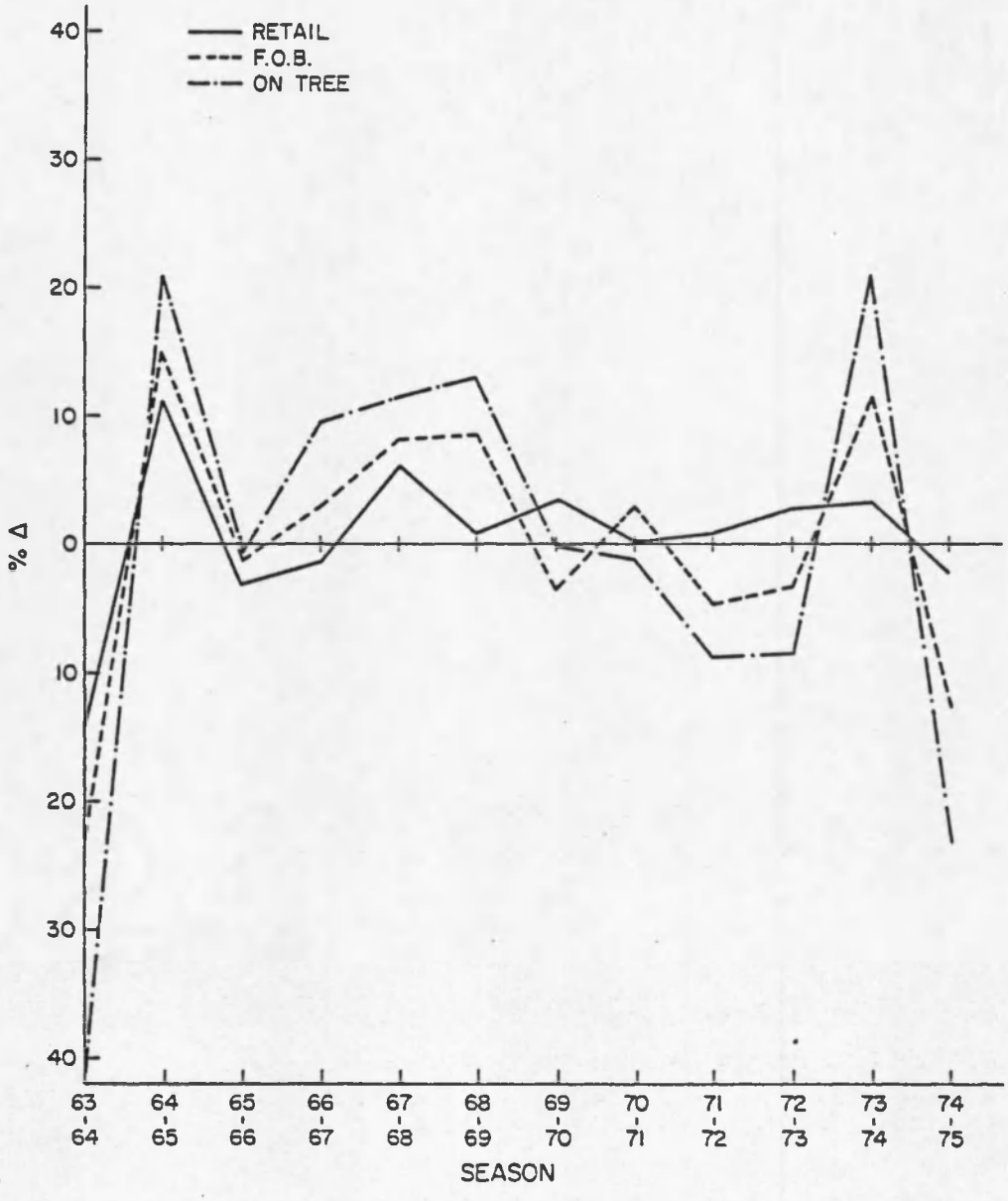

Figure 1. Percentage changes in lemon prices per carton at retail, f.o.b. and on-tree levels, 1963-64 to 1974-75.

prices more at the farm level than at the retail level. This important aspect will be more fully discussed in the last section of this chapter.

Least-squares regressions were run in order to observe the correlation between the annual percentage changes at the retail, f.o.b. and on-tree price levels. The specification resulted in higher R^2's and more significant "T" statistics than the method of first differences, a technique also applied. In order to obtain a less ambiguous interpretation of the "a" coefficient, the price series were deflated. The regressions that were run were based on the data found in Table 3.

The results of the regressions are indicated in the following equations:

$$X_1 = a + bX_2 \qquad \hat{X}_1 = -.0029 + 1.74457X_2 \qquad R^2 = .962 \quad (11\text{-A})$$

$$X_1 = a + bX_3 \qquad \hat{X}_1 = -.02103 + 2.15551X_3 \qquad R^2 = .544 \quad (11\text{-B})$$

$$X_2 = a + bX_3 \qquad \hat{X}_2 = .01053 + 1.25385X_3 \qquad R^2 = .585 \quad (11\text{-C})$$

X_1 = percent of change in the real on-tree price

X_2 = percent of change in the real f.o.b. price

X_3 = percent of change in the real retail price

The R^2 values of the equations indicated a strong association between the percentage changes in the on-tree (X_1) and the f.o.b. price (X_2) with somewhat weaker associations between on-tree (X_1) and retail prices (X_3), and f.o.b. (X_2) and retail prices (X_3).

The intercept values of the regressions were not significantly different from zero which indicates that if the independent variable remained constant the dependent variable would not change. In an economic sense this indicates that without any change in the retail price, the f.o.b. and on-tree price would remain constant. In contrast, all "T"

statistics for the "b" coefficients indicated that they were significantly different from zero at the 99 percent confidence interval.

These regressions also can be used to determine the price transmission elasticity. Thus given a one percent change in the retail price, the f.o.b. price would move in the same direction 1.25 percent (Equation II-C) and the on-tree price would move in the same direction 2.16 percent (Equation II-B). Also, given a one percent change in the f.o.b. price the on-tree price would move in the same direction 1.74 percent (Equation II-C). These elasticity coefficients measure the relative change in prices from one market level to the next (George and King 1971).

Price Trends Over Time

The most important aspect of the investigation of lemon prices is the measurement of trend over the last twenty years. Critics presume that the marketing order has "unduly enhanced" the price of fresh lemons. An investigation of price movements should help clarify this issue. It should be kept in mind that whether or not prices of fresh lemons have increased, the establishment of a direct causal linkage between the marketing order and price increases would be extremely tenuous. Numerous factors other than market order activities influence prices.

Current Prices

Current prices at the retail, f.o.b. and on-tree level were graphed over time (Figure 2). The retail price shows a relatively steeper movement when compared to f.o.b. and on-tree prices. All three prices indicated an almost consistent upward trend since the 1963-64 season. This pronounced upward trend in prices since 1963-64 season

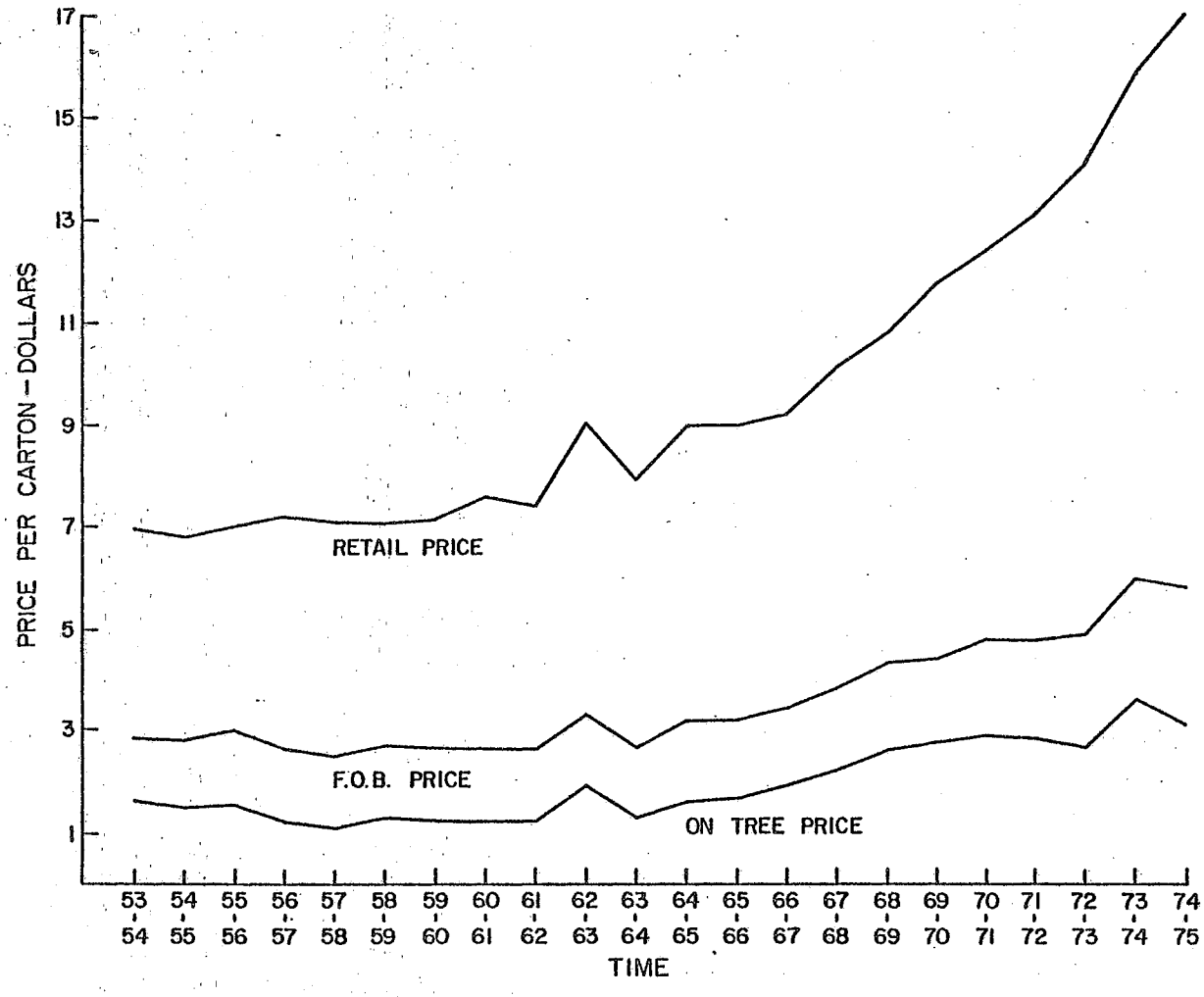

Figure 2. Retail, f.o.b. and on-tree prices of fresh lemons per carton (38 pounds), 1953-54 through 1974-75 (current dollars).

suggests a structural change in the market that appears to coincide with the Japanese elimination of import barriers on lemons in May 1964. Japan is now the leading importer of U. S. lemons. To give an idea of the effect the elimination of import barriers had on the U. S. lemon industry, Japan's imports from the U. S. accounted for less than one million dollars in the early 1960's; in fiscal 1974 the amount totaled 23.5 million dollars (Fox, Cable and Jordan 1974, p. 10). This increase in demand from the Japenese market could offer a partial explanation for the more pronounced upward movement of prices. The quantitative effect of the Japanese market on U. S. prices is being estimated in a thesis by Heimpel (in prep.).

One other possible explanation for the greater increase since the 1963-64 season may be inflation. For this reason, prices in deflated terms will be examined later.

In order to quantify the observed trends, ordinary least-squares regressions were run with the retail, f.o.b. and on-tree prices as functions of time. All monetary values in this case were expressed in current dollars. Regression equations were fitted in linear, natural logs, and first differences. Table 4 indicates the results of the regressions using time periods 1953-54 through 1974-75 and 1963-64 through 1974-75. Since the linear equations gave the best fit (highest R^2), they are the only ones reported in Table 4.

Table 4 confirms the upward trends observed in Figure 2. The slope coefficients for the regressions run with the 1953-54 through 1974-75 time period (T54) indicate a more pronounced rise in the retail price (X_3) than the f.o.b. (X_2) or on-tree (X_1) price.

Table 4. Least-squares regression using retail, f.o.b. and on-tree prices in current dollars as a function of time.[a]

Equation Number	Dependent Variable		Constant Term		Time Variable[b]	R^2 Values (Corrected)
(1)	X_1	=	.84688 (4.9350)	+	.09620 T54 (7.3626)	.717
(2)	X_1	=	1.24091 (8.2177)	+	.17948 T64 (8.747)	.873
(3)	X_2	=	1.84286 (7.9617)	+	.15094 T54 (8.5645)	.775
(4)	X_2	=	2.39455 (17.572)	+	.28892 T64 (11.604)	.957
(5)	X_3	=	4.6735 (8.5256)	+	.43764 T54 (10.486)	.838
(6)	X_3	=	1.56515 (17.148)	+	.78857 T54 (15.159)	.954

a. Numbers in parentheses are "T" statistics
   X_1 = On-tree fresh lemon price
   X_2 = F.O.B. packed price for fresh lemons
   X_3 = Retail price of fresh lemons
   T54 = Time variable, 1953-54 through 1974-75
   T64 = Time variable, 1963-64 through 1974-75

b. Numbers in parentheses are significantly different from zero at a one percent level.

By using semilogarithmic equations, estimations of average rates of growth in the three prices series can be obtained (Mills 1955). The semilogarithmic equations indicated that the retail price of fresh lemons increased an average of 4.4 percent per year between 1953-54 and 1974-75, while the f.o.b. and on-tree price increased 4.0 and 4.8 percent a year, respectively.

The regression equations that were run using the time period 1963-64 through 1974-75 (T64) yielded higher R^2 values and larger slope coefficients (Equations 2, 4, 6 in Table 4). This indicates that the upward trend is more pronounced since the 1963-64 season. As validation of this difference in slope coefficients, an F-test indicated that all estimated coefficients for the recent twelve year period (T64) were significantly different than the estimated coefficients for the total period (T54) at a 5 percent level.

Real Prices

The movement of the deflated prices at the retail, f.o.b. and on-tree level also were graphed over time (Figure 3). Current prices were deflated by the use of the modified version of the G.N.P. implicit price deflator explained in Chapter I and Appendix Table B. Up to the 1963-64 season the retail price showed a slight downward movement as did the f.o.b. and on-tree prices. The following years showed a gradual movement upwards in the retail, f.o.b. and on-tree prices. The margin between retail and f.o.b. prices seems to increase in the latter period.

Again in order to quantify these trends, ordinary least-squares regressions with the three price levels in real dollars as functions of

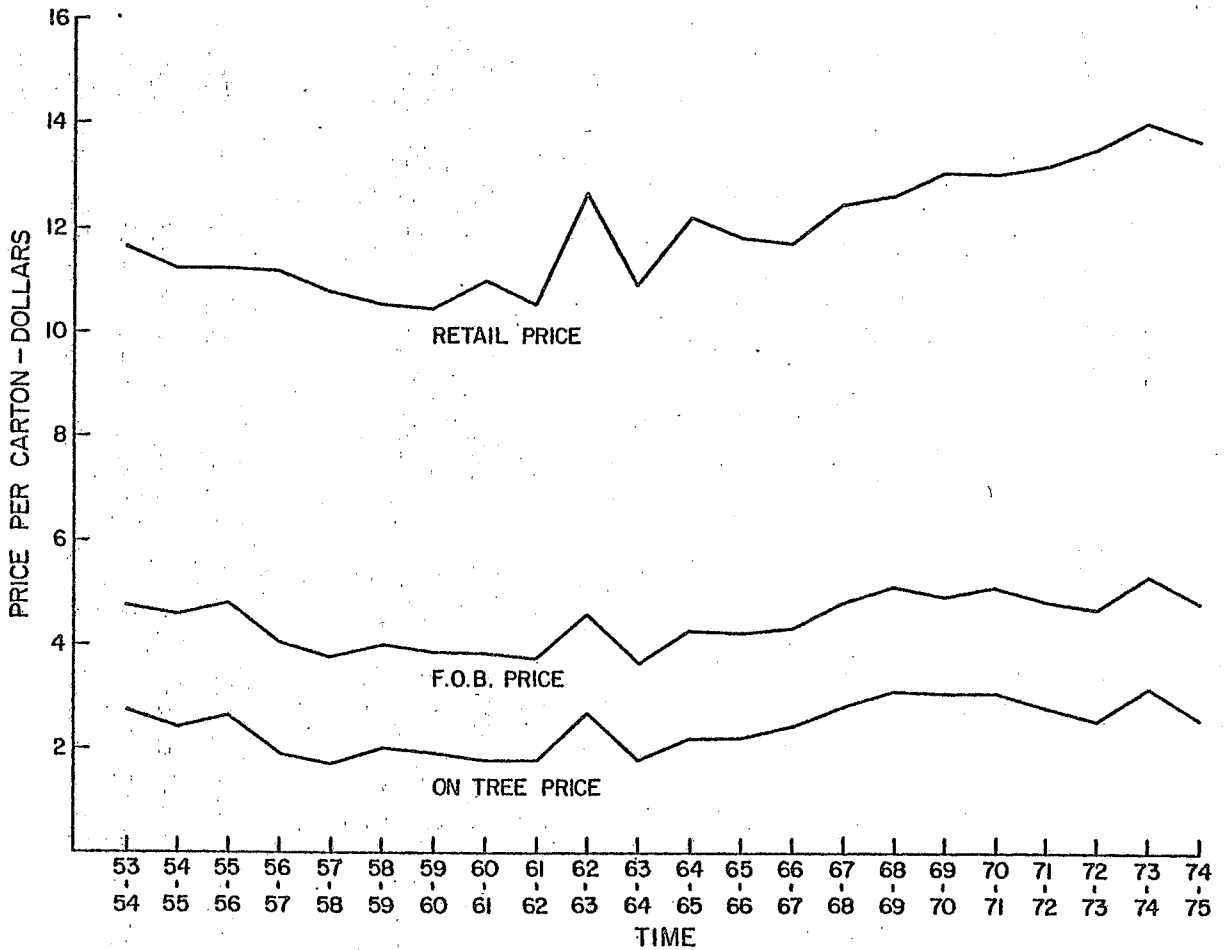

Figure 3. Retail, f.o.b. and on-tree prices of fresh lemons per carton (38 pounds), 1953-54 through 1974-75 (real dollars).

time were run. Table 5 contains the results of the regressions using the time periods 1953-54 through 1974-75 and 1963-64 through 1974-75. All regressions in Table 5 are of linear form rather than first differences or logs because of the better fit.

For the period 1953-54 through 1974-75 the R^2 values were rather low at the f.o.b. and on-tree level (Equations 1 and 3), accounting for less than 25 percent of the variation between each price level and the time variable. The R^2 value for the retail price was .686 (Equation 5) quite a bit higher than the R^2 values for the f.o.b. and on-tree price.

Although the slope coefficients are all significantly different from zero at the 5 percent level, they are considerably smaller than those obtained using current dollars. When the effect of inflation is accounted for, the upward movement flattens out considerably. Visually this is detectable by comparing Figures 2 and 3.

Slope coefficients were examined for real and current dollars using an F-test. The coefficients obtained when using real dollars were significantly different from those obtained using current dollars at a 5 percent level.

Using the time period 1963-64 through 1974-75 yielded higher R^2 values at all three price levels. The R^2 values for the on-tree level and f.o.b. level were .377 and .529, respectively, rather low but substantially higher than the R^2 values for the period 1953-54 through 1974-75. In contrast the R^2 value at the retail level (Equation 6) indicated a fairly strong association. The significance levels of the slope coefficients increased somewhat for the equations based on 1963-64 through 1974-75 time period.

Table 5. Least-squares regression using retail, f.o.b. and on-tree prices in real dollars as a function of time.[a]

Equation Number	Dependent Variable		Constant Term		Time Variable	R^2 Values (Corrected)
(1)	X_1	=	1.95720 (10.619)	+	.03831 T54 (2.7299)[b]	.235
(2)	X_1	=	2.09479 (10.016)	+	.07857 T64 (2.7649)[b]	.377
(3)	X_2	=	3.97566 (20.191)	+	.03968 T54 (2.6467)[b]	.222
(4)	X_2	=	4.00422 (20.344)	+	.09782 T64 (3.6577)[c]	.529
(5)	X_3	=	10.29822 (36.813)	+	.14594 T54 (6.8518)[c]	.686
(6)	X_3	=	11.11049 (59.425)	+	.24318 T64 (9.5725)[c]	.892

a. Numbers in parentheses are "T" statistics.
X_1 = On-tree fresh lemon price
X_2 = F.O.B. packed price for fresh lemons
X_3 = Retail price of fresh lemons
T54 = time variable, 1953-54 through 1974-75
T64 = time variable, 1963-64 through 1974-75

b. Significantly different from zero at a five percent level.

c. Significantly different from zero at a one percent level.

Semilogarithmic equations were used in the estimation of the average rate of growth of the three price series in real dollars. The equations indicated that the real retail price of lemons increased 1.2 percent a year while the f.o.b. and on-tree prices increased .9 and 1.6 percent a year between 1953-54 through 1974-75. When the time period was shortened to 1963-64 through 1974-75 all three price series showed an increasing rate of growth. The retail price averaged a 2.0 percent yearly increase while the f.o.b. price increased 2.2 percent. The on-tree price showed the largest increase with a 3.3 percent annual movement.

Lemon Prices and the General Price Level

This section investigates the relationship between movements in the general price level and the retail, f.o.b. and on-tree prices. The purpose is to determine if lemon prices are related to general price level movements (inflation, deflation) or if they behave independently.

The technique used in this section is taken from a paper presented by Robert S. Firch (1975) to the Western Agricultural Economics Association. Part of Firch's paper examined the relationship of the retail cost of food and the general price level. The technique was adopted in this section. Basically, it indicates the association between lemon prices and the general price level by stipulating the price as a function of the general price level.

The G.N.P. implicit price deflator was used as an indicator of the general price level. Percentage changes were calculated in the same manner as preceding sections (Table 3) where the midpoint between the

beginning point of a change and end point served as the base. The percentage changes in the G.N.P. implicit price deflator indicated the movement in the general price level. Simple least-squares regressions were run with all three price levels as a function of the general price level. The time period used in these regressions was 1953-54 through 1974-75. Table 6 contains the results for six equations. The first three utilize the general price level as the only independent variable. The low R^2 values for Equations 1 through 3 indicate a very weak association between the percent changes in the general price level and prices at the retail, f.o.b. and on-tree levels. As indicated in Table 6, none of the estimated coefficients were significant.

In an effort to test an additional hypothesis and to improve the statistical results, another independent variable was introduced: fresh domestic shipments. When dealing with one commodity, fluctuating sales of the particular commodity may influence price movements to the point where any relation between lemon price movements and the general price level are weak. Least-squares regressions were run using this additional variable and the results are also presented in Table 6. The R^2 values obtained using the additional variable did not improve very much. They are still too low to indicate any significant association between changes in the general price level and the retail, f.o.b. and on-tree prices. In fact, all R^2 values were not significantly different from zero as determined by the use of an R table (Steel and Torrie 1960).

The low R^2 values and the insignificance of the estimated coefficients suggest that association between percentage movements in the

Table 6. Least-squares regression with percentage changes in retail f.o.b. and on-tree price of lemons as a function of the general price level and domestic shipments, 1953-54 through 1974-75.[a]

Equation Number	Dependent Variable	Constant Term	Independent Variables	R^2 Values (Corrected)
(1)	X_1	= .00428	+ 1.09836 X_4	.079
(2)	X_2	= .00389	+ .86407 X_4	.018
(3)	X_3	= .00754	+ .65586 X_4	.046
(4)	X_1	= .37425	+ .20509 X_4 - .000026 X_5	.123
(5)	X_2	= .64337	- .67989 X_4 - .000044 X_5	.042
(6)	X_3	=1.1097	- 2.0052 X_4 - .000076 X_5	.013

a. Numbers in parentheses are "T" statistics.

X_1 = percentage change in retail price

X_2 = percentage change in f.o.b. price

X_3 = percentage change in on-tree price

X_4 = percentage change in the general price level

X_5 = fresh production which entered the domestic market

All estimated coefficients are not significant at any appropriate level.

general price level (inflation, deflation) and price movements of lemons is essentially nonexistent.

Lemon Prices and the Marketing Order

The lemon industry has operated under a marketing order since 1941. The influence of the marketing order on prices cannot be determined by comparison with a period when the order did not exist. Numerous technical and structural changes have occurred in the industry that make such an approach invalid. In lieu of this, recent price movements are analyzed in terms of the possible association with the marketing orders' activities.

The marketing order purports to offer the domestic consumer a steady supply of fresh lemons at a reasonable price without wide fluctuations in price. In this respect the marketing order may have had some positive effect in reducing instability in the retail market. This is, of course, relative only to the other two price levels. The section on price stability indicated that when stability is measured in respect to annual percentage price changes and with the coefficient of variation, the retail price was more stable in a relative sense than the f.o.b. or on-tree price.

The marketing orders' success in guaranteeing a fair and reasonable return to the grower and taking out some of the instability at the on-tree price level has been questionable when compared to the retail market. Without accurate cost data the question of a fair and reasonable return is a meaningless question. What is a fair return at the retail or on-tree level at this point is completely subjective. The relatively

greater price instability experienced at the on-tree level in comparison to the retail level should not be interpreted as a failure of the marketing order. In order to label the marketing order a success or failure or any type of causal agent in regards to stability you would have to have a period in which the order did not exist for which comparisons could be made. Some explanation of the greater instability at the farm level when compared to the retail level may be based on theoretical ground. Generally, elasticities at the farm level are more inelastic than retail price elasticity, thus a given change in supply will necessarily change prices more at the farm level than at the retail level. Theoretically under ceteris paribus conditions any change in supply will change prices more at the farm level in a relative sense when compared to the retail level.

With the above in mind it is difficult to directly link the marketing orders' activities as having a stabilizing or unstabilizing effect on the retail or farm prices.

The basic benefactors of marketing orders were to be the growers, but the data suggests that the marketing order is not very successful in keeping on-tree returns in line with the retail price in an absolute sense. It is also possible that a large percentage of the retail price is controlled by forces outside the scope of the marketing order. The latter seems most logical given the results of this chapter.

Criticism has been leveled at the lemon marketing order for enhancing prices by use of the rate of flow provision. The data on price trends indicate that the retail price in real dollars has increased on average about 1.2 percent annually from 1953-54 through 1974-75. The

period from 1964-65 through 1974-75 showed an average annual increase of 2.0 percent. The problem now becomes more subjective, are these price movements indicative of undue price enhancements? If we did grant this as undue price enhancement, we still at this point, cannot attribute this price movement to the marketing orders activities.

CHAPTER III

MARKETING MARGINS

The specialization of agricultural production in areas geographically distant from the consumer has created a large and expensive agricultural marketing system (Shepard 1958). Shepard's observation seems to hold true especially in the case of lemons. Virtually all of the domestic shipments of fresh lemons originate from the California and Arizona area, with California being by far the major producing state. The notion of a large and expensive marketing system is reflected in the analysis of the marketing margins in the lemon industry.

The basic objective of this chapter is to examine the marketing margins in the lemon industry and to isolate their effect on the retail price of fresh lemons. Since retail and f.o.b. prices are influenced by margin movements, trend analysis is useful in determining the effect of the margins on the retail price. Ordinary least-squares regressions with time as the independent variable will indicate how margins have moved over time. Secondary objectives of this chapter deal with basic marketing margin interrelationships and the retail prices and margins in three metropolitan centers: New York City, Chicago, and Atlanta.

The analyses of margins and retail prices will center on how much of the retail price is composed of by the marketing margins, and attempt to discover if any trends are apparent. The analyses of margins

and prices in the three cities give an idea as to how retail prices and marketing margins differ from area to area.

Conceptually, margins are the difference between certain price levels. In the lemon industry the difference between the fresh on-tree price and the f.o.b. price is the picking, hauling, packing and selling margin (PHPS). This basically measures what happens from the farmer to the packing house. The wholesale-retail margin (WRM) is the difference between the f.o.b. price and the retail price. Some components of the WRM are energy costs, storage, transportation and labor. Together the PHPS margin and the WRM equal the gross margin (GM). Since all price levels are concerned only with fresh sales, the margins only represent the marketing of fresh lemons.

Marketing Margin Relationships

The marketing margins were examined from 1953-54 through 1974-75. Table 7 contains the retail, f.o.b. and on-tree prices along with the GM, WRM, and the PHPS margin.

Table 7 indicates that the GM averaged about 80 percent of the retail price for the twenty-two year period. Of the two major components of the gross margin, WRM is by far the largest. The WRM averaged about 63 percent of the retail price while the PHPS margin comprised, on an average about 17 percent of the retail price.

Examination of the data in Table 7 suggested that the PHPS margin as a percent of the retail price has been declining. This hypothesis was tested using ordinary least-squares analysis with time as the independent variable. The result of the regression is as follows:

Table 7. California and Arizona lemons, retail, f.o.b., on-tree returns for fresh use, wholesale-retail margin, picking hauling packing and selling margin, and gross margin, 1953-54 through 1974-75.

Year November-October	Retail Price [a]	Wholesale-Retail Margin[b]	Percent Wholesale Retail Margin of Retail Price	F.O.B. Price [c]	Picking Hauling Packing Selling[d]	Percent Picking Hauling Packing Selling of Retail Price	On-tree Returns[c]	Gross Margin[e]	Percent Gross Margin of Retail Price
1953-54	$ 6.92	$ 4.09	59.1	$2.83	$1.20	17.3	$1.63	$ 5.29	76.4
1954-55	6.81	4.03	59.2	2.78	1.30	19.1	1.48	5.33	78.3
1955-56	7.01	4.02	57.3	2.99	1.35	19.3	1.64	5.37	76.6
1956-57	7.23	4.65	64.3	2.58	1.35	18.7	1.23	6.00	83.0
1957-58	7.07	4.60	65.1	2.47	1.35	19.1	1.12	5.95	84.2
1958-59[f]	7.05	4.38	62.0	2.67	1.34	19.0	1.33	5.72	81.1
1959-60	7.16	4.55	63.5	2.61	1.33	18.6	1.28	5.88	82.1
1960-61	7.60	4.99	65.7	2.61	1.39	18.3	1.22	6.38	84.0
1961-62	7.37	4.75	64.5	2.62	1.38	18.7	1.24	6.13	83.2
1962-63	9.03	5.73	63.5	3.30	1.39	15.4	1.91	7.12	78.8
1963-64	7.89	5.25	66.5	2.64	1.36	17.2	1.28	6.61	83.8
1964-65	8.99	5.85	65.1	3.14	1.53	17.0	1.61	7.38	82.1
1965-66	8.99	5.81	64.6	3.18	1.53	17.0	1.65	7.34	81.6
1966-67	9.19	5.80	63.1	3.39	1.52	16.5	1.87	7.32	79.7
1967-68	10.16	6.34	62.4	3.82	1.64	16.1	2.18	7.98	78.5
1968-69	10.78	6.42	59.6	4.36	1.75	16.2	2.61	8.17	75.8
1969-70	11.79	7.36	62.4	4.43	1.68	14.2	2.75	9.04	76.7
1970-71	12.42	7.60	61.2	4.82	1.95	15.7	2.87	9.55	76.9
1971-72	13.08	8.28	63.3	4.80	2.06	15.7	2.74	10.34	79.1
1972-73	14.09	9.20	65.3	4.89	2.24	15.9	2.65	11.44	81.2
1973-74	15.86	9.88	62.3	5.98	2.41	15.2	3.57	12.29	77.5
1974-75	17.05	11.23	65.9	5.82	2.71	15.9	3.11	13.94	81.8
			$\bar{X}$ = 63.0			$\bar{X}$ = 17.1			$\bar{X}$ = 80.1

a. Source for the retail price is U. S. Department of Agriculture, Economic Research Service (1976).

b. Wholesale-retail margin derived by taking the F.O.B. price from the retail price.

c. Sources are U. S. Department of Agriculture (1962 and 1962-75).

d. Picking, hauling, packing and selling margin derived by taking the on-tree returns from the F.O.B. price.

e. Gross margin is the summation of the wholesale retail margin and the picking, hauling, packing and selling margin.

f. Prior to 1958-59 prices only for California lemons.

$$X_1 = \underset{(50.746)}{.1934} - \underset{(-6.6972)}{.001943\ T54} \qquad R^2 = .676 \qquad \text{(III-A)}$$

The variable X_1 represents the PHPS margin as a percentage of the retail price. T54 is the time variable and the numbers in parentheses are the "T" statistics.

The above regression confirms that over the twenty-two years under study the PHPS margin as a percent of the retail price has been declining. The estimated coefficients were significantly different from zero at the one percent level of significance. In an economic sense these results indicate that the operations that are involved in the PHPS margin are becoming relatively more efficient.

Table 7 suggests that the WRM and the GM as a percentage of the retail price have not shown any observable trends over the study period. To validate this, both the GM and the WRM were used in regressions with time as the independent variable. The results of the regressions are as follows:

$$X_2 = \underset{(58.226)}{.61629} + \underset{(1.4764)}{.001189\ T54} \qquad R^2 = .053 \qquad \text{(III-B)}$$

$$X_3 = \underset{(65.969)}{.80969} - \underset{(-.80642)}{.000754\ T54} \qquad R^2 = -.017 \qquad \text{(III-C)}$$

X_2 = WRM as a percentage of the retail price

X_3 = GM as a percentage of the retail price

T54 = time variable

The figures in parentheses are the "T" statistics.

These regressions support the observation that as a percentage of the retail price, the GM and the WRM have not shown any trend. This

conclusion is based on the insignificance of the estimated (b) coefficients and R^2 values which are not significantly different from zero.

To determine how much the WRM and the PHPS margin has changed in the last twenty-two years, eleven year averages were calculated. Appendix C lists the deflated values for the retail, f.o.b. and on-tree price levels along with the three margins for fresh lemons. Data from Appendix C indicate that from 1953-54 through 1963-64, the retail price averaged $11.10 per 38 pound carton while from 1964-65 through 1974-75 it averaged $12.86 per carton. The retail price increase of $1.76 in real dollars can be partially attributed to the WRM which increased $1.17. Averages for the WRM were $6.96 per carton for 1953-54 through 1963-64 and $8.13 per carton for 1964-65 through 1974-75.

Comparison of eleven year averages for the PHPS margin shows an increase of 3 cents. Averages were $2.02 per carton for 1953-54 through 1963-64 and $2.05 per carton for 1964-65 through 1974-75. Therefore, of the $1.76 increase in the retail price per carton, $1.20 or 68 percent of the increase is associated with increases in the marketing margins. The remaining increase of $.56 in the retail price per carton was reflected in the on-tree price.

Marketing Margins Over Time

The movement of the marketing margins over time was tested using deflated values and least-squares regressions. Linear equations yielded better R^2 values and higher "T" statistics than logarithmic or first differences. Table 8 indicates the results of the regressions using the two

Table 8. Least-squares regression with deflated marketing margins as a function of time.[a]

Equation Number	Dependent Variable		Constant Term		Time Variable	R^2 Values (Corrected)
(1)	M_1	=	2.01846 (50.006)	+	.00137 T_{54} (.44578)	-.040
(2)	M_1	=	1.90942 (39.952)	+	.01925 T_{64} (2.9639)[b]	.414
(3)	M_2	=	6.32256 (40.193)	+	.10626 T_{54} (8.8722)[c]	.787
(4)	M_2	=	7.10627 (41.109)	+	.14536 T_{64} (6.1887)[c]	.772
(5)	M_3	=	8.34102 (47.316)	+	.10763 T_{54} (8.0191)[c]	.751
(6)	M_3	=	9.01569 (45.554)	+	.16460 T_{64} (6.1211)[c]	.768

a. Numbers in parentheses are "T" statistics.

M_1 = picking, hauling, packing and selling margin (PHPS)

M_2 = wholesale retail margin (WRM)

M_3 = gross margin (GM)

T_{54} = time period with 1954 = 1

T_{64} = time period with 1964 = 1

b. Significantly different from zero at the five percent level of significance.

c. Significantly different from zero at the one percent level of significance.

time periods, the first 1953-54 through 1974-75 and the second 1963-64 through 1974-75.

Equation 1 of Table 8 suggests that the PHPS margin has not shown any significant trends over the twenty-two year period as indicated by the insignificant time coefficient. A different result is obtained when the time period is broken in half. Equation 2 suggests that since 1963-64 the real PHPS margin has trended upwards. Although the R^2 value is low (.414) the estimated coefficient for the time variable is significant.

The equations which deal with the WRM movement suggest that the real WRM is moving upward over time. This is true for both time periods, and all estimated coefficients were significant and both of the R^2 values were greater than .770.

As expected, the GM showed the same upward movement as the WRM. Since the majority of the GM is made up by the WRM any trend in the WRM will have a major influence on the GM.

All indications point to the fact that in real dollars, the WRM and GM are trending upward over time. The data are somewhat questionable in regards to the PHPS margin. The importance of upward movements in the GM and especially the WRM is that some of the increase in the real retail price is due to increases in the cost of marketing. This does not exonerate the marketing orders' impact on the retail price, but does support the argument that most of the retail price increases are due to increases in the WRM.

In order to test how the WRM and the allocation of fresh lemons to the domestic market affect the retail price, a least-squares regression was run. The result as follows is in linear form.

$$X_1 = \underset{(.91032)}{3.1374} + \underset{(5.6637)}{1.2783}\, X_2 - \underset{(-.42474)}{.00006}\, X_3 \qquad R^2 = .847 \qquad \text{(III-D)}$$

where: X_1 = the real retail price of fresh lemons per carton

X_2 = the real WRM margin per carton

X_3 = allocation of fresh lemons in the domestic market

The value in parentheses are "T" statistics.

The estimated equation (III-D) indicated that from 1953-54 through 1974-75 the only significant variable was the WRM. The quantity variable was insignificant; this is especially important because of critics claim of price enhancement by way of supply regulation under the marketing order. In this particular case when supply and the WRM margin are stipulated as independent variables, the result seems to partially dispel the notion of supply regulation and higher prices.

Marketing Margins for Selected Cities

Analyses of three cities in respect to their marketing margins and retail price movements were undertaken in an effort to examine how lemon prices and margins differ from area to area. The three cities are New York, Chicago and Atlanta. These cities represent areas geographically separated and all are major consumption centers for fresh lemons.

The retail prices in selected cities were calculated as the average of monthly prices weighted by their respective monthly unloads. Retail prices were obtained from unpublished records of the Economic Research Service of the U. S. Department of Agriculture (1976). A common f.o.b. and on-tree price was used in the analyses of the three cities. As explained earlier, the margins represent the differences between the three price levels. Transportation costs represent rail charges on a

per carton basis, shipping weight 40 pounds, with 1,000 cartons per car originating in Ventura, California. Transportation costs are included in the wholesale-retail margin but are listed separately in order to study their movement. Transportation costs (rail charges) were not computed for Atlanta since it receives the majority of its fresh lemons by truck. Tables 9, 10, and 11 indicate prices, margins, transportation costs and appropriate percents for New York City, Chicago, and Atlanta, respectively, from 1963-64 through 1974-75. All prices are in current dollars.

Retail price increases were experienced in all three cities with Atlanta showing the greatest increase in an absolute and relative sense within the time period under study. The retail price in New York in 1974-75 increased 110 percent over the 1963-64 level. Increases for the same time period in Chicago and Atlanta were 144 percent and 162 percent, respectively. In absolute terms, Chicago experienced the highest retail prices from 1971-72 through 1974-75, with Atlanta second and New York having the lowest retail price for three out of the last four seasons under study. This seems odd given the higher transportation costs associated with New York. Somewhere in the WRM either labor or other costs have offset this.

The retail value in New York City on a per carton basis showed an average increase of 70 cents per carton per season since 1963-64. Chicago showed an average increase of 90 cents and Atlanta indicated the highest average increase, 92 cents per carton per season.

The WRM tended to behave in the same manner as the retail price. Atlanta experienced the fastest growing WRM with Chicago second and New York third. Average increases in the WRM per carton per season were 44

Table 9. Lemons: season average prices, margins, costs and returns, for fresh domestic use 1963-64 through 1974-75, New York City, current dollars.

Year November-October	Retail Price[a] ¢/pound	Retail Value[b] carton	Wholesale Retail Margin[c] Carton	Wholesale Retail Margin[c] Percent of Retail	F.O.B. Packed[d]	Transportation[e] Carton	Transportation[e] Percent of Retail	Picking Hauling Packing Selling[f] Carton	Picking Hauling Packing Selling[f] Percent of Retail	On-tree carton	Returns[d] Percent Retail
1963-64	21.0	$ 7.66	$ 5.02	65.5	$2.64	$ .97	12.7	$ 1.36	17.8	$1.28	16.7
1964-65	24.1	8.79	5.65	64.3	3.14	.97	11.0	1.53	17.4	1.61	18.3
1965-66	24.3	8.86	5.68	64.1	3.18	.97	10.9	1.53	17.3	1.65	18.6
1966-67	25.3	9.23	5.84	63.3	3.39	.97	10.5	1.52	16.5	1.87	20.3
1967-68	26.8	9.78	5.96	60.9	3.82	.99	10.1	1.64	16.8	2.18	22.3
1968-69	28.0	10.21	5.85	57.3	4.36	1.02	10.0	1.75	17.1	2.61	25.6
1969-70	32.0	11.67	7.24	62.0	4.43	1.09	9.3	1.68	14.4	2.75	23.6
1970-71	34.5	12.59	7.77	61.7	4.82	1.21	9.6	1.95	15.5	2.87	22.8
1971-72	34.8	12.70	7.90	62.2	4.80	1.24	9.8	2.06	16.2	2.74	21.6
1972-73	38.2	13.94	9.05	64.9	4.89	1.24	8.9	2.24	16.1	2.65	19.0
1973-74	43.9	16.01	10.03	62.6	5.98	1.46	9.1	2.41	15.1	3.57	22.3
1974-75	44.1	16.09	10.27	63.8	5.82	1.64	10.2	2.71	16.8	3.11	19.3

a. Twelve-month weighted average (November-October) is from U. S. Department of Agriculture, Economic Research Service (1976).

b. Value adjusted to allow 4% loss incurred during marketing.

c. Wholesale retail margin derived by taking retail value minus F.O.B. packed price.

d. On-tree return and F.O.B. prices obtained from U. S. Department of Agriculture (1962 and 1962-75).

e. Rail charges taken from monthly charge weighted to an annual charge. Origin Ventura, Calif.

f. Picking, hauling, packing and selling derived by taking the F.O.B. price minus the growers.

Table 10. Lemons: season average prices, margins, costs and returns, for fresh domestic use 1963-64 and 1974-75, Chicago, current dollars.

Year November-October	Retail Price[a] ¢/pound	Retail Value[b] carton	Wholesale Retail Margin[c]		F.O.B. Packed[d]	Transportation[e]		Picking Hauling Packing Selling[f]		On-tree carton	Returns[d] Percent Retail
			Carton	Percent of Retail		Carton	Percent of Retail	Carton	Percent of Retail		
1963-64	20.8	$ 7.59	$ 4.95	65.2	$2.64	$ .94	12.4	$1.36	17.9	$1.28	16.9
1964-65	24.7	9.01	5.87	65.2	3.14	.94	10.4	1.53	17.0	1.61	17.9
1965-66	24.2	8.83	5.65	64.0	3.18	.94	10.7	1.53	17.3	1.65	18.7
1966-67	23.8	8.68	5.29	60.9	3.39	.94	10.8	1.52	17.5	1.87	21.5
1967-68	27.0	9.85	6.03	61.2	3.82	.97	9.6	1.64	17.0	2.18	22.1
1968-69	29.0	10.58	6.22	58.8	4.36	1.00	9.5	1.75	16.5	2.61	24.7
1969-70	30.6	11.16	6.73	60.3	4.43	1.06	9.5	1.68	15.1	2.75	24.6
1970-71	30.5	11.13	6.31	56.7	4.82	1.18	10.6	1.95	17.5	2.87	25.8
1971-72	39.1	14.26	9.46	66.3	4.80	1.21	8.5	2.06	14.5	2.74	19.2
1972-73	42.8	15.61	10.72	68.7	4.89	1.22	7.8	2.24	14.4	2.65	17.0
1973-74	49.5	18.06	12.08	66.9	5.98	1.39	7.7	2.41	13.3	3.57	19.8
1974-75	50.7	18.50	12.68	68.5	5.82	1.59	8.6	2.71	14.6	3.11	16.8

a. Twelve-month weighted average (November-October)

b. Value adjusted to allow 4% loss incurred during marketing.

c. Wholesale retail margin derived by taking retail value minus F.O.B. price packed.

d. On-tree return and F.O.B. prices obtained from the U. S. Department of Agriculture (1962 and 1962-75).

e. Rail charges taken from monthly charge weighted to an annual charge. Origin Ventura, Calif.

f. Picking, hauling, packing and selling derived by taking the F.O.B. price minus the growers return for fresh sales.

Table 11. Lemons: season average prices, margins and returns, for fresh domestic use 1963-64 through 1974-75, Atlanta, current dollars.

Year November-October	Retail Price[a] ¢/pound	Retail Value[b] carton	Wholesale Retail Margin[c]		F.O.B. Packed[d]	Picking Hauling Packing Selling[e]		Growers Returns[d]	
			Carton	Percent of Retail		Carton	Percent of Retail	Carton	Percent of Retail
1963-64	18.6	$ 6.79	$ 4.15	61.1	$2.64	$1.36	20.0	$1.28	18.9
1964-65	20.8	7.59	4.45	58.6	3.14	1.53	20.2	1.61	21.1
1965-66	20.5	7.48	4.30	57.5	3.18	1.53	20.5	1.65	22.0
1966-67	21.4	7.81	4.42	56.6	3.39	1.52	19.5	1.87	23.9
1967-68	22.7	8.28	4.46	53.9	3.82	1.64	19.8	2.18	26.3
1968-69	24.6	8.97	4.61	51.4	4.36	1.75	19.5	2.61	29.1
1969-70	27.0	9.85	5.42	55.0	4.43	1.68	17.1	2.75	27.9
1970-71	32.9	12.00	7.18	59.8	4.82	1.95	16.3	2.87	23.9
1971-72	35.6	12.99	8.19	63.0	4.80	2.06	15.9	2.74	21.1
1972-73	38.8	14.15	9.26	65.4	4.89	2.24	15.8	2.65	18.7
1973-74	42.7	15.58	9.60	61.6	5.98	2.41	15.5	3.57	22.9
1974-75	48.8	17.80	11.98	67.3	5.82	2.71	15.2	3.11	17.5

a. Twelve-month weighted average (November-October).

b. Value adjusted to allow 4% loss incurred during marketing.

c. Wholesale retail margin derived by taking retail value minus F.O.B. price packed.

d. On-tree return and F.O.B. prices obtained from the U. S. Department of Agriculture (1962 and 1962-75).

e. Picking, hauling, packing and selling derived by taking the F.O.B. price minus the Growers return for fresh sales.

cents in New York, 64 cents in Chicago and 65 cents in Atlanta. Dividing the series into two six-year periods in order to determine if any significant changes occurred in the WRM-retail price ratio, indicated that as a percentage of the retail price, the WRM showed no trend in New York. The same is not true in the case of Chicago and Atlanta in which the WRM showed an increasing percentage of the retail price.

The PHPS margin as a percent of the retail value decreased in all three cities. Six year averages for New York indicated that the margin as a percent of the retail value decreased from 17.2 to 15.7 percent. Chicago's margin decreased from 17.2 to 14.9 percent with Atlanta's margin as a percent of retail value decreasing from 20.0 to 16.0 percent.

Transportation charges increased at an average of 5 cents per carton per season in New York and Chicago. Transportation cost as a percentage of retail value fluctuated in both New York and Chicago, but comparing six year averages it decreased from 10.9 to 9.5 and 10.6 to 8.8 percent of retail value for New York and Chicago, respectively. Transportation costs are illustrated in Figure 4.

Marketing Margins and Prices

Data throughout this chapter indicated that movements in the GM do influence retail prices. This is true especially in the case of the WRM. Past increases in the retail price can be partially attributed to increases in the WRM. When eleven year averages of the real retail price per carton were computed, $1.20 of the $1.76 increase was due to the margins. Of the $1.20 increase in the GM, $1.17 was due to the WRM.

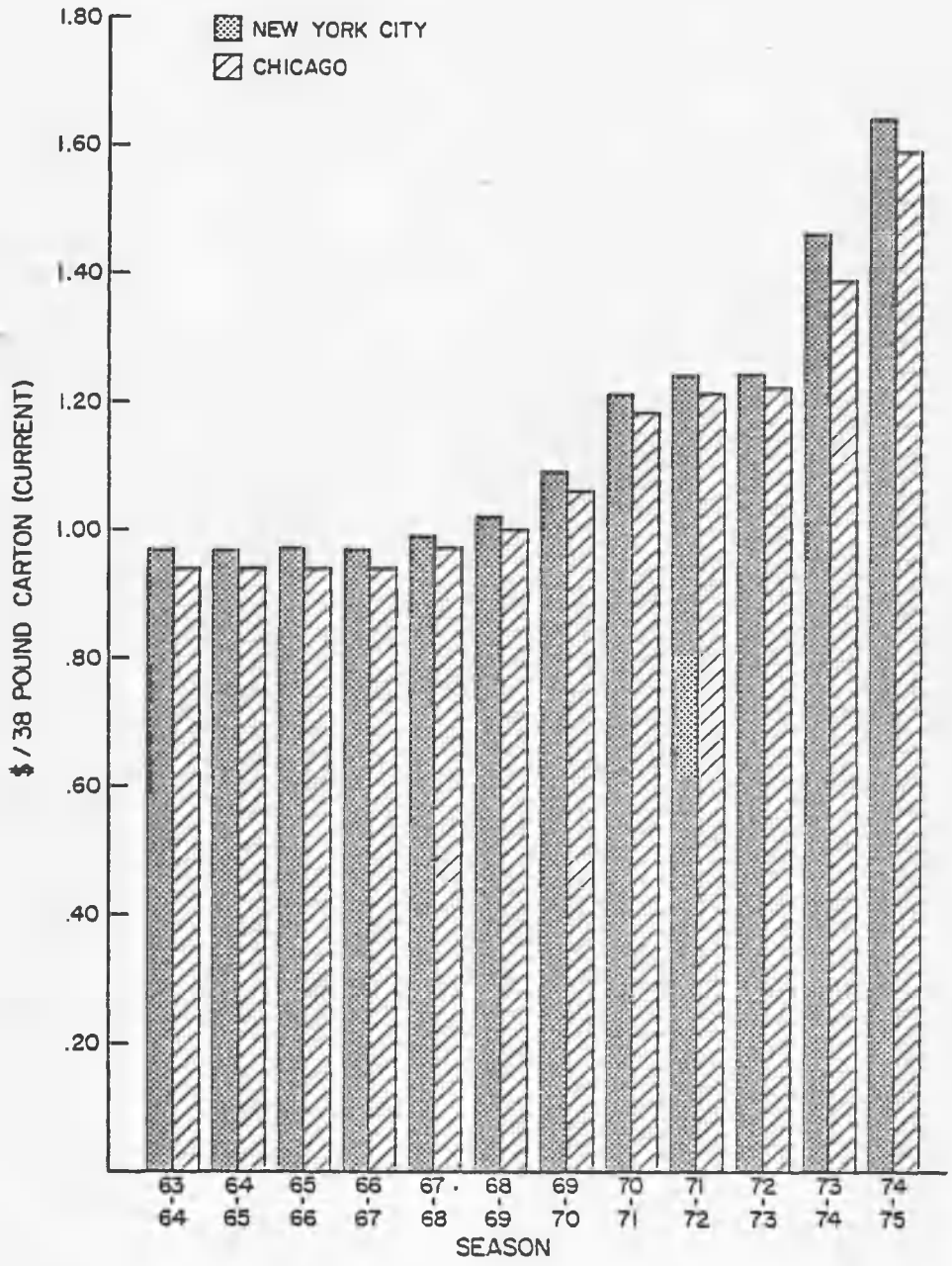

Figure 4. Rail charges from Ventura, California to New York City and Chicago on a per carton basis (38 pounds).

The WRM has had a large influence in price increases over the past twenty-two years. In an absolute sense the WRM has trended upward although as a percentage of the retail price it has remained fairly constant.

The PHPS margin has decreased over time when measured as a percentage of the retail price. In real dollars the PHPS margin in an absolute sense has not shown any significant trend with the exception of a slight rise since 1963-64.

The lemon marketing order does not influence movements in the marketing margins, at least in respect to the WRM. Equation III-D indicated that when WRM and the domestic shipment of fresh lemons were stipulated as independent variables and the retail price as the dependent variable, the only significant variable was the WRM. The rate of flow provision has drawn most of criticism directed toward the marketing order. Critics have charged that through supply control the marketing order has "unduly enhanced" the price of fresh lemons. Equation III-D seems to contradict those charges and implies that the dissolution of the marketing order will have a much smaller effect than critics presume.

CHAPTER IV

MARKET ALLOCATIONS AND THE SIZE DISTRIBUTION OF DOMESTIC SALES

Because of the operations of the marketing order, it is possible to identify three major outlets for lemons: the fresh domestic market, which includes the United States (excluding Hawaii) and Canada; the export market, whose major importer currently is Japan; and the processed market in which lemon juice, lemonade and other products are produced. Provisions of the marketing order apply directly to the first outlet. The volume of fruit going into these outlets has undergone significant changes since 1953-54. Because of the indirect effects of supply management and stabilization by means of the marketing order, analysis of changing allocations will be beneficial in evaluating the order and in subsequent analyses.

Per capita consumption and expenditures will be investigated in an effort to determine if they have changed over time. Since the Lemon Marketing Order operates under a minimum size requirement, an analysis of the domestic sales of fresh lemons and their distribution by size will be presented.

Fresh Domestic Shipments

Shipments into the domestic market were examined for the period 1953-54 through 1974-75 for both winter lemons (November-April) and summer lemons (May-October).

Table 12 indicates the fresh domestic shipments of summer and winter lemons and their percentage of total shipments for the twenty-two year period. Fresh domestic shipments for both winter and summer lemons have shown a decreasing trend in both an absolute sense and a relative sense, with the decline being much more pronounced for summer lemons.

The long run average of winter lemons allocated into the domestic market has been approximately 37.2 percent of the total utilization from 1953-54 through 1974-75. This is contrasted to about 27.3 percent allocated during the last five years, 1970-71 through 1974-75. The same relationship holds for summer lemons, with an overall average of 45.1 percent of the total production of summer lemons entering the domestic market in contrast to 24.7 percent for the last five years.

If stabilization is interpreted to mean a constant year-to-year quantity entering the fresh domestic market, it is apparent that the stabilization has not occurred in either an absolute or relative sense. Several explanations are possible: (1) shift in demand as a result of the introduction and acceptance of new substitutes (lemon juice and concentrated lemonade), (2) shift in demand as a result in the consumption of complementary foods such as fish or iced tea, (3) changes in quantity demanded because of higher retail prices, and (4) the Lemon Committee's belief in keeping supply low in an effort to guarantee higher farm prices.

Exports and Processed Markets

With total supply constant or increasing, a decline in shipments into the domestic market necessitates an increase in allocation into the export and/or processed markets. Table 13 contains historical data on

Table 12. The allocation of California and Arizona fresh lemons into the domestic market for summer and winter seasons, 1953-54 through 1974-75.

Year	Summer			Winter		
	Total[a]	Fresh[b]	Percent[c]	Total[a]	Fresh[b]	Percent[c]
	thousand carton-carloads					
1953-54	21,004	9,986	47.5	12,416	5,727	46.1
1954-55	17,033	9,661	56.7	11,209	5,745	51.3
1955-56	14,438	8,991	62.3	12,298	5,792	47.1
1956-57	20,881	9,271	44.4	10,678	5,614	52.6
1957-58	18,896	8,700	46.0	15,126	5,620	37.2
1958-59	18,272	9,191	50.3	17,911	5,559	31.0
1959-60	15,238	8,312	54.5	20,513	5,717	27.9
1960-61	18,127	8,611	47.5	10,421	5,377	51.6
1961-62	14,357	8,449	58.8	18,100	5,582	30.8
1962-63	17,580	7,961	45.3	9,128	5,488	60.1
1963-64	20,627	8,279	40.1	16,580	5,474	33.0
1964-65	18,062	7,684	42.5	10,475	5,311	50.7
1965-66	16,383	7,583	46.3	15,884	5,489	34.6
1966-67	18,684	7,146	38.2	17,270	5,301	30.7
1967-68	17,547	7,171	40.9	16,136	5,396	33.4
1968-69	13,125	6,892	52.5	17,493	5,243	30.0
1969-70	15,197	6,752	44.4	15,914	5,292	33.0
1970-71	16,690	6,812	40.8	15,594	5,234	33.6
1971-72	17,903	6,684	37.3	17,360	5,358	30.9
1972-73	19,917	6,799	34.1	23,985	5,526	23.0
1973-74	20,654	6,491	31.4	16,386	5,480	33.4
1974-75	21,887	6,519	29.8	33,934	5,379	15.9

a. Total equal all shipments for each particular season (domestic + exports + processed).
b. Fresh indicates the number of lemons which entered the fresh domestic market for each particular season.
c. Percent of the total allocation that entered the fresh domestic market for each particular season.

Table 13. Allocation of California and Arizona lemons into the processed and export markets, 1953-54 through 1974-75.[a]

Year	Exports				Processed			
	Winter	Percent[b] of Total	Summer	Percent[b] of Total	Winter	Percent[b] of Total	Summer	Percent[b] of Total
1953-54	321	2.6	1,348	6.4	6,369	51.3	9,670	46.0
1954-55	1,010	9.0	1,962	11.5	4,454	39.7	5,410	31.8
1955-56	1,567	12.7	1,881	13.0	4,939	40.2	3,566	24.7
1956-57	840	7.9	3.094	14.8	4,224	39.6	8,516	40.8
1957-58	2,665	17.6	3,380	17.9	6,841	45.2	6,816	36.1
1958-59	1,281	7.2	2,185	12.0	11,071	61.8	6,896	37.7
1959-60	2,008	9.8	2,367	15.5	12,788	62.3	4,559	29.9
1960-61	1,909	18.3	3,092	17.1	3,135	30.1	6,424	35.4
1961-62	2,117	11.7	1,604	11.2	10,401	57.5	4,304	30.0
1962-63	997	10.9	4,090	23.3	2,643	29.0	5,529	31.5
1963-64	1,537	9.3	3,668	17.8	9,569	57.7	8,680	42.1
1965-65	1,100	10.5	3,718	20.6	4,064	38.8	6,660	36.9
1965-66	2,314	14.6	3,291	20.1	8,081	50.9	5,509	33.6
1966-67	2,485	14.4	3,703	19.8	9,484	54.9	7,835	41.9
1967-68	2,318	14.4	3,956	22.5	8,422	52.2	6,420	36.6
1968-69	2,454	14.0	2,747	20.9	9,797	56.0	3,485	26.6
1969-70	2,786	17.5	3,838	25.3	7,836	49.2	4,607	30.3
1970-71	2,660	17.1	4,197	25.1	7,700	49.4	5,681	34.0
1971-72	3,274	18.9	4,877	27.2	8,728	50.3	6,342	35.4
1972-73	4,444	18.5	5,275	26.5	14,015	58.4	7,843	39.4
1973-74	3,786	23.1	6,500	31.5	7,120	43.5	7,663	37.1
1974-75	4,845	14.3	5,332	24.4	23,710	69.9	10,036	45.9

a. All values are in thousand-carton carloads with each carton containing 38 pounds of lemons. Winter months run from November through April and summer months run from May through October.

b. The percentage of total shipments that were exported or processed.

the shipments of winter and summer lemons into the export and processed market. These data show that exports are increasing both in an absolute sense and as a percent of total shipments. Exports of winter lemons have increased from 2.6 percent in 1953-54 to 14.3 percent of total shipments in 1974-75. In an absolute sense, exports of winter lemons increased from 321 thousand-carton cars in 1953-54 to 4,845 cars in 1974-75. The same basic relationship holds for summer lemons, moving from 6.4 percent to 24.4 percent of total shipments, and from 1,348 to 5,332 thousand carton-cars during the 1953-54 to 1974-75 period.

The processed market also showed an increase as a percent of total shipment and in an absolute sense. Shipments into the processed market were a higher proportion of total production for winter lemons. The twenty-two year period under study showed, on the average, about 49.5 percent of the total shipments in the winter months entered the processed market whereas 36.6 percent of summer lemons entered the processed market. Data from Table 13 show an increase in both winter and summer lemon allocation into the processed market but no consistent trend is apparent. The processed market tends to act as outlet for lemons which are neither shipped to the domestic or export market. This is expected because of the rather low returns that the farmer receives from the processed market.

The export market is becoming more important in that a portion of the supply that does not enter the domestic market is moved into the export market. The processed market serves mainly as an outlet for lemons that cannot meet the grade and size requirements of the other two markets and as a residual market that absorbs the portion of supply that is believed to be unprofitable to ship into the domestic or export market.

Per Capita Consumption and Expenditures

The previous section showed how the quantity which enters the fresh domestic market has declined over time. This fact, coupled with the population growth during the last twenty-two years, necessitates a decreasing per capita consumption. Table 14 indicates consumption and expenditures on a per capita basis for winter and summer lemons. Also total consumption and expenditures on an annual basis are given as the sum of their respective winter and summer totals. Per capita consumption and expenditures will be slightly overestimated because the population basis did not include Canada, which is considered part of the domestic market.

Per capita consumption of summer lemons is much higher than winter lemons. Summer per capita consumption also shows a greater decrease than does winter per capita consumption. The importance of substitutes in the summer may serve as a partial explanation for the greater decline of per capita consumption of fresh lemons. Chapter V contains an attempt to measure the impact of substitutes.

Table 14 indicates that not only has per capita consumption declined but also per capita expenditures in real dollars. Per capita expenditures were calculated by taking the product of the per capita consumption series (winter, summer and total) and the real price per unit for the corresponding periods. Real prices were obtained by deflating current prices by the adjusted GNP Implicit Price Deflator as explained in Chapter II. Table 14 suggests that even though the real price of fresh lemons has increased, the apparent decline of per capita consumption has more than negated the price increase, and per capita

Table 14. Per capita consumption of and expenditure on fresh domestic lemons, 1953-54 through 1974-75.

Year	SPDC[a]	WPDC[b]	TPDC[c]	SPEP[d]	WPEP[e]	TPEX[f]
1953-54	2.33	1.35	3.68	.70	.43	1.13
1954-55	2.22	1.33	3.55	.64	.41	1.05
1955-56	2.03	1.32	3.35	.60	.40	1.00
1956-57	2.06	1.26	3.32	.58	.40	.98
1957-58	1.90	1.24	3.14	.53	.36	.89
1958-59	1.97	1.20	3.17	.53	.34	.87
1959-60	1.75	1.21	2.96	.47	.34	.81
1960-61	1.78	1.12	2.90	.49	.35	.84
1961-62	1.72	1.15	2.87	.47	.32	.79
1962-63	1.60	1.11	2.71	.50	.40	.90
1963-64	1.64	1.09	2.73	.46	.32	.78
1964-65	1.50	1.04	2.54	.47	.34	.81
1965-66	1.47	1.07	2.54	.46	.33	.79
1966-67	1.37	1.03	2.40	.41	.33	.74
1967-68	1.36	1.03	2.39	.44	.35	.79
1968-69	1.29	.99	2.28	.43	.32	.75
1969-70	1.25	.99	2.24	.42	.35	.77
1970-71	1.25	.97	2.22	.43	.33	.76
1971-72	1.22	.98	2.20	.42	.34	.76
1972-73	1.23	1.00	2.23	.44	.35	.79
1973-74	1.16	.99	2.15	.42	.37	.79
1974-75	1.16	.96	2.12	.42	.35	.77

a. SPDC = Summer per capita consumption in pounds (May-October).

b. WPDC = Winter per capita consumption in pounds (November-April).

c. TPDC = Total per capita consumption in pounds (November-October).

d. SPEP = Summer per capita expenditures in real dollars (May-October).

e. WPEP = Winter per capita expenditures in real dollars (November-April).

f. TPEP = Total per capita expenditures in real dollars (November-October).

expenditure is declining. The possible economic explanations for this situation are a movement along an elastic demand curve or a shift in demand.

The total value of domestic sales was calculated for fresh summer and winter lemons by taking the real retail price for each season and multiplying it by consumption for each season. Table 15 indicates the results from 1953-54 through 1974-75. Summer total revenue from retail sales has shown a decreasing trend while winter total revenue has remained fairly constant.

The results suggest that in the case of summer lemons, given the increase in the real retail price, the declining fresh shipments have offset this price increase, and caused total revenue at the retail level to drop. Total revenue for winter lemons indicated no trend.

Under ceteris paribus conditions, the decline in total revenue for summer lemons implies that the retail demand is elastic. In the case of winter lemons the data suggest that the retail price elasticity of demand is approximately unitary. Chapter V contains empirical estimates of the price elasticities of demand that support the implications from the observed total revenue data.

Distribution of Domestic Sales by Size

The Lemon Marketing Order authorizes the Lemon Administrative Committee to determine the minimum size of lemons that enter the fresh domestic market. The most common minimum size throughout the period under study was 235's. The size 235 indicates the number of lemons that can be packed in a 38 pound carton.

Table 15. Total retail value of sales of fresh winter and summer lemons, 1953-54 through 1974-75.

Year	Winter Value[a]	Summer Value[a]
1953-54	$ 68,902.1	$ 113,782.0
1954-55	67,026.6	106,165.0
1955-56	65,543.3	100,345.0
1956-57	67,133.4	99,164.2
1957-58	62,225.4	91,454.1
1958-59	59,923.9	94,793.2
1959-60	61,035.0	85,685.7
1960-61	63,212.9	90,544.0
1961-62	58,791.5	88,432.3
1962-63	74,787.3	94,447.4
1963-64	61,353.1	88,333.6
1964-65	66,224.7	91,695.3
1965-66	64,949.6	89,258.2
1966-67	63,644.6	82,098.4
1967-68	69,097.2	87,182.0
1968-69	64,901.5	87,570.4
1969-70	70,817.2	86,276.0
1970-71	68,650.9	88,719.7
1971-72	71,024.8	87,942.1
1972-73	73,398.9	93,125.5
1973-74	78,598.0	88,867.2
1974-75	74,106.5	88,847.5

a. All values in thousands.

Table 16 indicates the distribution of lemons by size from 1958-59 through 1974-75. These data show that the average size of lemons that entered the fresh domestic market increased over time from an average of 169 per carton in 1958-59 to 152 lemons per carton in 1974-75.

Industry sources suggested that a possible explanation for the increase in the average size of fresh lemons was Districts 1 and 3's increased percentage of total fresh domestic shipments. The proposed hypothesis rested on three basic facts: the first was that District 2's trees yielded two crops a year while District 1 and 3's yielded one -- this would allow District 1 and 3's fruit to draw more nourishment from the tree; the second was the climatic differences; the last was that District 2's crop was harvested earlier and put into storage while Districts 1 and 3's fruit stays on the tree and increases in size.

The relationship between average size and Districts 1 and 3's shipments was tested using an ordinary least-squares regression. The result of the regression is as follows:

$$Y = \underset{(104.08)}{168.4} - \underset{(-6.1072)}{.56468\,X} \qquad R^2 = .694 \qquad \text{(IV-A)}$$

where: Y = average size of fresh domestic lemons

X = Districts 1 and 3's percent of total shipments

Numbers in parentheses are "T" statistics.

The estimated coefficient for Districts 1 and 3's percentage of total shipments was significantly different from zero at one percent level of significance. The results supported the hypothesis that as District 1 and 3's percentage of total shipments increased, the average size of fresh domestic lemons also increased.

Table 16. Size distribution of lemons that enter the fresh domestic market and district 1 and 3's percentage of the total shipments 1958-59 through 1974-75.

Year	Distribution of Sizes in Percent[a]						Average Size[a]	District 1 and 3 Percent of Total
	95's	115's	140's	165's	200's	235's		
1958-59[a]	3	13	31	33	14	6	169	5.8
1959-60[c]	2	10	25	34	22	7	163	8.8
1960-61[d]	2	11	25	33	20	9	163	7.4
1961-62[e]	3	11	25	32	21	8	163	7.8
1962-63[f]	4	13	26	29	18	10	161	6.8
1963-64[g]	3	12	25	30	21	9	163	8.3
1964-65[f]	5	13	24	27	19	12	164	12.6
1965-66[f]	5	13	23	29	19	11	163	12.7
1966-67[f]	7	14	24	28	18	9	159	17.1
1967-68[f]	7	16	27	30	13	7	154	19.4
1968-69[f]	10	15	23	25	27	10	157	22.0
1969-70[f]	9	16	23	26	16	10	157	22.8
1970-71[f]	9	15	25	25	16	10	157	25.1
1971-72[f]	7	13	24	27	19	10	161	21.4
1972-73[f]	12	18	23	23	15	9	153	24.2
1973-74[f]	15	17	24	21	14	9	151	22.5
1974-75[f]	14	17	23	23	15	8	152	26.3

a. Size number refers to the number of lemons that can be packed in a 38 pound carton.

b. Different size categories used: 105's, 126's, 150's, 180's, 216's, 245's and 270's. Partial year, District 1 and 2; no regulation of District 3; Distribution for District 1 and 2 for the period 3/22/59 to 11/1/59. No limits prior to 3/22/59; 245's from 3/22/59.

c. Partial year all districts: No limits prior to 12/6/59; 235's from 12/6/59 through 8/21/60; no limits thereafter.

d. Partial year all districts: No limits prior to 12/5/61; 235's thereafter until 10/29/61.

Table 16. (continued)

e. Partial year all districts: No limits prior to 2/4/62; 195's from 2/4/62 through 2/25/62; 235's thereafter until 10/28/62.

f. Minimum size 235's.

g. Minimum size 235's except when minimum size was 195's + 10% of 235's for the period 1/12/64 through 3/1/64.

Source: Lemon Administrative Committee (1960-76).

Lemon Marketing Order and Supply

It was discovered that fresh domestic shipments have shown a decreasing trend which is more pronounced for summer lemons. The decline in domestic shipments was picked up by the export market with the processed market serving as the low priority market taking what is believed is not profitable to ship in the domestic or export market.

With the decline in domestic shipments and the increase in the United States population, per capita consumption declined. Not only did the per capita consumption decline but per capita expenditure also declined. Total revenue at the retail level showed a decline for summer lemons while the results are inconclusive for winter lemons.

The Lemon Marketing Order regulates the minimum size of fresh lemons that enter the domestic market but the increase in the average size of fresh domestic lemons was not due to the operations of the Order. The Lemon Administrative Committee has maintained the same size regulation for the last eleven years under study. The increase in the average size seems to be partially caused by the increased shipments of fresh lemons in the domestic market from Districts 1 and 3.

CHAPTER V

ANALYSIS OF THE DEMAND FOR FRESH LEMONS

Method

The primary objective of this chapter is to determine and study the important variables that affect the price of fresh lemons in the domestic market. The brunt of the effort is placed on estimating the coefficients of certain structural variables rather than on building predictive models.

The technique employed is that of ordinary least-squares regression in both linear form and natural logs. The single equation method was selected over the simultaneous equations approach because of the simplicity of the method and the rather similar results that normally are obtained when using these methods. Karl Fox (1953) presents five questions that should be answered before one chooses either the single equation method or the simultaneous approach. Each of these questions will be discussed in terms of their application to this study. If any of the questions are answered in the affirmative, then there may be reason to believe that the single equation method will yield biased estimates of the structural coefficients.

The first question is whether the supply of the given commodity is affected by the commodities current price. The quantity of fresh lemons that enter the domestic market are allocated on a weekly basis by the Lemon Administrative Committee. This allocation is authorized under

the rate-of-flow provision in the Lemon Marketing Order. The Lemon Administrative Committee annually reports its estimation of next season's crop utilization. The estimated domestic shipments, although always overestimated do show a strong relationship to the actual shipments and last year's price. This indicates that except in certain circumstances a large part of the domestic shipments correspond to the estimations made earlier and not to the current retail price. It would be fatuous to assume the Committee does not look at the past week's price, but their main concern with price is at the f.o.b. level. It was shown that the f.o.b. and retail prices are related, but as Chapter II pointed out their relationship isn't as strong as expected.

Because of the Lemon Administrative Committee's weekly allocation, on a weekly period there seems to be some justification for using the simultaneous approach. The analysis in this chapter is on a seasonal basis and because of the close association between the annual estimation and actual utilization of the crop there is little reason to believe the simultaneous approach would yield better results.

The second question is whether consumption of a given commodity is affected by its current price or the demand for export or storage. Storage of lemons is of no importance in terms of annual consumption. However, lemons are an export commodity and since 1964 exports have become more important in the industry. The question is really how important is the export market and does it affect domestic consumption? Granted, the export market for lemons is large and has increased over time, yet the domestic market still remains the priority market. This

suggests that the causal relationship is that domestic consumption affects the export market and probably not vice-versa.

Domestic consumption has trended downward over the past twenty-two years while exports have fluctuated in the fifties and sixties and shown an upward trend since the late sixties. Domestic consumption is probably independent of export shipments and expansion of exports comes from expansion in total supply and out of processed market shipments.

The third question is whether consumers' incomes are significantly affected by changes in price or consumption of the given commodity. Largely because of its insignificance in the total economy there is no evidence that price or the consumption of lemons affect consumers' incomes.

The fourth question is whether the supply of any competing commodity is affected by the price of the given commodity. The major competing commodity of fresh lemons is lemon juice which is a product of the processing market. As mentioned before, seasonal domestic shipments are not related to the current price. If this is the case, the allocation into the processed market is determined by domestic shipments and exports not the retail price of fresh lemons.

The last question is whether there is more than one major domestic market. There are two major domestic outlets for lemons, the fresh market and the processed market. The domestic market is the priority market and therefore receives the majority of attention. The processed market serves mainly as a receiver of lemons that are believed to be unprofitable to ship in the domestic or export market. The processed market does not compete in any sense with the fresh market.

It seems as though the single equation method is valid in this case. Other points that influenced the decision to use the single equation method are given in a quote also from Karl Fox (1953, p. 8). He states that " . . . there are certain cases, particularly in analysis of agricultural prices in which simultaneity is of limited importance. In such cases it is doubtful whether the elaborate procedures of the Cowles' Commission[1] will improve or even change the results of the single-equation approach within the limits of sampling error."

Further rationale for using the least-squares, single equation approach can be found in a publication by Foote (1958). He discusses several studies of the simultaneous approach and points out statistically why the results of the single equation method and the simultaneous equation approach are similar.

In view of the above information and the simplicity of the single equation approach, it was decided to use it for the analysis of demand.

Selection and Specification of Variables

The lemon season used throughout this study does not correspond to a calendar year, but rather to a period which begins in November and continues through the following October. Moreover, the season can then be divided into two parts -- a winter lemon season comprising the period of November through April and a summer season which runs from May through October. Analysis was undertaken treating the demand for winter and summer lemons separately.

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1. The Cowles' Commission here is noted for its contribution in simultaneous equation methods.

It was argued earlier that the domestic supply of fresh lemons is not significantly affected by its current price. Because of this, the dependent variable in all of the regressions was the retail price of either the fresh winter or summer lemons. The retail prices for fresh lemons in both the winter and summer seasons were derived by weighting the monthly prices in leading United States' cities (see Appendix A) by their respective monthly unloads of fresh lemons. Weighted prices are preferable to using just the simple average.

Independent variables were plotted with respect to the dependent variable in order to determine the nature of the association between the dependent and independent variables. Five independent variables were selected: per capita disposable income, per capita consumption of fresh lemons, time, trans-Pacific exports and the price of frozen lemonade concentrate.

Trans-Pacific exports, whose major destination is Japan, was included because of the growing importance of this particular export market, while the price of lemonade was included as a substitute for fresh lemons.

A study by Hoos and Seltzer (1952) included temperature as an independent variable. Although the temperature variable was significant in their study, the rationale for its inclusion does not seem applicable some twenty-four years later. Their argument for using the temperature variable in the summer demand equation was that high temperatures encouraged the intake of cool beverages such as fresh lemonade. This may have been the case thirty or so years ago, but it is more likely in the last twenty years the lemonade is from frozen concentrate, not fresh

lemons. The explanation for the use of the temperature variable in the winter equation was that low temperatures and ailments like viral infections and colds are related and many people use fresh lemons to combate these infections (Hoos and Seltzer, 1952, p. 40). This is not the case with respect to winter or summer lemons and the influence of temperature.

If the doubling of all price and income variables had no effect on consumption, then deflated values should be used in order to adjust for the effects of the general price level. This is the case for all perishable goods and semi-durable goods. Only in commodities with large initial expenditures does the change in money value suggest that deflation per se is not appropriate (Foote 1958, p. 27). For this reason, along with Friedman's (1970, pp. 47-99) argument, all monetary variables were deflated by the modified G.N.P. implicit price deflator (Appendix B). This modified version was basically the same as the one used in Chapter II except that the deflator for winter lemon variables is the average of the fourth and first quarter data (October-March) and for the summer lemon variables the average of the second and third quarter data (April-September). This procedure approximates the time periods closer than if one used an annual deflator.

A similar technique was used in obtaining per capita disposable income. For example, in the equations for winter lemons, the per capita disposable income for that year was the average of the fourth and first quarter data. This method yielded a per capita disposable income value for October through March which more closely coincides with the winter lemon season (November-April) than an annual value. The same procedure was followed in obtaining a representative value for summer per capita

disposable income with the difference being that an average of the second and third quarter data was used.

Per capita consumption was derived by dividing winter and summer fresh lemon consumption by population averages for the appropriate quarterly periods. Basically, the same procedure was used as in determining per capita disposable income.

Trans-Pacific exports were aggregated into season totals by summing monthly exports from November through April for winter lemons and May through October for summer lemons.

Frozen lemonade concentrate was the only substitute commodity for which appropriate data could be found. The price data for the lemonade variable are incomplete and only cover the period 1963-64 through 1974-75.

The sources and the data used in this chapter's analysis are listed in Appendix D.

The basic equations used in this analysis are:

$$P_w = f\ (WPCYD, WPDQ, WTPEX, WSL, T)$$

$$P_s = f\ (SPCYD, SPDQ, STPEX, SSL, T)$$

where: P_w = retail price of fresh winter lemons

WPCYD = winter per capita disposable income

WTPEX = winter trans-Pacific exports

WSL = winter prices of lemonade concentrate

WPDQ = winter per capita domestic consumption

P_s = retail price of fresh summer lemons

SPCYD = summer per capita disposable income

SPDQ = summer per capita domestic consumption

STPEX = summer trans-Pacific exports

SSL = summer prices of lemonade concentrate

T = time

Statistical Results

Single equation least-squares regressions were completed in linear form, natural logs and first differences. The time period under investigation was 1953-54 through 1973-74 with the exception of the regressions which included the lemonade variable. Because of the unavailability of a complete data series for lemonade, the time period for the regressions that included the lemonade variable was shortened to 1963-64 through 1973-74.

On the basis of a priori reasoning different combinations of the independent variables were specified and the results are indicated in Tables 17 and 18. Regressions using first differences of the data were not included in either table because of the rather poor statistical results that were obtained.

Winter Lemons

An interesting point brought out by the results in Table 17 is that the per capita consumption variable is not significant at any appropriate level in any of the equations. This did not follow any of the a priori expectations. Although Chapter II has shown that the real retail price of fresh lemons has increased over time, the quantity entering the market in the winter season has been relatively stable. In 1953-54, 5,727 thousand-carton-cars entered the fresh domestic market in comparison with 5,480 cars in the 1973-74 winter season. Even when you couple this slight decline with a forty million increase in population, the

Table 17. Estimated regression equations for the retail price of fresh winter lemons.

Equation Number[a]	Dependent Variable[b]	Constant Term[c,d]	Independent Variables[d,e]					R^2 Values (Corrected)
			WQ	YD	S	EX	T	
1	P	3.8028	1.4732	.0021[f]				.534
		(.7152)	(.5369)	(2.792)				
2	P	5.3520	-1.0821	.0029			-.1103	.511
		(.7748)	(-.1434)	(1.2272)			(-.3650)	
3	P	16.1735	-6.0354	.0015		.0011	-.2276	.513
		(1.3016)	(-.6790)	(.5365)		(1.0464)	(-.7079)	
4	P	7.9675	-14.7019	.0047	.3645		-.1695	.752
		(.9054)	(-1.2865)	(1.1301)	(1.1343)		(-.4504)	
5L	P	-2.0946	.1548	.5676[f]				.510
		(-1.0711)	(.5075)	(2.3744)				
6L	P	-1.4666	-.7939	.5468[f]			-.1562[f]	.580
		(- .7990)	(-1.4441)	(2.4705)			(-2.0107)	
7L	P	.7603	-.7833	.4496		.0137	-.1589[g]	.556
		(.2208)	(-1.3808)	(.9842)		(.2454)	(-1.9695)	
8L	P	-6.2618	-.9253	.9215[f]	.4686			.783
		(-1.5102)	(-1.6012)	(2.3705)	(1.1876)			

a. All equation numbers followed by "L" indicate logs to the base "e."

b. P = retail price of fresh winter lemons -- real $/carton.

c. Constants in logarithmic functions are log of "a"

Table 17. (continued)

d. "t" statistics are in parentheses.

e. WQ = per capita consumption of fresh winter lemons
YD = per capita disposable income (November-April) -- real dollars
EX = winter trans-Pacific exports
T = time, origin 1954 = 2. Equations 4 and 8L ran over period 1964-74.
S = retail price of frozen lemonade concentrate, 6 ounce can

f. significant at the 5% level of significance

g. significant at the 10% level of significance

Table 18. Estimated regression equations for the retail price of fresh summer lemons.

Equation Number[a]	Dependent Variable[b]	Constant Term[c,d]	Independent Variables					R^2 Values (Corrected)
			SQ	YD	S	EX	T	
1	P	-2.0501	1.7115[f]	.0034[f]				.831
		(-.6240)	(2.0962)	(5.4491)				
2	P	-1.6790	1.1362	.0038[f]			-.0633	.823
		(-.4766)	(.6293)	(2.9130)			(-.3596)	
3	P	3.4077	-.3189	.0032[f]		.0005	-.1625	.819
		(.4753)	(-.1251)	(2.1284)		(.8171)	(-.7548)	
4	P	9.9936	1.9621	-.0009	-.2062		.3593	.879
		(1.4479)	(.4583)	(-.2803)	(-.9424)		(1.0718)	
5L	P	-5.7153[f]	.2776	.9967[f]				.784
		(-2.4646)	(1.5183)	(3.5944)				
6L	P	-1.2018	-.5690[f]	.5387[f]			-.1851[f]	.885
		(-.5949)	(-2.3124)	(2.3293)			(-4.0961)	
7L	P	-2.2578	-.5412[f]	.6767[g]		-.0164	-.1725[f]	.880
		(-.7747)	(-2.1035)	(1.8906)		(.5136)	(-3.2950)	
8L	P	1.0106	.0191	.1270	-.1223		.2836	.852
		(.1507)	(.0033)	(.1318)	(-.5471)		(.5100)	

a. All equation numbers followed by "L" indicate logs to the base "e."

b. P = retail price of fresh winter lemons -- real $/carton.

c. Constants in logarithmic functions are log of "a"

T

Table 18. (continued)

d. "t" statistics are in parentheses.

e. WQ = per capita consumption of fresh winter lemons
YD = per capita disposable income (November-April) -- real dollars
EX = winter trans-Pacific exports
T = time, origin 1954 = 2. Equations 4 and 8L ran over period 1964-74
S = retail price of frozen lemonade concentrate, 6 ounce can

f. significant at the 5% level of significance

g. significant at the 10% level of significance

resulting variations in per capita consumption did not significantly affect the retail price movement. One possible explanation is that approximately 80 percent of the retail price of fresh lemons is made up by the marketing margins, and in the case of winter lemons a major causal agent in the observed price movements may be found in the margins.

Per capita disposable income and time proved to be significant in more of the regressions for the twenty-one year period than any other independent variables. As Table 17 indicates, winter trans-Pacific exports did not prove to be significant in any of the regressions.

Equation number 6L in Table 17 was selected as the best among those representing the twenty-one year study period for winter lemons. Although the per capita consumption variable is not highly significant, it is significantly different from zero at the 20 percent level. The coefficients of the per capita disposable income and time variable are significantly different from zero at the 5 percent level of significance.

Equation 6L in Table 17 indicates in economic terms that ceteris paribus:

(1) A one percent change in per capita disposable income is associated with a movement in the same direction of .55 of one percent in the retail price of fresh winter lemons.

(2) A one percent change in per capita consumption of fresh winter lemons is associated with a movement in the opposite direction of .79 of one percent in the retail price of fresh winter lemons.

(3) The retail price of fresh winter lemons would decline over time since the coefficient of the time variable is negative.

The R^2 value for Equation 6L (Table 17) is only .580. The low R^2 value could lead to the inclusion of new variables, variables traditionally not included in agricultural price analysis. One possibility would be to introduce some of the variables that make up the marketing margins as independent variables in retail price equations. This would hopefully yield higher R^2 values and more significant statistical results.

As was discussed earlier, data on the substitute variable, the retail price of frozen lemonade concentrate, could only be found for the period 1963-64 through 1973-74. For this reason several equations were estimated using the shorter time period in order to include the price of lemonade concentrate. Equations numbered 4 and 8L in Table 17 gave the best fit when using this variable. As can be seen, the substitute variable proved insignificant in both cases. This suggests that there is no relationship between changes in frozen lemonade concentrate prices and changes in the retail price of fresh winter lemons. The validity of this conclusion is tempered by the fact that the equations were estimated with only seven degrees of freedom.

Summer Lemons

As was noted in the case of winter lemons, the effect of per capita consumption of fresh lemons on the fresh retail price did not hold to the *a priori* expectations in many of the equations. In contrast to the winter lemon case, the quantity of summer lemons that were allocated to the domestic market has shown a decrease of approximately 35 percent for the twenty-one year period under investigation. The decrease of 3,467 thousand-carton cars of lemons coupled with an increase in

population of about 41 million would seem to have a significant effect on the price of fresh summer lemons. Equation 1 in Table 18 indicates that the per capita consumption variable shows a positive and significant relationship with the dependent price variable. This is inconsistent with theory and suggests a specification error. The logarithmic functions yielded the best of the estimated equations, and the results of Equation 6L, Table 18 seem to be consistent with theory.

The independent variables in Equation 6L were per capita consumption, time, and per capita disposable income. All of the estimated coefficients for the independent variables were significantly different from zero at a five percent level of significance.

Equation 6L in Table 18 indicates in an economic sense that ceteris paribus:

(1) A one percent change in per capita disposable income is associated with a movement in the same direction of .54 of one percent in the retail price of fresh summer lemons.

(2) A one percent change in per capita consumption of fresh summer lemons is associated with a movement in the opposite direction of .57 of one percent in the retail price of fresh summer lemons.

(3) The retail price of fresh summer lemons would decline due to the negative coefficient for the time variable.

The R^2 value for estimated Equation 6L (Table 18) is .885, which is substantially higher than the respective R^2 value for winter lemons. The estimated coefficients obtained from Equations 6L (Table 17) and 6L (Table 18) were similar particularly for disposable income.

The time period of the regressions was shortened to 1963-64 through 1973-74 when the price of lemonade was used as an independent variable. The best regression results obtained when using the lemonade variable are listed in Table 18. The lemonade variable did not prove to be significant which is somewhat surprising in that it was generally assumed that lemonade concentrate would serve as a substitute for fresh lemons, especially in the summer. Again, the problems of estimation with only eleven observations must be recognized.

Overall, the most important variable in the analysis of the retail price of fresh lemons in both the summer and winter cases is per capita disposable income. It is plausible that per capita disposable income behaves as some type of proxy for a marketing margin variable. This does not seem as unreasonable as it may sound; it has been discussed before that the marketing margins equal approximately 80 percent of the retail value, and by far the largest factor in the margins themselves is the labor cost. It is possible that the per capita disposable income variable is picking up some of the changes in the labor cost in the marketing margins.

An important and disturbing point is the instability of the sign on the quantity variable. Tables 17 and 18 indicate that the sign and the significance of the estimated coefficients for the quantity variable fluctuate. Equations 6L in both Tables 17 and 18 yielded the most appropriate coefficients in light of economic theory and *a priori* expectations. Inspection of the correlation matrix yielded certain insights into the statistical problems of the data. The matrix showed that the independent variables were, in some instances, highly correlated which

could explain the fluctuations in the sign and significance of the estimated coefficients. The most common cure for the problem of multicollinearity is the deletion of certain independent variables. The result of the deletion process risks what is called nonspecification bias, that is deleting certain theoretically relevant independent variables. An alternative to the deletion method is a technique called ridge regression. Brown and Beatties' article (1975) illustrates the use of ridge regression in dealing with the problem of multicollinearity. Basically ridge regression deals with the problem of multicollinearity by augmenting the main diagonal of the correlation matrix by small positive amounts.

Ridge regression was utilized in estimating several price equations. The results of the ridge regressions were similar (especially in respect to the sign) to the estimated Equations 6L in Tables 17 and 18. For this reason, Equations 6L were used as the most accurate approximation of winter and summer retail price. Besides being fairly similar to the ridge regression estimations, Equations 6L also seemed to fit economic theory and a priori expectations.

Price and Income Elasticity Concepts

The price elasticity of demand is a concept used to measure the responsiveness of the quantity demanded with respect to a given change in price. The percentage change in quantity demanded divided by the percentage change in price is the price elasticity of demand. The definition does not suggest that the causal relationship is in the form of price affecting quantity. In many agricultural commodities the causal relationship runs the other way because of the predetermined nature of

supply. The concept of elasticity refers to a change in quantity, neither causing nor caused by a given change in price, but only associated with a given change in price (Shepard 1941, p. 194).

Because of the relationship between the price elasticity of demand and total revenue, economists specify the general nature of demand in three ways: elastic, inelastic and unitary.

If the price elasticity of demand is greater than minus one, it is called elastic. Elastic meaning a one percent change in price is associated with a greater than one percent change in quantity.

If the price elasticity of demand is equal to minus one then a one percent change in price is associated with a one percent change in quantity. This relationship is termed unitary elasticity.

If the price elasticity of demand is less than minus one, then a one percent change in price is associated with a less than one percent change in quantity. This relationship is termed inelastic.

In mathematical notation the price elasticity of demand is $Ed = \frac{dq}{dp} \cdot \frac{p}{q}$ for a particular demand curve where "p" refers to price and "q" to quantity demanded. The price elasticity of demand is negative. Price elasticity can differ at any point on a linear demand curve ranging from inelastic to elastic regions. If the linear function is expressed in logarithms, then every point on the demand curve has the same elasticity. The proof of this is given by Foote (1958, p. 79).

Another measure of elasticity that is important is the income elasticity of demand. Income elasticity indicates the responsiveness of quantity with respect to percentage changes in income. Income elasticity of demand may be positive, negative or zero. A positive income

elasticity would indicate that as income increases the quantity consumed or demanded increases. This type of relationship depicts a type of commodity referred to as a superior good. An inferior good would have a negative income elasticity and its demand would decrease as income increased. If income and quantity are unrelated, the income elasticity would be zero.

Given a linear equation of the form $q = a + bYD$, where q = quantity demanded and YD = income then $\frac{dq}{dyd} \cdot \frac{yd}{q}$ is the income elasticity. If the equation is expressed in logarithmic form then the estimated coefficient of the income variable is the income elasticity.

Estimated Elasticities

The estimates of the elasticities are on a seasonal basis. There are separate estimates for summer lemons (May-October) at the retail, f.o.b. and farm level and another set of estimates for winter lemons. The estimates are only applicable to fresh domestic use. A major problem in the estimation of the elasticities is in the determination of the appropriate equations from which the estimates can be derived. More specifically the question is whether to estimate the direct elasticities by using quantity as the dependent variable or by using price as the dependent variable and thereby estimating your elasticities indirectly.

Estimations of price elasticity of demand from price flexibilities usually tend toward the lower bounds of the true elasticity depending upon the cross effects of other commodities (Houck 1965).

Both types of equations were tried to see if the estimated elasticities would be similar. The elasticities were in most cases very

different, ranging from inelastic estimates of price elasticity and a negative income elasticity in equations that specified quantity as the dependent variable, to elastic estimates of price elasticity and positive income elasticities in equations that specified price as the dependent variable.

The dissimilar results from the equations, depending upon which dependent variable was specified, created a dilemma. The decision to use the equations with price dependent in estimating elasticities was based on three particular points. The first point was discussed earlier in this chapter in regards to the decision to use a single equation method rather than a simultaneous approach. It was argued that the nature of the price-quantity relationship was such that the casual relationship of price as a function of quantity was the most logical. The second point dealt with total revenue over the time period under study. Given an inelastic demand, an increase in price should be associated with smaller percentage decrease in the quantity demanded and an overall increase in total revenue. Computed total revenue over the past 21 years indicates that in real dollars total revenue in the domestic market is decreasing not increasing, and over the same twenty-one years the price has increased and the quantity consumed has decreased. This drop in real total revenue indicates that under ceteris paribus conditions, the elasticity at the retail level is elastic rather than inelastic. This is especially true in the case of summer lemons, and to a lesser extent with winter lemons. The third and final point centered on the greater significance of the quantity and income variables in equations which specified price as the dependent variable. The higher significance levels increase

confidence in the estimated coefficients and hence the elasticity estimations.

The technique for estimating the elasticities at the f.o.b. and farm level was taken from a publication by George and King (1971). They derive the f.o.b. and farm price elasticities by using the retail elasticity and the elasticities of price transmission. The price transmission elasticity is the ratio of relative change in the retail price to the relative change in either the farm price or the f.o.b. price. The price elasticity of demand at either the f.o.b. or the farm level is the product of the retail price elasticity of demand and the respective price transmission elasticity.

The estimated equation used to derive the elasticities for winter lemons is Equation 6L, Table 17:

$$P_R = .231 - \underset{(-1.44)}{.79387\ Q} + \underset{(2.47)}{.54679\ YD} - \underset{(-2.01)}{.15621\ T} \qquad \text{(V-A)}$$

where: P_R = log of the retail price of fresh winter lemons

Q = log of per capita consumption of fresh winter lemons

YD = log of per capita disposable income

T = log of time 1954 = origin

Figures in parentheses are "t" statistics.

Transposing equations (V-A) yields (V-B) and (V-C).

$$.79387\ Q = .231 + .54679\ YD - .15621\ T - P_R \qquad \text{(V-B)}$$

$$Q = .291 + .68877\ YD - .19677\ T - 1.26\ P_R \qquad \text{(V-C)}$$

The results suggest that the price elasticity of demand at the retail level for fresh lemons is elastic. But testing of the estimated elasticity indicated that it is not significantly different from one at

any appropriate level. Consequently a more accurate estimation of the price elasticity of demand at the retail level may be that of unitary elasticity. Houck (1965) argued that in estimating price elasticities as the reciprocal of price flexibilities, the estimation would always tend toward the lower bounds. Given this idea, the estimate of -1.26 will be used in this study.

The income elasticity for fresh winter lemons is .69, which indicates a one percent change in income would result in a .69 percent change in quantity. The income elasticity coefficient was significantly different from zero and one at a five percent level.

In deriving the price elasticity of demand for winter lemons at the f.o.b. and farm level, price transmission equations were estimated.

$$P_R = 5.163 + \underset{(5.5119)}{.57693}\ P_{f.o.b.} \qquad \text{(V-D)}$$

$$P_R = 9.178 + \underset{(5.5842)}{.32670}\ P_f \qquad \text{(V-E)}$$

where: P_R = log of the retail price of fresh winter lemons

$P_{f.o.b.}$ = log of the f.o.b. price of fresh winter lemons

P_f = log of the farm price of fresh winter lemons

Figures in parentheses are "T" statistics.

Since equations (V-D) and (V-E) are in logarithmic form, the price transmission elasticity is merely the respective coefficients of the f.o.b. and farm price variables.

The price elasticity of demand at the f.o.b. level is the product of the price elasticity of demand at the retail level and price transmission elasticity of equation (V-D). By simple multiplication -1.26 x (.57693) yields an estimate of -.72 as the price elasticity of demand

at the f.o.b. level. The same procedure using equation (V-E) yields -1.26 x (.3267) or -.41 as the price elasticity at the farm level.

The estimated equation used in deriving the elasticities for summer lemons is Equation 6L, Table 17:

$$P_R = .3006 = \underset{(-2.3124)}{.56897\ Q} + \underset{(2.3293)}{.53868\ YD} - \underset{(-4.0961)}{.18514\ T} \qquad \text{(V-F)}$$

where: P_R = log of retail price for fresh summer lemons

Q = log of per capita consumption of fresh summer lemons

Y_D = log of per capita disposable income

T = log of time 1954 = origin

Transposing equation (V-F) yields (V-G) and (V-H):

$$.56897\ Q = .3006 + .53868\ YD - .18514\ T - P_R \qquad \text{(V-G)}$$

$$Q = .5283 + .9468\ YD - .3254\ T - 1.76\ P_R \qquad \text{(V-H)}$$

These results suggest that the retail price elasticity of demand is elastic. The estimated elasticity is -1.76 and it is significantly different from zero and from one at the five percent level. The estimated income elasticity is .95 which is also significantly different from zero and one. This indicates that a one percent change in income is associated with a .95 percent change in the quantity demanded.

The price elasticities of transmission were estimated by the following equations:

$$P_R = 4.235 + \underset{(6.8751)}{.68307\ P_{f.o.b.}} \qquad \text{(V-I)}$$

$$P_R = 8.396 + \underset{(6.7568)}{.38295\ P_f} \qquad \text{(V-J)}$$

where: P_R = log of retail price of fresh summer lemons

$P_{f.o.b.}$ = log of f.o.b. price of fresh summer lemons

P_f = log of farm price of fresh summer lemons

Figures in parentheses are "T" statistics.

As in the case of winter lemons, the product of the price elasticity of demand at the retail level and the elasticity of price transmission from equation (IV-I) yields an f.o.b. price elasticity of demand of -1.20 for fresh summer lemons. The price elasticity of demand at the farm level for fresh summer lemons is -.67.

Table 19 provides a summary of the elasticities for both winter and summer lemons at all three levels.

Table 19 indicates that the price elasticity is greater for summer lemons than winter lemons at all three price levels. The elasticities in this study were higher than the elasticities Hoos and Seltzer (1953, p. 34) derived. Hoos and Seltzer estimated summer retail price elasticity at -.78 and f.o.b. and on-tree price elasticity, respectively, at -.49 and -.44. Their estimated elasticities differed greatly from this studies' in respect to the retail and f.o.b. prices. Their estimates were inelastic while the estimates in this chapter indicated elastic price elasticities. One point that should be noted is that Hoos and Seltzers' elasticities were averages for the period 1925 through 1941, before the Lemon Marketing Order.

Income elasticities from this study were .69 and .95 for respective winter and summer lemons. These estimates compared to Brandow's (1961, p. 17) income elasticity estimate of .40 for fruit were closer than the price elasticities compared above.

The high price elasticities, especially during the summer, may indicate the importance of substitutes for fresh summer consumption.

Table 19. Summary of elasticity estimates for winter and summer lemons.

	Winter Lemons	Summer Lemons
Retail Price Elasticity	-1.26	-1.76
Retail Income Elasticity	.69	.95
F.O.B. Price Elasticity	- .72	-1.20
Farm Price Elasticity	- .41	- .67

Lemonade and lemon concentrate are two products that would serve as substitutes in the hot summer months. Efforts to include the effect of substitutes in the price equations (Table 18) were inconclusive. Further work is needed with respect to substitutes for fresh lemons.

The income elasticities in the case of summer and winter lemons are positive, indicating that lemons are superior goods. The income elasticity for summer lemons is quite a bit higher than the elasticity for winter lemons, which indicates increased disposable income would result in greater change in demand for summer lemons in comparison to winter lemons.

If the estimated elasticities are an accurate representation of the demand for fresh lemons, certain conclusions can be drawn. The first would indicate that if the quantity of fresh summer lemons was increased then the retail and f.o.b. prices should decrease, but an overall rise in total revenue should result at both of these levels, but not at the farm level.

The case of fresh winter lemons is somewhat inconclusive. The retail elasticity of demand was -1.26, but was not significantly different from one. The f.o.b. and on-tree price elasticities were inelastic. If the quantity of fresh winter lemons was increased, then the prices would decline but total revenue at the retail level may increase or remain the same. Total revenue at the f.o.b. and on-tree levels will drop.

The point of particular importance, especially in the case of fresh summer lemons, is the price elasticities ranging from elastic at the retail level to inelastic at the farm level. The Lemon Administrative Committee seems to be in a dilemma. Their main concern is with

getting a fair return to the grower, which could be accomplished by restricting the quantity that enters the domestic market. This type of action raises the retail price and drops the total revenue at the retail level. If the Committee increased the quantity shipped into the domestic market, the retail price would drop and total revenue would increase at the retail level but total revenue at the farm level would decline.

The Lemon Administrative Committee, making one set of decisions cannot simultaneously satisfy the domestic consumer and the lemon grower. Whichever action they take they leave one group better off at the expense of the other group.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Marketing orders, which are a type of government involvement in agriculture, have their roots in the Agricultural Adjustment Act of 1933. The purpose of marketing orders and agreements is to guarantee the farmer a reasonable return and in turn insure the domestic consumer a stable market with high quality products at fair price.

Very little empirical research has been conducted concerning the effect of marketing order programs on the domestic consumer. The political environment today necessitates that any piece of agricultural legislation be examined with respect to both the farmer and the consumer's view. Farm legislation, whether it already be law or in the drafting stage, is subject to close scrutiny by consumer organizations or their representatives. This is not unexpected nor should it be undesirable, for it is the consumer who ultimately pays most of the costs of regulatory legislation, be it farm or otherwise.

The objective of this study was to examine the impact of the Lemon Marketing Order on the domestic consumer. Hopefully, research of this type can be utilized by policymakers, legislators and others who are interested in changing or defending marketing order programs.

The major problem of this study, as with several others that attempt to examine marketing orders, is that the Lemon Marketing Order has been in existence for such a long time that comparisons of periods when

the order existed and when it did not, are not very useful because of the structural changes that have occurred in the market. Consequently, market performance under the order has to be judged in terms of more general criteria concerning prices, quantities, margins, consumer expenditures, etc.

Ordinary least-squares regressions, simple calculus and trend analysis were techniques employed in the analysis of the Lemon Marketing Order.

Conclusions

In recent years the major criticism of the Lemon Marketing Order has been that of "undue price enhancement" by means of the rate of flow provision. Chapter II indicated that the real retail price of fresh lemons has increased an average of 1.2 percent annually from 1953-54 through 1974-75. The period from 1964-65 through 1974-75 showed an annual increase of 2.0 percent. The data also indicated that although the on-tree price has shown slightly higher annual percentage increases, the absolute differential between the price levels is increasing.

As conceived in the original lesislation, the basic benefectors of marketing orders were to be the growers. In the case of lemons, it appears: (1) as if the marketing order has not been very successful in keeping on-tree returns in line with retail prices, or (2) that a large percentage of the movement of the retail price is controlled by forces outside the scope of the marketing order. If the latter is the case, then the dissolution of the marketing order would have a much smaller effect on retail prices than critics presume. It should be noted that

on the basis of this study the marketing order cannot be called ineffective as far as the farm or on-tree price is concerned because no attempt was made to determine what return the farmer would receive if there was no marketing order.

Marketing margins comprise the difference between the three price levels. The wholesale-retail margin is the difference between the retail and f.o.b. price, and the picking, hauling, packing and selling margin is the difference between the f.o.b. and on-tree price. The summation of both of these margins yields the gross margin.

The 22 year average of the retail price per carton (38 pounds) indicated that approximately 80 percent of the retail value is made up by the gross margin, with the wholesale-retail margin composing 63 percent of the retail value and the picking, hauling, packing and selling margin making up 17 percent of the retail value.

Margin analyses suggested that the wholesale-retail margin in real dollars is increasing over time. This would help explain the increasing differential between the retail price and the on-tree price. The picking, hauling, packing and selling margin in real dollars has not shown any significant trend, although it has declined as a percentage of the retail price. The gross margin indicated some upward trend but not as great as the wholesale-retail margin.

Overall, about 68 percent of the retail price increases can be attributed to the upward movement in the wholesale-retail margin.

When the wholesale-retail margin and total shipments were stipulated as independent variables in a regression equation with retail price as the dependent variable, the quantity variable proved insignificant.

This should not lead to the complete exoneration of the Lemon Marketing Order, but it does weaken the critic's claim of price enhancement by supply regulation.

Chapter IV investigated the long run allocation of lemons into the fresh domestic, export, and processed markets.

The shipments of fresh lemons into the domestic market showed a decreasing trend, not only in an absolute sense but also a percent of total shipments. The greatest decline was experienced in shipments during the summer months. Overall averages indicated that approximately 37.2 percent and 45.1 percent of total shipments enter the fresh domestic market, respectively, for winter and summer lemons. As an indication of the decline, during the last five years (1970-71 through 1974-75), about 27.3 percent of winter lemons and 24.7 percent of summer lemons entered the domestic market.

There may be several explanations for this: (1) shift in demand as a result of the introduction and acceptance of substitutes such as lemon juice and concentrated lemonade, (2) shift in demand as a result of changes in the consumption of complementary foods such as fish and iced tea, (3) changes of quantity demanded because of higher retail prices, and (4) changes in total supply and its allocation because of structural changes in the market. Hypotheses 1, 3 and 4 were investigated in this study.

The export market has shown the most striking increase in both an absolute and relative sense with the processed market serving as a secondary outlet and showing no discernible trend.

The decline in the absolute and relative shipments of fresh lemons coupled with an increasing population results in a declining per capita consumption. Although summer per capita consumption is greater than winter per capita consumption, summer consumption showed the greatest decline over the time period under study. Along with declining per capita consumption, per capita expenditures have also decreased in real dollars even though the real retail price has shown an increase.

The Lemon Marketing Order provides for regulation of the size of fresh lemons that enter the domestic market. During most of the time since 1953-54, the common minimum size requirement was 235 lemons per carton. It was shown that the average size of fresh lemons that enter the domestic market have increased over time. Part of this increase in size is due to the increasing percentage of total domestic shipments from Districts 1 and 3 where production conditions and marketing strategies result in larger lemons.

The total value of sales at the retail level were calculated for summer and winter lemons. Summer lemon sales showed a decreasing trend while total value for winter lemon sales remained fairly constant. Under ceteris paribus conditions these results would suggest that the retail price elasticity is elastic for summer lemons and unitary in the case of winter lemons.

Price elasticities of demand and income elasticities were estimated from price equations. The income elasticity of summer lemons was .95, quite a bit higher than the .69 income elasticity estimated for winter lemons. Both estimated elasticities were significantly different from zero. Positive income elasticities indicate that both fresh summer

and winter lemons are regarded as superior goods, with changes in income affecting the consumption of summer lemons more so than winter lemons.

The price elasticities of demand were greater for summer lemons at all three price levels. Price elasticity at the retail level for winter lemons was estimated at -1.26 while the estimate for summer lemons was -1.76, definitely elastic. As expected, the elasticities at the f.o.b. and farm level were smaller. Winter f.o.b. price elasticity was estimated at -.72 and the summer f.o.b. price elasticity was estimated at -1.20. Estimated price elasticities at the farm level yielded -.41 for winter lemons and -.67 for summer lemons.

The higher estimated elasticities for summer lemons may be due to the importance of substitutes such as frozen lemonade concentrate and lemon juice. A test of the importance of substitutes using the price of frozen lemonade concentrate was inconclusive.

If the estimated elasticities are accepted as an accurate representation of the fresh lemon market, then under ceteris paribus conditions, an increase of total domestic shipments in the summer would result in lower retail prices but higher total revenue at the retail level. However, at the on-tree level the opposite would be true: given inelastic demand, increased fresh summer shipments will lower the on-tree return and decrease total revenue to producers.

In the case of winter lemons, the retail price elasticity was -1.26 but significantly different from one only at the 20 percent level. Given this, an increase or decrease of shipments into the fresh domestic market would have only a minor effect on total revenue at the retail level. However, the on-tree price elasticity was inelastic, indicating

under ceteris paribus conditions, an increase in domestic shipments will decrease total revenue at the grower level.

The estimated elasticities suggest that the Lemon Administrative Committee is somewhere between a "rock and a hard place." Making one set of decisions, they cannot simultaneously satisfy both domestic consumer and the grower as is implied by the law. Non-Pareto welfare choices exist and any future study of the Lemon Order should attempt to quantify the welfare impacts of the major alternatives open to the Committee.

Considerations

The estimation procedure was discussed in Chapter V including the decision to utilize the single equation least-squares technique in preference to the simultaneous approach. There is no need to reiterate the argument behind the choice; suffice it to say that it would be interesting to investigate the problem from a simultaneous approach in order to determine if the results would be similar to those obtained by the single equation method.

It would be interesting to see if the simultaneous equations approach yielded more consistent results than the single equation approach. The study was not only plagued by inconsistency in terms of the significances and signs of the coefficients, but also inconsistency was found in the estimation of elasticities. When price was used as a dependent variable, retail price elasticity for winter lemons was estimated as not significantly different from unity and summer price elasticity was elastic. In contrast, when quantity was specified as the dependent variable, estimates of price elasticities for winter and summer lemons were

inelastic. Even though there are economic reasons for specifying price as the dependent variable, these inconsistencies are disturbing.

Another problem was that of multicollinearity. Much of the data indicated multicollinearity, and in an effort to avoid the dropping of important independent variables from the regressions, ridge regressions were run. Even though they verified the estimates obtained by ordinary least squares, the multicollinearity still exists and may have influenced the results.

One last consideration is important. In the specification of variables that influence the marketing margins, nearly all of the regressions in Chapter V indicated per capita disposable income as the most significant. However, it appears that the per capita disposable income variable is acting partially as a proxy variable for some part of the margin, especially the wholesale-retail margin. Approximately 80 percent of the retail price of fresh lemons is made up by the marketing margins and by far the largest factor influencing the margin is the cost of labor. It is plausible that the income variable partially reflects the movements in the labor cost component of the margins. This may account for its high significance.

This study suggests the need for further research into certain aspects of marketing orders and their effects on the domestic consumer.

APPENDIX A

LEADING UNITED STATES CITIES USED IN THE COMPUTATION OF THE FRESH DOMESTIC RETAIL PRICE OF LEMONS

Chicago, Illinois
Detroit, Michigan
Los Angeles, California
Philadelphia, Pennsylvania
Boston, Massachusetts
Pittsburgh, Pennsylvania
Cleveland, Ohio
Washington, D. C.
Baltimore, Maryland
St. Louis, Missouri
San Francisco, California
Denver, Colorado
Houston, Texas
Minneapolis, Minnesota
Nashville, Tennessee
Wichita, Kansas
Buffalo, New York
Dallas, Texas
Dayton, Ohio
Milwaukee, Wisconsin
San Diego, California
Seattle, Washington
Atlanta, Georgia
Cinncinati, Ohio
Hartford, Connecticut
Honolulu, Hawaii
Indianapolis, Indiana
Kansas City, Missouri
Cedar Rapids, Iowa
Champagne-Urbana, Illinois
Lancaster, Pennsylvania
Green Bay, Wisconsin
Durham, North Carolina
Orlando, Florida
Anchorage, Alaska
Florence, South Carolina
Niles, Michigan
Klamath Falls, Oregon
Southbridge, Massachusetts
Union, South Carolina
Crookston, Minnesota
Mangum, Oklahoma

Source: U. S. Department of Agriculture, Economic Research Service, 1976.

APPENDIX B

GROSS NATIONAL PRODUCT IMPLICIT PRICE DEFLATORS

Year	Annual Price Deflator (Nov.-Oct.)	Winter Price Deflator (Nov.-Apr.)	Summer Price Deflator (May-Oct.)
1953-54	59.43	59.18	59.68
1954-55	60.57	60.17	60.97
1955-56	62.33	61.77	62.90
1956-57	64.61	64.14	65.07
1957-58	65.79	65.57	66.02
1958-59	67.14	66.70	67.58
1959-60	68.43	68.19	68.68
1960-61	69.11	68.90	69.33
1961-62	70.19	69.88	70.51
1962-63	71.33	71.18	71.48
1963-64	72.45	72.18	72.73
1964-65	73.85	73.38	74.33
1965-66	76.05	75.30	76.80
1966-67	78.41	77.96	78.86
1967-68	81.58	80.67	82.50
1968-69	85.61	84.50	86.73
1969-70	90.24	89.15	91.33
1970-71	94.91	93.70	96.13
1971-72	98.97	98.07	99.87
1972-73	104.01	102.24	105.79
1973-74	113.14	110.30	115.99
1974-75	124.36	--	--

Sources: U. S. Department of Commerce (1976a, b).

APPENDIX C

DEFLATED RETAIL, F.O.B. AND ON-TREE PRICES AND DEFLATED VALUES FOR THE GROSS, WHOLESALE-RETAIL, AND PICKING, HAULING, PACKING AND SELLING MARGINS

Year	Retail Price[a]	F.O.B. Price[b]	On-tree Price[b]	Gross Margin[c]	WRM[d]	PHPS[e]
1953-54	$11.64	$4.76	$2.74	$ 8.90	$6.88	$2.02
1954-55	11.24	5.59	2.44	8.80	6.65	2.15
1955-56	11.25	4.80	2.63	8.62	6.45	2.17
1956-57	11.19	3.99	1.90	9.29	7.20	2.09
1957-58	10.75	3.75	1.70	9.04	6.99	2.05
1958-59	10.50	3.98	1.98	8.52	6.52	2.00
1959-60	10.46	3.81	1.87	8.59	6.65	1.94
1960-61	11.00	3.78	1.77	9.23	7.22	2.01
1961-62	10.50	3.73	1.77	8.73	6.77	1.97
1962-63	12.66	4.63	2.68	9.98	8.03	1.95
1963-65	10.89	3.64	1.77	9.12	7.25	1.88
1964-65	12.17	4.25	2.18	9.99	7.92	2.07
1965-66	11.82	4.18	2.17	9.65	7.64	2.01
1966-67	11.72	4.32	2.38	9.34	7.40	1.94
1967-68	12.45	4.68	2.67	9.78	7.77	2.01
1968-69	12.59	5.09	3.05	9.54	7.50	2.04
1969-70	13.07	4.91	3.05	10.02	8.16	1.86
1970-71	13.09	5.08	3.02	10.06	8.00	2.05
1971-72	13.21	4.85	2.77	10.45	8.37	2.08
1972-73	13.55	4.70	2.55	11.00	8.85	2.15
1973-74	14.02	5.29	3.16	10.86	8.73	2.13
1974-75	13.71	4.68	2.50	11.21	9.03	2.18

a. U. S. Department of Agriculture, Economic Research Service, 1976.

b. Sources: U. S. Department of Agriculture, 1962 and 1962-75.

c. Gross Margin = (Retail price minus on-tree price).

d. Wholesale-retail margin = (Retail price minus f.o.b. price).

e. Picking, hauling, packing and selling margin = (f.o.b. price minus on-tree price).

APPENDIX D

DATA USED IN PRICE EQUATIONS

Year	Winter Retail Price [a] $/carton	Summer Retail Price [a] $/carton	Winter Per Capita Disposable Income [b]	Summer Per Capita Disposable Income [b]
1953-54	7.12	6.80	1570.0	1565.0
1954-55	7.02	6.70	1601.0	1656.0
1955-56	6.99	7.02	1695.0	1727.0
1956-57	7.67	6.96	1769.0	1797.5
1957-58	7.26	6.94	1796.0	1816.5
1958-59	7.19	6.97	1863.0	1902.0
1959-60	7.28	7.08	1918.5	1938.0
1960-61	8.10	7.29	1935.5	1973.0
1961-62	7.36	7.38	2024.0	2060.0
1962-63	9.70	8.57	2085.0	2124.0
1963-64	8.09	7.76	2190.5	2286.0
1964-65	9.15	8.87	2338.0	2427.5
1965-66	8.91	9.04	2528.0	2593.0
1966-67	9.36	9.06	2669.0	2738.5
1967-68	10.33	10.03	2828.0	2936.0
1968-69	10.46	11.02	3000.0	3112.0
1969-70	11.93	11.67	3224.0	3366.0
1970-71	12.29	12.52	3458.0	3593.5
1971-72	13.00	13.14	3687.0	3814.0
1972-73	13.58	14.49	4062.0	4291.0
1973-74	15.82	15.88	4483.0	4635.5
1974-75	16.89	17.19	4793.5	5076.5

Year	Winter Trans-Pacific Exports (1000 cartons)	Summer Trans-Pacific Exports (1000 cartons)	Winter Per Capita Consumption (pounds)	Summer Per Capita Consumption (pounds)
1953-54	60	66	1.35	2.33
1954-55	78	69	1.33	2.22
1955-56	92	57	1.32	2.03
1956-57	194	115	1.26	2.06
1957-58	213	123	1.24	1.90
1958-59	107	140	1.20	1.97
1959-60	160	137	1.21	1.75
1960-61	155	176	1.12	1.78
1961-62	162	186	1.15	1.72
1962-63	206	241	1.11	1.60
1963-64	249	878	1.09	1.64
1964-65	443	703	1.04	1.50
1965-66	754	759	1.07	1.47
1966-67	839	871	1.03	1.37
1967-68	1,130	1,096	1.03	1.36
1968-69	1,134	1,264	.99	1.29
1969-70	1,400	1,638	.99	1.25
1970-71	1,825	1,730	.97	1.25
1971-72	2,132	2,510	.98	1.22
1972-73	2,244	2,705	1.00	1.23
1973-74	2,320	2,913	.99	1.16
1974-75	--	--	.96	1.16

Year	Winter Lemonade Concentrate[c] cents/pound	Summer Lemonade Concentrate[c] cents/pound
1963-64	13.9	13.9
1964-65	13.4	12.4
1965-66	12.6	12.4
1966-67	12.3	12.3
1967-68	12.5	12.2
1968-69	12.5	12.8
1969-70	13.1	13.2
1970-71	13.6	13.9
1971-72	14.3	14.4
1972-73	14.6	14.7
1973-74	15.1	18.1

a. Source: U. S. Department of Agriculture, Economic Research Service, 1976.

b. Sources: U. S. Department of Commerce, 1976a and b.

c. Source: U. S. Department of Labor, 1964-74.

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