Impacts of a prorate suspension on marketing margins for California-Arizona navel oranges

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The University of Arizona, 1988

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IMPACTS OF A PRORATE SUSPENSION ON MARKETING MARGINS FOR CALIFORNIA-ARIZONA NAVEL ORANGES

by

Charles Christopher Lyon

A Thesis Submitted to the Faculty of the

DEPARTMENT OF AGRICULTURAL ECONOMICS

In Partial Fulfillment of the Requirements
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1988

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ABSTRACT

In January, 1985, the rate-of-flow controls ("prorate") for the California-Arizona navel orange industry were suspended for half of the marketing season. This marked the first time in 32 consecutive years that the industry operated without market controls. This study compares the behavior of industry marketing margins during the deregulated period with that of regulated seasons in order to assess the impacts of the prorate suspension on the marketing system.

Econometric results indicate that relative to subsequent regulated seasons, marketing margins contracted during the prorate suspension period. This implies that despite deregulation, the agricultural marketing sector was unable to exercise market power and maintain retail orange prices high while depressing grower prices, as some growers claimed. In addition, the results suggest that shortrun distributor reaction to a permanent termination of marketing order controls would result in changes in marketing system behavior which would be favorable to consumers.

CHAPTER ONE
INTRODUCTION

For fifty-five years, federal legislation has enabled growers of fruits, vegetables, and specialty crops to produce and market their commodities under the umbrella of agricultural marketing orders. In 1984, 45 marketing orders in 32 states covered more than 50% of all fruits and tree nuts produced in the United States and 15% of the domestic vegetable output by value (Polopolus, et al., p. 1). In California alone, orders which govern the marketing of 19 individual crops account for three-quarters of the value of those crops (French, et al., 1978).

Marketing orders provide producers of the same commodity in the same geographical area with the authority to regulate product marketing. The goal of the regulation is to achieve higher returns for growers. Principle instruments available to producers under the marketing order program are volume management provisions, rate-of-flow controls, and minimum quality standards. In addition, market support activities such as generic advertising, research and development assessments, container standardization, and regulation of trade practices may be allowed.

1.1. Nature of the Problem

The California-Arizona navel orange industry has operated under the aegis of a federal marketing order in nearly every marketing season since 1934[1]. A committee of industry members (the Navel Orange Administrative Committee or NOAC) coordinates the marketing of navel oranges grown in California and Arizona by limiting the total quantity of fresh oranges which can be sold in the U.S. and Canadian markets. This

[1] The California-Arizona orange industry operated without market controls during the years 1952-54.

constraint is achieved by prorating the weekly volume of fresh navels sold by individual shippers. Any "excess" production above the prescribed limit is diverted by the industry to the secondary and non-competitive processing or export markets. The goal of the volume control is to limit supply shipped to the profitable fresh market, thereby increasing fresh orange prices and maximizing net revenues for navel producers (NOAC Annual Report, 1971/72).

The controls are controversial. Critics inside and outside the industry charge that volume regulation contributes to food price inflation, causes resource misallocation, reduces price competition among shippers ("handlers" in the navel industry), and restricts firm growth and market efficiency. Supporters of the marketing order counter that volume controls maintain grower income above levels which would otherwise prevail, provide for stability of prices and quantities throughout the marketing season, elongate the marketing season, provide quality assurance to consumers, protect small-scale producers, and reduce risk and uncertainty for growers and consumers.

These competing claims have been difficult to substantiate empirically. Since many orders have been in effect for a number of years, adequate data from regulated and deregulated periods are generally unavailable. Hence, the ability to evaluate industry performance with and without marketing controls is limited. Instead, researchers have relied upon econometric simulations to analyze the shortrun impacts of a marketing order termination (see Minami, French, and King; Shepard; Thor and Jesse). While these studies have been able to enhance our understanding of the marketing order program, their results have been subject to criticism (French, 1978).

In January, 1985, the Secretary of Agriculture, John Block, abruptly suspended the right of NOAC to regulate fresh market shipments. With 48% of the year's crop still to be marketed, the suspension marked the first time in 32 consecutive seasons that the California-Arizona navel industry operated without volume controls on a significant portion of the season's production. This period of "open movement" presents itself as an opportunity to evaluate the actual shortrun effects of a marketing order termination. Comparison of industry behavior during the deregulated period with that of regulated periods will permit an empirical evaluation of the claims concerning the shortrun effects of marketing orders on market performance.

1.2. Study Objectives

The principle objective of this study is to evaluate the claims of marketing order proponents and opponents with respect to the impact of the volume control suspension on the navel orange industry. In the aftermath of the suspension, proponents contended that grower revenues declined, prices and quantities of navels shipped became more variable, and consumers suffered because retail prices did not respond to decreases in farm- and wholesale-level prices. In effect, growers charged that because retail prices did not fall, retailers were able to pocket economic profits at the expense of consumers and growers alike. Marketing order opponents, on the other hand, countered that grower revenues actually increased, consumer prices dropped, and that market efficiency was not compromised by the removal of volume controls.

This paper seeks to investigate these claims by comparing the behavior of industry marketing margins during the prorate suspension with margin behavior during periods of regulation. In this manner, the shortrun impacts of a marketing order termination on market participants can be quantified. Marketing margins have been chosen as the subject of this study because they reflect the contemporaneous impact of changes in economic variables on all participants in the marketing channel: consumers, distributors, and growers. Thus it is argued that margin analysis is both pertinent to the problem at hand and represents a contribution to the literature on marketing orders since little research has been conducted on how the orders affect marketing margins (Jesse, 1987, p. 224).

1.3. Method of Analysis

A set of four plausible econometric models explaining marketing margin behavior in the California-Arizona navel orange industry will be specified and estimated. The model specifications will be developed based on economic theory, industry observation, and interviews with industry members. Estimation will be performed using data collected from regulated and deregulated marketing periods. Results of the estimations will be analyzed and compared and hypothesis tests will be performed to determine whether there exists a "preferable" model in the group.

Most econometric studies develop their analyses based on a single model which the researcher assumes to be the "true" specification; this study develops four separate specifications. The four models chosen for analysis here represent a compendium of theoretical approaches to the examination of margin behavior. Since there is little a priori knowledge which would favor one specification over another, selecting a single model from the alternatives would be necessarily arbitrary. Instead, an attempt at definitive selection of a single, "true", model describing margin behavior in the California-Arizona navel industry is accomplished by means of statistical testing procedures. These procedures are deemed both more illuminating and more objective than ad hoc selection. More illuminating because they focus not only on the strengths of a single model but also on the weaknesses of its alternatives; more objective because selection is based on measureable statistical criteria rather than subjective rationale.

1.4. Organization

The paper will be organized as follows. Aspects of the navel industry relevant to the formulation of the econometric models of marketing margins will be introduced in Chapter Two. The history, provisions, rationale, and possible impacts of the marketing order program will be covered in Chapter Three. The historical background and specific issues related to the prorate suspension will be discussed in Chapter Four. Previous literature on marketing margins will be reviewed and margin models will be specified in Chapter Five. Chapter Six will present the data and econometric results and test the models. Chapter Seven will summarize the study and review the conclusions.

CHAPTER TWO

THE CALIFORNIA-ARIZONA NAVEL ORANGE INDUSTRY

This chapter will provide information about the economic environment of the California-Arizona navel industry. Discussion will focus on production trends, industry structure, wholesale and retail markets, consumption trends, and determinants of orange value.

2.1. Production Trends and Regions

Since the early 1960's, world production of oranges has been increasing rapidly, albeit at a decreasing rate. In 1960-61, world output totaled 713.4 million cartons, the U.S. comprising 34% of that volume. In 1985-86, production totaled 2077.7 million cartons, the U.S. share declining to 17.9% (Citrus Fruit Industry Statistical Bulletin, 1987). In addition to the U.S., major producers of oranges are Brazil, Spain, Italy, and Mexico. These 5 countries produce 80% of the world output.

2.1.1 U.S. Production

The United States plays a significant role in the world market for oranges, both in fresh and processed form. The U.S. and Brazil (which has tripled orange acreage since 1970) together comprise 90% of the world Frozen Concentrate Orange Juice (FCOJ) exports. U.S. fresh exports are about 11% of the world volume, with major markets in the Pacific Rim and Europe. Conversely, the U.S. is an important market for FCOJ exports from Mexico, Spain, and Brazil.

U.S. orange production is concentrated mainly in Florida and California. Some commercial volume is also grown in Arizona and Texas, but these two states supply less than 5% of the U.S. crop. Florida production represents 75-80% of all oranges by volume, while California accounts for about 15-20%. Pronounced quality differences distinguish the regions' products and hence their markets: while Florida produces 90% of all oranges destined for the U.S. processed market (FCOJ and Chilled Orange Juice, etc), California provides about 85% of all oranges entering the domestic fresh market (Table 2.1.1.). This dichotomy in markets derives from the characteristics of the two regions' output: Florida produces an orange high in juice content favored by processors while fresh California-Arizona oranges are popular with consumers because they are easily peeled, sweet, and contain few seeds.

2.1.2. California-Arizona Production

California-Arizona orange production is predominately of the navel and Valencia varieties. Production of navels represents only about 15% of the total volume of U.S. orange production, but comprise nearly 75% of all fresh winter oranges marketed in the U.S. (Table 2.1.2.). Navels begin to mature in late October and early November and are marketed through mid-June. The Valencia harvest begins in mid-March, and they are marketed until the navel season recommences in the fall. Thus marketing seasons for the two varieties often overlap and growers find navels competing with Valencias for retail market share.

Navel production in California and Arizona is administratively divided by NOAC into 4 geographical regions: District 1, which includes the San Joaquin Valley and Sacramento Valley; District 2, which covers production in the counties of Los Angeles, Orange, Santa Barbara, Ventura, and San Diego; District 3, which includes the Imperial Valley of California and all of Arizona; and District 4, Northern California. Total navel acreage in 1986/87 was 112,192 acres. Of this, District 1 contained approximately 83.8%, or 94,032 acres, while District 2 was next largest with 13,663 acres or 12.17%. District 3 contained 3,446 acres and District 4, 1051 acres (Table 2.1.3.).

TABLE 2.1.1.: ANNUAL COMMERCIAL FRESH ORANGE SHIPMENTS
BY STATE OF ORIGIN, SELECTED YEARS
(millions of cartons)

SEASON	CAL/AZ	FLA/TX	C-A % OF TOTAL
1963/64	47.6	26.1	64.59
1964/65	52.2	31.1	62.67
1964/65	53.4	36.3	59.53
1973/74	63.5	23.3	73.16
1974/75	75.7	26.8	73.85
1975/76	69	25	73.40
1983/84	80.4	15.5	83.84
1984/85	81.9	12.4	86.85
1985/86	92.6	17.3	84.26

SOURCE: CITRUS FRUIT INDUSTRIES STATISTICAL BULLETIN, various years

1963-65 FLA/TX data includes temples, tangelos and K-earlys

TABLE 2.1.2.: WINTER FRESH ORANGE DOMESTIC SHIPMENTS
BY STATE OF ORIGIN, SELECTED YEARS
(millions of cartons; pounds)

SEASON	C-A NAVELS		FLORIDA		TEXAS		C-A % OF TOTAL
	CTNS	LBS	CTNS	LBS	CTNS	LBS	
1963/64	24.50	918.75	15.30	688.50	0.29	11.56	57.15
1964/65	26.50	993.75	20.06	902.70	1.03	41.00	52.37
1965/66	27.50	1031.25	21.36	961.20	1.62	64.80	51.72
1973/74	33.20	1245.00	18.80	846.09			59.54
1974/75	37.80	1417.50	22.17	997.56			58.69
1975/76	37.30	1398.75	21.48	966.51			59.14
1983/84	45.90	1721.25	14.16	637.20			72.98
1984/85	41.30	1548.75	11.03	496.35			75.73
1985/86	48.00	1800.00	15.50	697.50			72.07
1986/87	47.60	1751.25	15.08	678.60			72.07

FLORIDA QUANTITIES ARE FOR MONTHS NOVEMBER TO MAY

SOURCES: CALIF-ARIZ: NOAC ANNUALS
FLA/TEXAS: 1973-1986 DATA FROM CITRUS FRUIT INDUSTRIES STATISTICAL BULLETIN.
1963-1966 AND 1986/87 DATA FROM ANNUAL STATISTICAL RECORD,
FLORIDA CITRUS ADMINISTRATIVE COMMITTEE.

FLA & TX AFTER 1966 IS AGGREGATED.
C-A PRODUCTION IS 37.5# CTNS.
FLA/TX PRODUCTION AFTER 1966 IS 45# CTNS.
TX PRODUCTION 1963-66 IS 40# CTNS.
FLA PRODUCTION 1963-66 IS 4/5 OF A BUSHEL AT 45# PER BUSHEL.

About 88-91% of all navels entering the domestic fresh market are produced in District 1. District 2 typically produces 6-9% of the California-Arizona navel crop. The remainder is divided among Districts 3 and 4.

2.2. Producer characteristics

The producer side of the navel industry has been described as "atomistic"--a large number of producers operating relatively small units. The recent trend, however, has been towards increased concentration. In 1975/76, for example, there were 4,767 growers with an average grove size of 22.3 acres. In 1986/87, the number of growers had dropped 19.26% to 3,849 while average grove size increased to 29.14 acres. Notwithstanding the apparent concentration among navel producers, the industry is still regarded as having a structure approximating that of a competitive industry (Thor, p. 19; Rausser, p. 41).

2.3. Handler characteristics

Handlers are primarily responsible for packing and distributing the fruit. In addition, contractual arrangements between growers and handlers often stipulate that growers must relinquish all harvesting activities to handlers. In these cases, handlers provide a picking crew, decide when and how much to harvest, and transport the fruit to the packinghouse. Such arrangements are normal for Sunkist-affiliated packers and growers. Once the fruit reaches the packinghouse, it is washed, dried, and graded. Fruit destined for the fresh market is stamped with a packinghouse trademark (by the larger packinghouses), sized, and packed in 37.5-pound cartons for shipment. Fruit is generally sold "f.o.b. acceptance/arrival," giving the buyer the right to inspect fruit on arrival for acceptance or rejection. Fruit of lesser quality and/or size is diverted to processing uses, used as cattle feed, or, on occasion, destroyed.

TABLE 2.1.3.: CALIFORNIA-ARIZONA NAVEL ORANGE ACREAGE BY DISTRICT, SELECTED YEARS
(thousands of acres)

SEASON	DISTRICT 1	DISTRICT 2	DISTRICT 3	DISTRICT 4	TOTAL
1965/66	51.9	24.5	3.87	*	80.27
1975/76	81.2	18.5	4.42	2.25	106.37
1986/87	94.03	13.66	3.45	1.05	112.19

* ACREAGE INCLUDED IN DISTRICT 1 TOTAL

DISTRICT 4 ESTABLISHED IN 1979/80

DATA FROM 1968/69 TO 1978/79 INCLUDED IN DISTRICT 1

DATA PRIOR TO 1968/69 NOT AVAILABLE

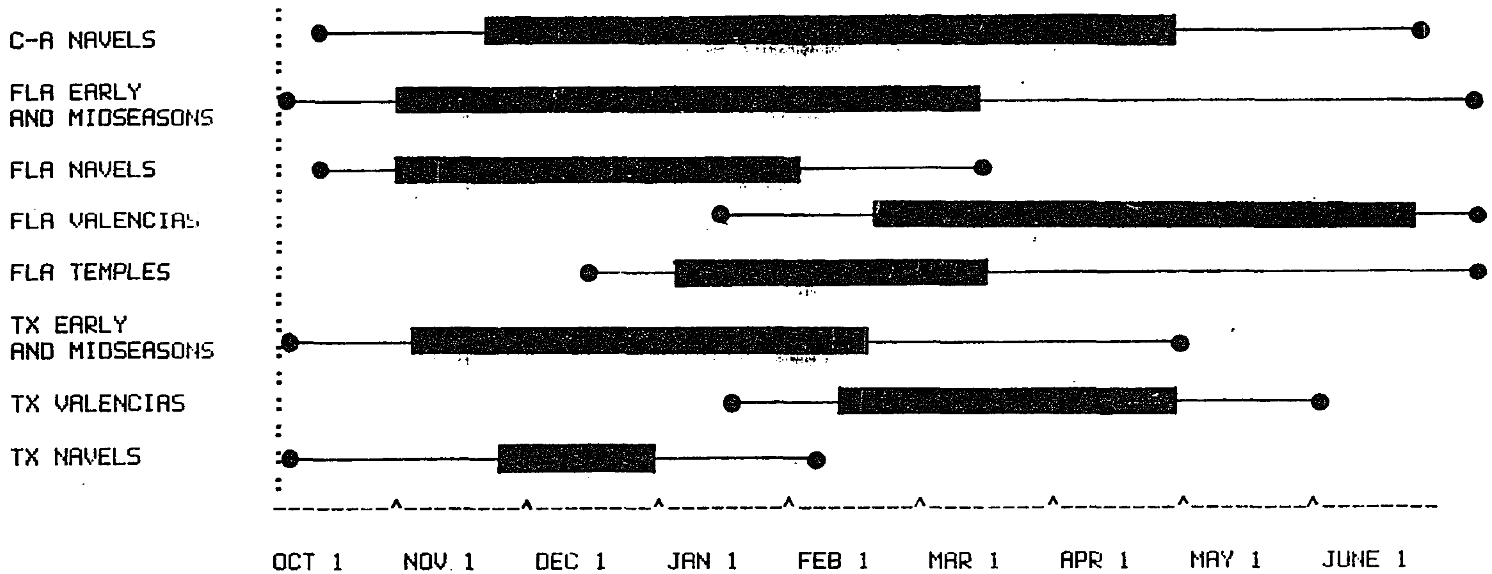
SOURCE: NOAC ANNUAL, 1987

Most handlers are affiliated with one of the cooperative marketing organizations operating in the industry. Sunkist, the largest co-op, marketed 53.4%, 50.6%, and 53% of the fresh navel volume in the 1983/84, 1984/85, and 1985/86 seasons, respectively. Another co-op, Central California Orange Growers Association, comprised of 5 large handlers, handled 21% of the crop in 1984/85, 18.9% in 1985/86, and 21.2% in 1986/87. A third co-op, Pure Gold, currently handles about 5% of the navel volume annually.

2.4. Wholesale and Retail Markets

California-Arizona navels are marketed nationally and compete in the wholesale and retail markets with smaller quantities of fresh winter oranges produced in Texas and Florida (Figure 2.4). Since competing varieties of winter oranges are heterogeneous in quality, market share in spatially-separated markets is not strictly a function of distance, but depends, in part, on consumer preferences. Certain spatial marketing patterns do apply, however, as Florida oranges have been dominant in the terminal markets of the southeastern U.S., while California-Arizona oranges have a distinct competitive advantage in the western markets (Tables 2.4.1., 2.4.2.). Market share is more volatile in midwestern markets and year-to-year variation in shares is partially a function of crop size and weather conditions in each production region. Texas quantities are negligible (except in the Dallas market) and have relatively little impact on the market shares of the larger production regions.

The fruit and vegetable industries have been experiencing trends towards increased verticle integration, both forward and backward, among shipping point firms, wholesalers, and retailers. In addition, large grocery retailers have become increasingly reliant upon direct purchases from handlers, rather than from wholesalers. A National Commission on Food Marketing (NCFM) study, published in 1966, reports that over the



Wide Band Indicates Peak Harvest Schedule

SOURCES: CALIFORNIA-ARIZONA SCHEDULE FROM NOAC ANNUALS.

FLORIDA SCHEDULE FROM FLORIDA CITRUS ADMINISTRATION STATISTICAL ANNUAL, 1982.

TEXAS SCHEDULE FROM RAUSSER, P. 183.

FIGURE 2.4.: MARKETING SCHEDULE FOR C-A NAVELS AND COMPETING ORANGES, BY STATE AND VARIETY

TABLE 2.4.1.: AVERAGE C-A MARKET SHARE IN SELECTED CITIES, 1975-78
(by quantity of unloads)

MONTHS 1975/76 TO 1977/78

CITY	SEASON		NOV	DEC	JAN	FEB	MAR	APR	MAY
ATLANTA	1975/76		0.01	0.12	0.02	0.08	0.10	0.09	0.19
	1976/77		0.01	0.01	0.10	0.34	0.23	0.38	0.53
	1977/78		0.00	0.01	0.03	0.08	0.13	0.15	0.15
		AVERAGE	0.007	0.047	0.050	0.165	0.154	0.206	0.289
CHICAGO	1975/76		0.64	0.71	0.40	0.50	0.67	0.61	0.59
	1976/77		0.57	0.67	0.44	0.87	0.84	0.75	0.83
	1977/78		0.54	0.66	0.56	0.62	0.58	0.76	0.63
		AVERAGE	0.584	0.682	0.466	0.666	0.697	0.704	0.683
DALLAS	1975/76		0.46	0.54	0.52	0.50	0.53	0.58	0.79
	1976/77		0.48	0.51	0.52	0.51	0.60	0.74	0.70
	1977/78		0.38	0.54	0.61	0.65	0.58	0.69	0.79
		AVERAGE	0.439	0.530	0.550	0.555	0.571	0.671	0.760
NEW YORK	1975/76		0.28	0.49	0.40	0.37	0.47	0.56	0.50
	1976/77		0.45	0.50	0.35	0.70	0.67	0.66	0.60
	1977/78		0.28	0.56	0.50	0.57	0.59	0.56	0.66
		AVERAGE	0.338	0.518	0.416	0.546	0.576	0.597	0.586
SAN FRAN	1975/76		0.99	1.00	0.93	1.00	1.00	1.00	1.00
	1976/77		1.00	1.00	0.98	1.00	1.00	1.00	1.00
	1977/78		0.97	0.99	0.99	0.94	0.99	0.99	1.00
		AVERAGE	0.988	0.996	0.965	0.981	0.997	0.996	0.999

SOURCES: USDA, Fresh Fruit and Vegetable Unloads in Eastern Cities, selected years.
USDA, Fresh Fruit and Vegetable Unloads in Western Cities, selected years.

TABLE 2.4.2.: AVERAGE C-A MARKET SHARE IN SELECTED CITIES, 1983-1986
(by quantity of unloads)

MONTHS 1983/84 TO 1985/86

CITY	YEAR		NOV	DEC	JAN	FEB	MAR	APR	MAY
ATLANTA	1983/84		0.1	0.03	0.25	0.29	0.42	0.59	0.48
	1984/85		0.07	0.04	0.16	0.50	0.50	0.46	0.42
	1985/86		0.15	0.11	0.25	0.29	0.34	0.27	0.38
		AVERAGE	0.106	0.060	0.220	0.361	0.422	0.443	0.425
CHICAGO	1983/84		0.94	0.97	0.96	0.96	0.97	0.98	0.96
	1984/85		0.92	0.95	0.94	0.96	0.97	0.97	0.90
	1985/86		0.93	0.95	0.95	0.95	0.97	0.95	0.90
		AVERAGE	0.931	0.956	0.949	0.956	0.970	0.963	0.917
DALLAS	1983/84		0.52	0.58	0.83	0.96	0.96	0.96	0.97
	1984/85		1	1	1	1	1	1	1
	1985/86		1.00	0.92	0.97	0.97	1.00	1.00	1.00
		AVERAGE	0.840	0.832	0.933	0.976	0.986	0.986	0.989
NEW YORK	1983/84		0.59	0.5	0.68	0.77	0.75	0.68	0.61
	1984/85		0.61	0.54	0.52	0.66	0.69	0.72	0.56
	1985/86		0.69	0.70	0.67	0.78	0.66	0.49	0.57
		AVERAGE	0.631	0.582	0.624	0.734	0.697	0.629	0.581
SAN FRAN	1983/84		1	1	0.98	0.92	0.93	0.99	1.00
	1984/85		1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1985/86		1.00	0.89	0.84	0.87	0.99	1.00	1.00
		AVERAGE	1.000	0.963	0.941	0.928	0.975	0.997	1.000

SOURCES: USDA, Fresh Fruit and Vegetable Unloads in Eastern Cities, selected years.
USDA, Fresh Fruit and Vegetable Unloads in Western Cities, selected years.

years 1948-63, direct sales by fresh fruit and vegetable handlers to retailers rose from 10% to 28% of total sales. Sales to wholesalers, jobbers, and other terminal market brokers fell during this period from 80% to 57% (NCFM Tech Study No. 4, p. 92). Although current data on quantities of fresh oranges sold to wholesalers and retailers is limited, industry personnel estimate that 40 to 50% of fresh market navel sales are made directly to chain stores. The remainder is split among wholesalers, jobbers, and institutional customers. Indeed, as the NCFM study reports, "substantially all national, and most regional, chains operate integrated wholesale and distribution systems" (p. 104). In effect, the role of terminal market wholesalers has been reduced to that of a residual supplier to the large retail food chains.

Direct purchases by retailers from shipping point firms have had two significant impacts on the structure of the shipping point market: one, retailers placing large orders have strict requirements regarding quantity and quality which only large shippers can accomodate. This may be one reason for the increased concentration among handlers. Secondly, direct retail purchases from growers' agents (handlers) has given retailers greater influence over product quality and shipping point services. Retailers communicate quality requirements directly to producers and can maintain strict quality controls via shipping point inspections. The result is that producers have been able to respond more quickly to the desires of consumers as translated through retailers' orders.

2.5. Grower share of retail value

As verticle integration among market participants has increased, marketing margins, or the spread between consumer and grower prices, has generally been declining. One method of measuring margins is to calculate the grower-packer share of retail value. This may be expressed as

$$S = \frac{P_a}{P_x}$$

where S is the grower-packer share of retail value, P_a is the price of the agricutural commodity at the shipping point, and P_x is the retail price of the commodity. A decreasing (increasing) grower-packer share implies larger (smaller) margins. Table 2.5.1. reports the regional season-average grower-packer share of retail value for navels in selected years. In all three regions for which data has been collected, the grower-packer share has increased, reflecting decreasing spreads. Noting the regional differences in Table 2.5.1., grower-packer share is greatest in the West and smallest in the North Central region. This undoubtedly reflects the lower transportation costs involved in shipping to the more proximate western markets. Clearly, as distance from California-Arizona production regions increases, transportation costs increase, and the shipping point-wholesale (SW) spread increases. Although the SW spread is greater in the Northeast than in the North Central region, the wholesale-retail spread (reflecting intracity marketing costs) is greater in the North Central region, depressing the grower-packer share of retail value in that market.

One possible explanation for the decrease in grower-packer/retail margins in the navel industry may be the increase in backward verticle integration (VI) among grocery retailers. Sexton, in an analysis of downstream VI by marketing co-ops, identifies two ways in which costs, and thus margins, may be reduced as a result of VI (p. 1168). First, integrated firms may be able to avoid double taxation if subsidiaries pass income internally to the parent company without tax liability. Second, transaction costs may be reduced if vertically integrated firms can internalize transactions which were previously made through market organization.

TABLE 2.5.1.: MARKET PARTICIPANT SHARES OF RETAIL NAVEL VALUE, SELECTED YEARS

Season Average Percentage by Region

	Northeast			North Central			West		
Season	G-P	SW	WR	G-P	SW	WR	G-P	SW	WR
1975/76	36	20	44	37	10	53	40	7	53
1976/77	36	14	50	32	14	54	45	16	39
1977/78	37	11	52	33	6	61	45	8	47
1978/79		NA			NA			NA	
1979/80	38	27	35	36	29	35	47	14	40
1980/81	38	26	36	33	25	43	42	26	31
1981/82	41	28	32	43	33	24	45	10	44
1982/83	35	24	40	35	23	41	41	23	36
1983/84	42	30	25	40	34	26	54	13	33
Average	37.88	20.00	39.25	36.13	19.33	42.13	44.88	13.00	40.38

G-P = Grower-packer price received divided by retail value.

SW = Wholesale price in terminal market less f.o.b. price. Includes transportation and primary wholesaler costs. Expressed as a percentage of retail value.

WR = Retail price less wholesale cost. Includes intracity costs such as transport and secondary wholesalers costs. Expressed as a percentage of retail value.

NA = Data not available

SOURCE: USDA, Fresh Fruit and Vegetables: Prices and Spreads in Selected Markets, 1975-84.

In both these cases, cost reductions would serve to narrow marketing margins.

2.6. Consumption trends

Annual per capita consumption of oranges in the U.S. has generally increased over the past 15 years, but has fluctuated wildly, responding to price variations determined in part by domestic crop size and increased imports. In 1970, per capita consumption of oranges (on a fresh weight equivalent basis), was 69.5 pounds with a total U.S. crop of 371.1 million cartons and imports of 90 million pounds of fresh fruit and 1.4 million gallons of orange concentrate. In 1983, per capita consumption jumped to 103.5 pounds, following a relatively large U.S. crop of 450 million cartons and imports of orange concentrate which had increased to almost 365 million gallons. Imports of fresh fruit in 1983 were 93 million pounds (Huang and Fitzpatrick).

The increased per capita consumption, however, has come primarily in processed products, as fresh consumption of all oranges on a per capita basis has shown a net decrease (Table 2.6.1.). On a fresh weight equivalent basis, per capita consumption of single strength FCOJ has increased from 20.83 pounds in 1970 to 33.59 pounds in 1983. Fresh consumption during the same period, meanwhile, has dropped from 16.5 pounds to 12.8 pounds. Apparently, the increase in processed orange consumption has come at the expense of fresh consumption and indicates the growing popularity of juice as a substitute for the fresh product. For California-Arizona navels specifically, per capita consumption has been increasing. As indicated in Table 2.6.2., per capita consumption of fresh California-Arizona navels during the 1980's has been the highest of recent years. This increase, in the face of a general decline in fresh consumption, probably reflects two developments in the U. S. orange industry: one, as Florida producers have increasingly emphasized production for the processing market,

TABLE 2.6.1.: PER CAPITA ORANGE CONSUMPTION & IMPORTS, SELECTED YEARS

YEAR	FRESH ORANGES	FROZEN SINGLE-STRENGTH ORANGE JUICE	US IMPORTS FRESH FRUIT	US IMPORTS CONCENTRATE
1970	16.5	20.83	90473	1461
1971	15.7	24.39	90926	19343
1972	14.5	27.85	109670	38075
1973	14.4	20.07	121745	20146
1974	14.4	29.65	102985	18248
1975	15.9	32.99	62002	33046
1976	14.7	34.55	133970	31402
1977	13.4	34.33	161810	47926
1978	13.4	27.64	124445	150741
1979	12.4	30.49	128507	160018
1980	15.8	31.90	99412	100014
1981	13.5	30.28	94045	214231
1982	12.7	33.42	96606	396072
1983	15.5	38.99	93174	364769
1984	12.8	33.59	141661	558118

SOURCES: CONSUMPTION DATA-USDA, FRUIT SITUATION, OCTOBER 1985.
IMPORT DATA-CITRUS FRUIT INDUSTRY STATISTICAL BULLETIN, various years.

CONSUMPTION DATA IS PER CAPITA.

FRESH FRUIT IMPORT DATA IS IN '000'S OF LBS.

CONCENTRATE DATA IS IN '000'S OF GALLONS.

1984 DATA IS ESTIMATED.

California-Arizona has emerged as the primary production region for fresh winter oranges in the U. S. (as indicated in Tables 2.1.1. and 2.1.2.); and two, weather-related difficulties have hampered the ability of Florida and Texas to provide substantial and consistent fresh orange supplies to the U. S. market. This latter development is the result of a series of freezes in Florida which occurred during the 1981, 1982, 1984, and 1985 seasons. The restrictions placed on the quantity of Florida fresh market shipments by the freezes opened new market windows to California-Arizona producers.

2.7. On-tree Storage and Value

Navels grown in the same district under the same climatic conditions tend to mature simultaneously, although each district's harvest commences at different times. District 1 shipments begin as early as mid-October, followed by District 3 in late October and early November. District 2 begins navel shipments the latest, starting in mid to late November. Harvested navels do not store well so they are generally packed within 24-48 hours of harvest and shipped within a week.Navels do, however, possess the unique quality of "on-tree" storage. On-tree storage is an important factor in the marketing decisions of growers and handlers, since harvest and marketing of ripe fruit can be delayed for 2 to 5 months, depending on the production region. This permits the industry to calibrate shipments intraseasonally, rather than shipping all fruit immediately upon maturity. An obvious advantage of on-tree storage is that it provides growers and handlers with the ability to plan shipments and avoid as much as possible the price-depressing effects of a market glutted with ripe fruit.

On-tree storage, while permitting the grower to delay harvest and the eventual sale of the fruit, does affect factors which influence fruit value. Size, appearance, and eating characteristics are the prime determinants of value; on-tree storage generally increases fruit size while gradually reducing interior quality (as determined by juice

TABLE 2.6.2.: PER CAPITA CONSUMPTION CALIF-ARIZ NAVELS, SELECTED YEARS (in pounds)

Season*	Total Domestic Shipments	Population U. S.	Population Canada	P/C Consumption
1970	31113	205052	21324	5.15
1971	27945	207661	21595	4.57
1972	31970	209896	21822	5.17
1973	24507	211909	22072	3.93
1974	33246	213854	22395	5.28
1975	37797	215973	22727	5.94
1976	37335	218035	23027	5.81
1977	35562	220239	23312	5.48
1978	27421	222585	23554	4.18
1979	26121	225055	23791	3.94
1980	40101	227757	24086	5.97
1981	43610	230138	24365	6.43
1982	38274	232520	24625	5.58
1983	49018	234799	24883	7.08
1984	45917	237019	25142	6.57
1985	41319	239283	25386	5.85
1986	47985	241489	25625	6.74
1987	47621	243084	25858	6.64

Canada and U. S. population in '000's;
Domestic shipments in '000's of 37.5 lb. cartons.

SOURCES: Quantity data from NOAC Annual, 1987

Population data for U.S.: Statistical Abstract of the United States:1987.

Population data for Canada: World Population Profile:83-85.

Note: * is year in which season ends, i.e., "1986" refers to 1985/86 season.

content, sugar-acid ratios, and brix count). It is widely assumed that advantages in on-tree storage from weight and size gain offset the negative impacts on appearance and taste (Thor, p. 13).

2.8. Price Determinants

Navel oranges destined for the fresh market are graded and sized by handlers and sold at prices based on these two criteria. Sizes range from 36 to 163 oranges per 37.5 pound box, although smaller sizes sometimes occur. There are three grades: "shipper's first grade" which designates the highest quality, "choice", and "standard", which denotes the lowest quality. Grade designations vary only "slightly" across season, packinghouse, and handler affiliation (Thor, p. 16).

F.o.b. (shipping point) prices are established by shippers for grade and size combinations based on the market forces of supply and demand. F.o.b. prices for the same grade-size combination often differ across production districts, reflecting inherent quality differences between the regions. An important influence on f.o.b. prices in the navel industry is the Sunkist "price scale". The Sunkist scale is a matrix of prices for grade-size combinations published by Sunkist for Sunkist label produce offered for sale in each of the production regions. This matrix, aside from informing buyers of Sunkist prices, serves as the standard for determining f.o.b. prices for the rest of the industry in that most other handlers use the Sunkist matrix as a guide for their own pricing decisions (Mueller, et al.).

2.9. Summary

In this chapter, we have reviewed the salient features of the navel industry and marketing system. The industry has been trending towards increased concentration and economies of scale among producers and handlers. Wholesale and retail markets are marked by increased verticle integration, largely backward by retailers. The industry is characterized by a structure approximating perfect competition. In addition, it appears that grower-packer share of retail value has been increasing, signifying a narrowing of industry marketing margins.

CHAPTER THREE

THE MARKETING ORDER PROGRAM

The first half of this chapter will trace the development of the Federal Marketing Order program, outline its rationale and objectives, and define the provisions contained therein. The resemblance of the Federal marketing orders to cartels will be reviewed. The second half will detail the specifics of the California-Arizona Navel Marketing Order: its history, provisions, and possible impacts on market performance. Longrun implications of the volume controls on industry structure will be discussed.

3.1. The Federal Marketing Order Program

Legislation authorizing the use of marketing agreements was originally contained in the Agricultural Adjustment Act (AAA) of 1933. The Act was amended in 1935 and then superceded by passage of the Agricultural Marketing Adjustment Act (AMAA) of 1937. The legislation came in response to economic problems in the agricultural sector caused by political and economic events in the post-World War One era.

3.1.1. Early History

During the World War I, large quantities of agricultural land in Europe were removed from production. As a result, acreage in non-European countries, principally the United States, Canada, Australia, and Argentina, increased substantially (Thor). When European acreage was returned to production after the war, the additional capacity precipitated a world-wide decline in prices for agricultural commodities.

In the United States, farmers suffered acutely. Prices for agricultural goods failed to retain their value relative to non-agricultural goods. Although the general price level for all goods fell during the years 1929 to 1933, the wholesale producer price index for farm products fell by 62.1 percent while the index for non-farm products declined by 28.2 percent (OMB Memo, p. 5). By 1937, farm income was one-half that of the general population (ibid.). Consequently, farmers--one of the largest and most powerful special interest groups of the day--began to demand legislative relief from the vagaries of the marketplace.

The AAA of 1933 contained legislation specifically aimed at fruit, nut, and vegetable producers. The legislation enabled producers to exercise control over how their produce was marketed. Importantly, no authorization for direct supply control was included. Instead, the legislation implicitly acknowledged the basic problem in the fruit and vegetable industries to be not one of excess production but related to difficulties in marketing. That the marketing orders are administered at the handler level rather than at the grower level indicates the intent to control marketing in lieu of production (Polopolus, p. 8).

Marketing difficulties for fruits and vegetables arise from certain conditions unique to the production of these commodities. Fruits, nuts, and vegetables are produced in a variety of grades, sizes, and maturities, may be perennials (in the case of fruits and nuts), and require lengthy lags between planting and actual production (up to seven years in the case of citrus). As a result, shortrun supply for these commodities is largely inelastic and year-to-year volume is uncontrollable and unpredictable. Large swings in intra- and interseasonal production are possible, leading to alternating conditions of market glut and scarcity which, because of the inelasticity of supply, cannot be alleviated in the shortrun. With yield variability comes price variability which is further exacerbated by the brief storage life of most fruits and vegetables.

3.1.2. Objectives of the Federal Orders

As enacted, the marketing order legislation provides for the following major policies:

"(To) establish and maintain such orderly market conditions...as will establish, as prices to farmers, parity prices..."

To protect the interest of the consumer by: (1), attaining parity by "gradual correction of the current (price) level"; and (2), not authorizing any action which "has for its purpose the maintenance of prices to farmers above the (parity level)."

"(To) establish and maintain such orderly market conditions...as will provide, in the interests of producers and consumers, an orderly flow of the supply thereof to market throughout its normal marketing season to avoid unreasonable fluctuations in supplies and prices."

Parity price is defined as the average price for a commodity over the previous ten years, adjusted by indices of prices paid and received by farmers. The concept of parity is derived from the relationship between farmer revenues and costs during the 1910-14 "golden age" of American agriculture. Its objective is to maintain a constant relationship between farm costs and income, based on input and output prices which prevailed during that period. "Orderly marketing" and "orderly flow" are essentially indistinguishable concepts, but have been separated for legal purposes (Polopolus, et al., p. vi).

The broad impact of the legislation has been to provide producers with the ability to collectively influence quantities of produce marketed so as to match product supply with market demand. The objectives have been attained by conveying to growers powers which ultimately amount to government-enforced cooperation in marketing (Breimyer, p. 14).

3.1.3. Provisions of the Federal Orders

The marketing orders assign to growers specific powers which permit them to directly influence the marketing of their output. Individual orders rely on a combination of the tools available to accomplish objectives specific to each industry. The basic provisions concern quality control, quantity control, and market support activities. These are described below.[2]

Quality Controls

Quality control provisions permit the establishment of minimum standards for grades, sizes, and maturity of fruit sent to market. The effect is to remove from the market undersized or low quality fruit. Some orders allow quality standards to remain unchanged from year-to-year while others change standards frequently. In 1981, thirty-seven of the forty-seven orders used grade and size restrictions, three used size restrictions only and two used grade restrictions only.

Quantity controls

The quantity controls consist of volume management and market flow regulations. Volume management restrains production, "selling" the excess output to another market or removing a portion of the total supply from commercial channels to place in a reserve pool. The effect of volume management is to reduce the quantity sold

[2] This section draws heavily on Jesse and Johnson, Effectiveness of Federal Marketing Orders.

in the primary market. Volume management provisions include producer allotments, market allocation, and reserve pools.

Producer allotments: each producer is assigned a specific maximum quantity which can be sold off the farm. Allotments are based on historical sales data, which determine aggregate quota levels and individual quotas. Allotments are used in the hops, cranberry, and Florida celery orders.

Market allocation: regulates the sales in one of two or more market outlets for the same commodity. The "free percentage" is sold in the more profitable primary market while the "restricted percentage" is sold in a noncompetitive market, e.g., export or processed. The allocation provision is used by three West Coast tree nut orders, California dates, and California raisins.

Reserve pools: same in principle as the market allocation program except that a declared reserve is set aside rather than sold in the secondary market (the reserve is defined as the excess over "anticipated" demand in the primary market). The reserve may be sold in the same year if market conditions permit or can be sold in the following year. Reserve pools are used by the cranberry, tart cherry, raisin, hops and prune orders.

Market flow: market flow regulations focus not on controlling the total quantity sold but on regulating the flow to market and the within-season pattern of sales. Under these regulations all produce is sold but grower returns are enhanced by price discrimination across markets. Two methods of controlling flow are handler prorates and shipping holidays. Handler prorates specify the maximum quantity a handler can ship over a stated period of time, usually a week. Any excess can be held for the subsequent week's shipment or can be diverted to the secondary market. Prorates may be season-long, for a limited time period, or for any number of weeks. Exemptions are usually available which permit under- and over-shipment of the prorate quantity under certain circumstances. The prorate is used by the California, Texas, and Florida citrus orders, Florida celery, South Texas lettuce, and tokay grapes.

Shipping holidays are a limited form of market control in which short periods are designated when all commercial shipments to terminal markets are prohibited. The orders specify conditions under which shipping holidays can be declared, their maximum length, and the minimum period between holidays. This provision is used primarily to avoid market gluts during calendar holidays (e.g. Christmas) when prices are generally high. Nine orders have shipping holiday provisions.

Market support activities

Market support refers to provisions which permit the standardization of containers, assessments for industry research and development, and generic advertising and promotion activities.

3.1.4. Marketing Orders and Cartels

The marketing order has impacts on market structure which have been compared to those of a cartel (Jamison). A cartel is defined as "a combination of firms whose objective is to limit the scope of competitive forces within a market" (Ferguson and Gould, p. 348). In the classical theory of the cartel, supply as well as price is controlled by member firms. The goal of the cartel is to enhance producer revenues via centralized marketing decisions. This usually means allocating sales of output among member firms on the basis of market shares which prevailed at the time of the cartel's formation. The limitation placed on competitive forces by the cartel alters the structural characteristics of the industry so that industry response to economic variables becomes that of a monopolist.

Marketing orders share with cartels the objective of revenue enhancement. The volume control provisions permit the administrative committee to coordinate the marketing decisions of thousands of producers. This effectively supplants the autonomous nature of the individual producer in a competitive market with the supply response of a monopolist. Indeed, it may be argued that marketing orders are more powerful than cartels, given that producer participation is mandatory and compliance is enforced by law.

There are two noteworthy differences between marketing orders and cartels, however, which limit the exercise of market power under the orders. First, whereas cartels are characterized by almost absolute control over supply, marketing orders (except those which use producer allotments) are devoid of supply control. The authority of the administrative committee applies only to the marketing of a specified portion of the commodity. The second difference lies in the number of members in each organization. Cartels are generally composed of a relatively few large firms while marketing orders typically apply to thousands of producers. As will be discussed, these dissimilarities limit the potential accumulation of market power by growers under the orders. They are particularly important points to consider when examining the performance of the California-Arizona navel industry.

3.2. The California-Arizona Navel Order

The following sections describe the California-Arizona Navel Marketing Order. The origin and history of the order is reviewed, specific provisions are detailed, and the longrun implications of the marketing order vis-a-vis industry performance and structure are considered. Discussion of these points will aid in developing a basis for comparison of the industry with and without controls.

The California-Arizona Navel Order was adopted in response to problems growers encountered in marketing their fruit. The original order, established in 1933, covered all major varieties of oranges grown in California, the Valencia and the navels. In 1952, however, the order was terminated. The termination lasted until 1954 when growers readopted the controls but with separate orders for Valencias and navels. The orders adopted in 1954, with subsequent amendments, are those under which growers operate today.

3.2.1. Early History

The orange industry was established in Southern California during the mid-1700's, but did not become a major factor in the California economy until late in the 1800's. The status of the industry changed when completion of the transnational railroad system opened the urban markets of the East Coast to California citrus growers. Compared to historical transportation costs, the rail freight rates were low enough so that growers could realize a profit on all they could produce and ship (Gable, p. 82). The profits resulted in the rapid expansion of the industry, as California citrus acreage increased from 3,000 acres in 1880 to 40,000 acres in 1893 (U.S. Bureau Census, 1890, p. 583-4). The expansion, however, was too swift and the market was soon swamped with fruit. Profits gave way to an industry-wide period of severe losses known as the "red-ink" years.

The "red-ink" years marked a period in California citrus history when grower revenues rarely covered the costs of packing, transportation, and marketing (Sunkist Adventure, p. 7). The reduction in transport costs which occurred with the advent of the rail freight service encouraged an increase in production and shipments which glutted terminal markets and drove prices to levels below grower cost. Even the most efficient firms incurred losses, as profitability for the entire industry was eliminated (Gable, p. 83).

The overexpansion apparently developed because of uncertainty about production and marketing in the industry. First, producers did not know what production decisions other producers were making so that production beyond the point of profitability occurred (Gable, p. 83). Second, producers and sales agents operating in California were unaware of supply conditions in terminal markets so that some markets were glutted with fruit while others faced a scarcity (Meyer, p. 45). Hence, grower profits were lost as a result of incomplete information.

In addition to the lack of supply information was a lack of market price information. The "buyer's market" which existed during the "red-ink" years forced growers to sell their fruit through terminal market agents on a commission or consignment basis. Monitoring of the agents was made impractical by the long distance, so growers were dependent upon the integrity of their agents as to what price they received for their produce. This price uncertainty allowed abuse in the marketing system. In effect, agents were suspected by growers of manipulating the arrival dates of shipments so as to be able to pay growers the minimum price possible (Gable, p. 90). The problem was exacerbated by the long trip and brief storage life of the oranges, since fruit often arrived in distressed condition and prices had to be discounted.

The adversities of marketing provided impetus for growers to integrate horizontally into voluntary marketing associations. The first attempt at voluntary market coordination came in 1885, with the formation of the Orange Growers Protective Union of Southern California. The Union sent salaried employees into the terminal markets to monitor the selling of members' fruit. It did not, however, require its members to use the Union's buying, selling, or shipping services. This caused a lack of organization and cooperation which led to the Union's demise after a few years.

Three other organizations were subsequently formed but failed as well. Their failure was due principally to the inability of the associations to successfully unite the divergent interests of growers and handlers into a single marketing organization (Sunkist Adventure, p. 9). As a result, growers decided to form their own marketing group.

In 1893, growers organized the Southern California Fruit Exchange (SCFE). Incorporated as the California Fruit Growers Exchange (CFGE) in 1905 and then renamed Sunkist Growers, Inc., in 1952, the cooperative has dominated the California-Arizona citrus industry for almost a century. Its success, however, was not always assured.

The SCFE was formed for the purpose of prorating shipments of fruit among members. In its first year the SCFE controlled 89 percent of all California orange shipments. In the following year, however, volume marketed by SCFE dropped to 37 percent. The decline in grower support has been attributed to several developments which reduced grower returns: one, the Exchange was not always informed of shipments made by its members so that competition existed between member's fruit in terminal markets; two, Exchange fruit encountered strong opposition from non-Exchange dealers who intentionally glutted markets in order to reduce Exchange returns; and three, non-Exchange dealers uniformly undercut member's prices, reducing Exchange sales (Sunkist Adventure, p. 11).

These efforts by non-Exchange dealers to prevent the continued operation of the SCFE weakened the organization. The next decades were characterized by attempts to strengthen the Exchange through incorporation and alliance with an independent organization, the California Citrus Union. The alliance eventually failed and industry efforts to attain marketing coordination once again foundered. Because of these failures, the industry began to push for compulsory participation in marketing control. The AAA of 1933 and the AMAA of 1937 contained the necessary provisions to make market coordination mandatory for orange growers. Proration of navel shipments began in January, 1934. As a result, "market coordination came to operate with the force of law" (Shepard, p. 89).

3.2.2. Provisions

The California-Arizona order utilizes three major policy instruments to regulate navel orange marketing. They are rate-of-flow, size restrictions, and research. The three instruments are described below:

1. Rate-of-Flow

This provision authorizes the industry to regulate (on approval of the Secretary of Agriculture) on a weekly basis the flow of all oranges shipped in fresh form to the U.S. and Canadian markets. Rate-of-flow is administered for each of the four production districts individually. This separation takes account of the natural differences in the output of each district and the export marketing opportunities which exist for Southern California growers but which do not exist for the other districts. "Rate-of-flow" and "prorate" are used synonymously in the literature.

2. Size restrictions

The size provision allows the industry to regulate the minimum size of oranges shipped to the domestic fresh market. The size restrictions are not uniform across years, as they may change according to crop conditions. The restriction compels growers to ship undersized fruit to the processing market and prevents them from filling their quotas by shipping small fruit (Shepard, p. 91).

3. Research

This provision permits the committee to authorize research and development projects designed to promote the marketing, distribution, and consumption of California-Arizona oranges. For example, the industry conducts annual econometric evaluations of market conditions and uses these evaluations in their attempts to acheive maximum profits for growers. Research expenditures are financed through handler assessments.

3.2.3. Price Discrimination

The rate-of-flow provision allows the industry to practice price discrimination across markets and intertemporally (Shepard, p. 120). For effective price discrimination, three conditions must exist: one, the seller must have some control over price; two, markets must be separable so that arbitrage between them is not possible; and three, elasticities of demand in the markets must be different. Satisfaction of these three conditions permits a person or firm to achieve a higher weighted average price than that which would be possible under perfect competition.

The California-Arizona navel industry appears to fulfill these conditions. First, the marketing order regulation provides the administrative committee with the power to control a large portion of the seasonal supply by market allocation. Second, the rate-of-flow and size restriction provisions permit NOAC to exploit differences in demand conditions in the three outlets for navels: fresh, processing, and export. Finally, price flexibilities as estimated for the fresh and processed market are different: -0.4 to -0.6 for fresh market and "quite limited" for the processed market (Thor, p. 268).

With these three conditions satisfied, augmenting grower returns thus depends on how effectively the prorate mechanism is employed by NOAC to constrain shipments to the fresh market. In practice, constraining supplies in the inelastic fresh market will increase price in that market. "Excess" production is sold in the export market or diverted to the elastic processed market, which, according to Thor, appears to be largely unresponsive to increased California-Arizona processing shipments. The result is grower revenues which are higher than those which would obtain under perfect competition.

Temporal price discrimination occurs on a seasonal basis. Shipments tend to be tightly constrained at the beginning of the season when prices are among the highest of the year. The tight constraints are imposed to avoid market gluts and protect the "integrity" of the market. Integrity generally refers to quality. Industry members say that in absence of the constraint, producers will take advantage of early-season high prices and "beat the market" by shipping all they can harvest. Average product quality will suffer and consumers will develop a negative product image to the detriment of the entire industry. Therefore, industry members argue, the prorate protects both the consumer and the industry from the actions of a few growers. Tight temporal constraints are also used during the Christmas week and immediately thereafter when fresh orange demand is typically strong.

3.2.4. Possible Economic Impacts

Intervention by government into agricultural markets is traditionally justified on the basis of improving market performance. Economists have recognized several circumstances in which markets, if left to themselves, may not allocate resources optimally (Baumol and Blinder, p. 253). These instances may result from market failure, market conditions which cause producers to make sub-optimal decisions on how much to produce, and the existence of market power among market participants. In these cases, government intervention may be both desirable and necessary.

Marketing orders were instituted in order to address three situations in which intervention was deemed desirable. These are: price instability resulting from market failure; quantity and quality variability; and asymmetry of market power. This section examines the intervention justification for each of these concerns, the theoretical impacts of the intervention and any related empirical evidence.

1. Price instability

Stability of prices is the most frequently cited justification for the marketing order controls. The prevailing logic among marketing order proponents is that both consumers and producers will benefit from price stability since instability per se causes a decrease in net social welfare. Similarly, it is argued, price stability leads to more efficient use of plants, equipment, and input markets.

Theoretical studies conerning the impacts of price instability are mixed. Waugh (1944), Oi (1961). and Massell (1969), used economic surplus measures to demonstrate that if prices over two periods are not stable, consumers and producers will gain or lose depending on the source of the instability. Turnovsky (1974) used expectations hypotheses to demonstrate that if supply fluctuated while demand was constant, then producers would gain and consumers would lose from stabilization with the net effect being posititive. Jesse (quoted from Thor, p. 60) used welfare theory to conclude that intraseasonal price stabilization results in losses to consumers but gains to producers and an overall net gain. He further concluded that prohibition of market controls would likely result in increases in consumer surplus both in the shortrun and longrun.

Turnovsky, Shalit, and Schmitz (1980) used utility theory to conclude that "for plausible parameter values (of elasiticities, budget share, and the Arrow-Pratt coefficient) one would still expect price instability to be preferred" in the case of a single commodity with a low budget share and an Arrow-Pratt coefficient which is low. In the case of a high degree of risk-aversion, stability may be preferred to instability for a single commodity.

Producer and consumer welfare may also be affected by the impacts commodity price stabilization has on other markets. In industries which require a large degree of capital investment (e.g., citrus orchards), price stability reduces risk premiums for producers and lenders (Jesse, March 1982, p. 51-3). This may have two effects on prices: one, with a smaller risk premium, producers will require a lower return; and two, investment capital available to producers at lower interest rates encourages expansion of productive capacity. Stable prices, then, may increase output and ultimately decrease prices to consumers.

Price stabilization efforts, however, may have welfare effects which are negative in the longrun. For example, a government evaluation of the marketing order program, premised on the notion that both producers and consumers would prefer price stability, concluded that this "necessitates overproduction to ensure against crop failures" and requires diversion of the excess to secondary uses or destruction (OMB). The attendant implication is that prices must be maintained at a level sufficiently high to encourage overproduction and still return a "reasonable" profit to producers. That this policy may entail a wasteful transfer of resources into the production of a commodity for which there is no effective demand is apparently the price consumers and society pay for a stable and sufficient supply.

Questions exist, however, as to whether marketing orders can achieve the objective of price stability. Empirical evidence on this point is mixed. Advocates of the navel marketing order cite orange industry performance during the years 1952-54, when the order was not in effect, as evidence of the need for volume control. During this period, both quantities and prices were highly variable compared to prorated periods before and after (Agribusiness Associates, p. 83). In a study of virtually all crops covered by marketing orders, including navels, researchers found that farm prices for fruits and vegetables marketed under the orders appeared neither higher nor more stable than prices of similar commodities not marketed under the orders (Jesse and Johnson, p. 45). This contrasts with a recent study of prorate in the lemon industry (Carman and Pick) which concluded that lemon price and quantity variability was more substantial when prorate was suspended than when it was in effect.

2. Quantity variability

Advocates of the marketing orders argue that both the biological nature of the agricultural production process and the perishability of agricultural comodities makes volume regulation and quality control provisions necessary in order to provide a stable and continuous supply of high quality produce. Volume stabilization in the California-Arizona Orange industry is accomplished by the prorate mechanism. The impact of this program on market performance appears to have both negative and positive aspects.

Efficiency gains from volume control accrue from a reduction in uncertainty associated with regulation of shipments. The quantity and production information collected and disseminated by the administrative committees permit handlers to better plan plant, equipment, and input use. This efficiency helps minimize the costs of production, packing, and marketing (Thor, p. 61). Volume control also appears to elongate the marketing season as quantities marketed are reduced at the peak harvest time and distributed over the remainder of the season (Thor, p. 268).

Efficiency losses from monopoly stabilization result from the adverse effects the volume constraints have on growers and handlers. Marketing orders which regulate volume among handlers tend to protect handler market share status quo, reducing competition at the handler level (Armbruster and Jesse, p. 138). Allocation of volume also results in disincentives to producers to expand and improve production practices (Lenard and Mazur). Volume controls which regulate handlers but not producers may allow producers to attain economies of scale, but not handlers. In this case, handlers are forced to adjust to the optimal size of producers (Jamison). This may result in limits on firm growth for handlers and may prevent both handlers and producers from exploiting quality and efficiency advantages (Jesse, March 1982).

The controls also result in income transfers between producers, consumers, and handlers. Supply limitations, for example, have generally reduced processor and handler returns while enhancing grower returns (Jamison). Marketing orders which allocate volume between markets cause income transfers between consumers in the restricted fresh market and those in the augmented processed market (Jesse, March 1982). Such transfers may not maximize net social welfare. A study of the California cling peach industry, for example, found that although tight output controls stabilized price and output, total social welfare declined (Minami, French, and King quoted in OMB Memo).

3. Quality variability

A separate issue related to the nature of agricultural production is that of quality control. Many orders, including the navel order, use minimum quality or size standards. Oranges, for example, are sold on the basis of size and grade at the shipping point (f.o.b.) and wholesale levels (Rausser, p. 145). Since grades and sizes can be extremely variable from year-to-year, the marketing order authorizes NOAC to set a minimum size standard for fruit shipped to the fresh market. Fruit which fails to meet this standard is either diverted to the processing market, sold as cattle feed, or destroyed. In the navel industry, size restrictions have been used in 15 of the last 17 years and are adjusted depending upon the crop condition. It appears that in seasons of particularly large crops, the size restrictions take their most restrictive form (Shepard).

The rationale for minimum quality standards usually offered is that by removing low quality produce, standards improve average product quality, which in turn enhances consumer demand and raises the price for the remaining produce (Jesse and Johnson, p. 12). Standards are seen as enhancing grower returns, maintaining product quality and restricting the shipment of low-quality fruit. Thus, it is claimed, quality standards benefit both consumers and producers. Some economists, however, disagree and flatly state "quality controls are really disguised volume controls" (French, et al., 1978).

The question of how consumers and producers are impacted by the quality controls focuses on whether minimum quality standards negatively impact consumer welfare by restricting from the market lower-priced produce which would otherwise be purchased. Recent studies concerned with quality standards suggest that under certain conditions, consumers would be better off if permitted to purchase produce which the industry would otherwise prohibit from market.

Bockstael (1984), for example, concluded that if consumers can perceive quality and producers cannot affect quality, then standards which prohibit the marketing of low quality produce will hurt consumers (p. 468). In the event that producers can affect quality, Bockstael demonstrated that both consumers and producers cannot benefit from the standards (p. 469). For example, if price increases in the market as a result of higher quality produce being shipped, then clearly consumers lose economic surplus. If price should fall, producers lose surplus. While the price effect of the minimum standards is a priori indeterminant, the significant result is that "society as a whole...loses from minimum quality standards in all cases" (p. 469). The result holds as well in the case of the diversion of excess to a secondary market such as the processing market which exists for orange producers.

4. Asymmetry of market power

It has been described how the atomistic structure of the production side of the agricultural sector made it susceptible to the abuse of the relatively more concentrated marketing sector, composed of retailers and wholesalers. The asymmetry of market power denied producers the ability to earn a fair market value for their output.

As noted, this was a primary motivation for the voluntary (and later mandatory) marketing orders. The problem stemmed from the fact that while the production side of the agricultural sector is characterized by low barriers to entry and many small producers, the marketing side is relatively concentrated with high barriers to entry. These structural differences, coupled with the lack of market information, left atomistic producers with little or no countervailing power to prevent abuse. The marketing order regulates the behavior of producers and handlers and requires the collection and dissemination of information regarding handlers. Such information reduces the opportunities for market abuse. By applying these regulations across market participants, the potential for discriminatory practices is diminished (Armbruster and Jesse, p. 147).

Imposition of such regulations on the market may have efficiency costs. Marketing orders undeniably alter the structural characteristics of the market since the powers being conveyed to producers incorporate monopoly elements. French argues that if the market structure resulting from the imposition of marketing orders is compared to that of the perfectly competitive market, a "monopoloid" device such as the marketing order represents a clear decrease in marketing efficiency (French, 1978).

As has been mentioned elsewhere, however, the standard of the perfectly competitive market may not be a valid comparison for judging efficiency costs and gains. Without sufficient knowledge of the market structure which would have existed had the order not been applied, there seems little justification for the assumption that the structure would have been competitive. And certainly an efficient market by no means implies a competitive market. An "efficient" market simply implies a market whose equilibrium price accurately reflects underlying demand and supply conditions. As Kilmer has noted, "if the market is monopolistic, then an 'efficient' price would be a monopoly price" (Kilmer, p. 137). Thus it is not entirely clear what the net effect of marketing orders on social welfare has been.

The foregoing discussion of the efficiency issues surrounding marketing orders relies heavily on the imprecise economic notions of consumer and producer welfare. While welfare analysis has been illustrative in its ability to approximate relative magnitudes of the changes in producer and consumer welfare resulting from marketing order regulations, it has been unable to definitively measure these costs and benefits. Perhaps a clearer method of assessment is available in the empirical examination of the behavior of industry marketing margins. Price spreads measure the nominal earnings of participants in the marketing channel: shippers, wholesalers, and retailers. The manner in which these earnings are affected in the shortrun by the removal of the regulation provides an indication of how earnings under regulation compare to "competitive market" earnings. While still not a definitive measure, such a comparison has as its advantage the fact that it is premised not on the vague concepts of social utility and surplus measures, but on the concrete metric of money.

3.2.5. Administrative Committee

Marketing order provisions in the navel orange industry are administered by NOAC. NOAC is composed of eleven members, ten of whom are industry members and the eleventh a non-industry member. The non-industry member is a non-aligned chairman without voting powers. The ten industry members are growers and handlers--six growers and four handlers. The committee members are nominated by the industry and appointed by the Secretary of Agriculture. The non-industry member is nominated by the industry members of the committee and is approved by the Secretary of Agriculture. Cooperatives in the industry which control 50 percent or more of the seasonal volume are permitted to seat at least five voting members.

Functions and responsibilities of the committee are to recommend regulatory policy to the Secretary (who is responsible for issuance of the regulations) and then carry-out those recommendations. The committee begins its seasonal duties by meeting prior to the marketing season and submitting the policy recommendations for the upcoming season to the Secretary. The recommendations include estimates of the best economic utilization of the estimated crop as well as recommended size limitations and the percentage of total crop anticipated to be allocated to the fresh, processd, and export markets. The recommendations are forwarded to the Agricultural Marketing Service (AMS), published in the Federal Register, and then acted upon. Throughout the marketing season, as estimates become more accurate, revisions are made according to crop conditions in order to determine recommended prorate quantities (Rausser, p. 240).

During the marketing season, prorate quantites are determined on a weekly basis. Prorate allotments are announced three to ten days prior to the period of regulation. These quantites may be adjusted by the committee during the regulation period if market conditions warrant. Handlers may overship their allotments by up to 20% in any given week but these overshipment quantities must be deducted from the following weeks' allotment.

The two main objectives of the NOAC are to increase grower income and stabilize prices. In the parlance of the industry, these goals are effected by attaining the "best economic utilization" and orderly marketing. Best economic utilization refers to maximization of seasonal returns or, at other times, allocation of seasonal production which results in an average price which is no greater than parity (Rausser, p. 238).

Thus the committee faces the problem of maximizing total industry revenue subject to two constraints: one, market demand; and two, equity (Clodius). Equity refers to permitting each producer to ship to the fresh market an equal percentage of his crop. Equity ensures that the maximum quantity of oranges to be shipped from a particular region is distributed proportionately among all handlers in the region. Prorate bases are calculated for each handler as a proportion of the total anticipated production controlled by each handler.

In practice, industry-wide equity is not achieved. As noted in Section 2.1., District 1 ships about 90% of all domestic California-Arizona fresh navel marketings. Prorate constraints are therefore more restrictive for District 1 producers than for producers in other districts. In the past four seasons, for example, District 1 producers have operated under volume constraints in more weeks per season than any other district (Table 3.2.1.). In addition, whereas 53.9% to 94.3% of all marketings from District 1

TABLE 3.2.1.: NUMBER OF PRORATED WEEKS BY DISTRICT, SELECTED YEARS

Season	Weeks in Season	Number of Prorated Weeks by District 1	2	3	4
1983/84	31	22	0	5	0
1984/85**	15	13	0	3	0
1985/86	40	16	0	0	0
1986/87	37	26	5	0	0

SOURCE: NOAC Annuals

**through week ending Jan. 31, 1985.

have been shipped under prorate controls, other districts have operated comparatively freely (Table 3.2.2.). If equity were to be attained on an industry-wide basis, all producers in all four districts would operate under the same prorate constraints. Tables 3.2.1. and 3.2.2. indicate that this is not the case.

The distinction between equity and best economic utilization is important. Best economic utilization cannot necesarily be attained given the equity constraint. Best economic utilization denotes profit maximization and maximization may not be achieved unless growers of the highest quality fruit are allowed to ship all they wish. Equity, however, demands that each grower have equal opportunity to ship the same percentage of fruit. Thus, equity reduces profit levels on an industry-wide basis.

Other constraints on profit maximization stem from the practical market experience of the NOAC. NOAC cannot use its power to maximize shortrun returns for two reasons: one, they have learned that a policy of shortrun maximization can result in a price so high that oranges are priced out of the market; and two, the lack of homogeneity of interests among growers precludes the formulation of joint profit maximization policies. This is because members represent a diverse set of interests within the navel industry: a large co-op, a small coop, and independents. Decisions are a compromise between these interests. As a result, joint profit maximization is impossible (Clodius).

3.2.6. Longrun Implications

As was noted previously, one of the major differences between cartels and the marketing orders was the lack of control over production. Empirical analysis of prorate in the California-Arizona citrus industries suggests that in the longrun, benefits to growers are nullified by industry supply response. This phenomenon occurs because, absent barriers to entry, shortrun profits obtained under the marketing controls encourage new entrants and expanded production.

TABLE 3.2.2.: QUANTITY OF PRODUCTION SHIPPED UNDER PRORATE
by District, 1983/84 to 1986/87

Season		Districts 1	2	3	4	SEASON TOTAL
1983/84	Prorated	35506	0	608	0	36114
	Total	42045	2859	734	279	45917
	%	84.45	0.00	82.83	0.00	78.65
1984/85	Prorated	15530	0	210	0	15740
	Total	16466	1937	732	271	19406
	%	94.32	0.00	28.69	0.00	81.11
1985/86	Prorated	23700	0	0	0	23700
	Total	43962	3086	793	195	47986
	%	53.91	0.00	0.00	0.00	49.39
1986/87	Prorated	37177	597	0	0	37774
	Total	43228	2564	1399	430	47621
	%	86.00	23.28	0.00	0.00	79.32

Quantity data in carload units of 1,000 cartons each

SOURCE: NOAC Annuals
"Prorated" refers to quantities shipped under prorate.
"Total" refers to the total quantity of shipments from the district for the season.
"%" refers to the percentage of total shipments shipped under prorate.

In order to maintain constant returns in the face of increasing output, the industry must divert greater percentages of production to the secondary market. As entry continues, expansion persists and overproduction becomes chronic. Price in the secondary market falls, thereby reducing the weighted average price to producers. Producers are forced out of the industry as net revenues decline. Exit continues until production contracts and prices regain a competitive level. In the longrun, the result is an equilibrium identical to that which would have occurred had the prorate not been instituted (Smith).

The scenario is evident in the California-Arizona orange industry (Shepard), as well as in other industries operating under marketing orders (Smith; Jamison). Shepard concludes that in the California-Arizona navel industry "higher average prices associated with the market-allocation programs appear to motivate future additions to productive capacity...the additional output forthcoming from new acreage leads to still larger diversions to the processing market and, eventually, to lower average prices" (p. 112). This observation suggests that in the end, both society and producers suffer welfare losses under the marketing orders. Producers suffer because revenue-enhancement schemes eventually lead to lower net revenues and society loses because of the resource misallocation resulting from overproduction in the industry.

An estimate of resource misallocation due to volume controls in the California-Arizona navel industry is difficult to calculate. Nevertheless, Jesse has estimated that if the marketing orders for navel and Valencia oranges in California-Arizona were terminated, 40,000 to 50,000 acres of production and 2,100 to 7,000 producers would be forced to exit the industry (AMA Docket No. F&V 907-6 to 10, p. 133). The acreage figure represents about a quarter of the current navel and Valencia acreage (NOAC and Valencia Orange Administrative Committee Annual Reports, 1987). If these estimates are valid, then the social welfare cost from the resource misallocation implied by these statistics is substantial.

3.2.7. Summary

In this chapter, the history and implications of the marketing order program have been discussed. Marketing orders were instituted to address the economic concerns of farmers by permitting producers to coordinate marketing activities. In the California-Arizona navel industry, market coordination activities have been used in nearly every marketing season since 1934. The shortrun objective of the coordination is to attain best economic utilization of the season's crop and to ensure orderly marketing. This implies shortrun profit maximization for producers. Shortrun implications, however, may be different from the longrun effects.

CHAPTER FOUR

THE PRORATE SUSPENSION

This chapter provides an analysis of the claims and counterclaims resulting from the prorate suspension. In addition, a brief overview of the history of events which led to the prorate suspension of 1985 will be presented.

4.1. Review of Marketing Order Challenges

For most of their history, the California-Arizona citrus marketing orders have operated in relative anonymity from public and private scrutiny. During the 1970's, however, concerns about price inflation and market concentration in the industry triggered investigations by consumer protection commissions and regulatory agencies. In 1974, the Cost of Living Council (CLC), concerned about rising food costs, requested that the United States Department of Agriculture (USDA) require NOAC to raise its weekly prorate. CLC observed that although 1973/74 season orange production was 14% more than the previous season, fresh navel prices were higher and prorates lower than the year earlier. CLC believed that the industry was contributing to inflation by constraining fresh market shipments and causing higher navel prices to consumers. Although NOAC and USDA initially refused the CLC request, prorates did increase voluntarily for a period of approximately ten weeks.

Charges of monopolistic tendencies and market concentration were aimed at the industry by the Federal Trade Commission (FTC). In December, 1976, the FTC initiated an anti-trust investigation against Sunkist Growers, Inc. The FTC charged that Sunkist, which controlled well over 50% of Western citrus production, had conspired to monopolize the industry by controlling prices and limiting competition. The case was resolved after four years of litigation when Sunkist entered into a consent agreement in which it agreed to divest a processing plant in Yuma, Arizona. Sunkist also agreed not to acquire more processing capacity for a period of ten years and to not acquire more than 39 packinghouses without prior approval of the FTC. In addition, for a period of five years, Sunkist was prohibited from acquiring any citrus packinghouse without FTC approval (Mueller, et al., p. 6).

Efforts designed to force the deregulation of the industry intensified with the election of Ronald Reagan to the presidency. In 1981, Reagan issued Executive Order No. 12291, which directed that federal regulations must "maximize the net benefits to society" (Wall Street Journal, August 10, 1984). Under this directive, the Office of Management and Budget (OMB) initiated investigations into all federal programs to determine if they could be administered at lower cost. Staff members of the OMB and the Justice Department began to advocate reform of the navel marketing order. The push for deregulation was fueled by particularly negative media coverage of the 1980/81 navel season, in which some 3.5 billion navels were excluded from the fresh market (New York Times, February 15, 1981) and 82,800 tons of navels were used as cattle feed (GAO, p. 11).

The public outcry resulting from the publicity spurred a vigorous, though divided, campaign within the Reagan Administration to curb NOAC powers. In 1983, Reagan directed the USDA to "remove or modify" federally-sanctioned marketing orders in general and the navel order in particular (Hershey). Secretary of Agriculture Block initially opposed the attempts at reform but eventually decided not to extend market controls on lemons. Lobbyists for Sunkist, the dominant marketer of lemons in the U.S., reacted swiftly and convinced the White House to rescind Block's order (Wall Street Journal, August 10, 1984). Perhaps more importantly, Sunkist and the farm lobby persuaded Congress to suspend funds which were earmarked for the OMB investigation of the marketing orders. Thus the marketing order program became the only program of any federal agency excused from review by the OMB (Lenard and Mazur).

The battle over market control, however, was not entirely resolved. Instead, the issue came to a head in January, 1985, when Block announced the suspension of the navel prorate for the rest of the 1984/85 marketing season (Western Citrus Report, February 8, 1985). As a result, NOAC and the California-Arizona navel industry suddenly found themselves facing "open movement" on a significant portion of the year's crop for the first time in 32 consecutive marketing seasons.

4.2. The Prorate Suspension

Administrative declaration of a prorate suspension for California-Arizona navels was precipitated in the short run by climatic conditions in the nation's other main production regions of Florida and Texas. Cold weather in December, 1983, across the southern portion of the country severely damaged citrus crops in Florida and Texas. The entire Texas orange crop was destroyed, resulting in no commercial shipments of fresh oranges from Texas during the 1984/85 season. In Florida, 120,000 acres of citrus (approximately one-seventh of the state's citrus acreage) was damaged or destroyed. The following season, another freeze in January, 1985, destroyed an additional 100,000 acres of Florida citrus (Florida Agricultural Statistics; 1984, 1985). Aggregate losses to the Florida citrus industry from the two freezes were estimated at a total of one billion dollars (Daniels).

In the wake of the 1985 freeze, Florida officials placed an embargo on all shipments of fresh oranges. The reduced supplies from Florida caused an unseasonal increase in f.o.b. prices for California-Arizona navels. USDA, noting that navel prices had failed to exhibit their normal post-Christmas drop, exercised the authority granted it by the marketing order statutes and announced a prorate suspension on California-Arizona navels on January 29, 1985, effective February 7, 1985 (Karr). "It was clear," said AMS administrator James Handley, "that the season average price for...[navel] oranges would be substantially above parity" (Wall Street Journal, February 1, 1985).

4.3. The Issues

Suspension of the prorate raised many specific issues for the industry as well as for government observers and consumer advocates. Marketing order proponents made three major claims regarding market performance after the prorate susupension:

1. Prices of navels in the marketing channel and quantities shipped became more variable as a result of the lack of market control (Klassen);

2. Grower revenues declined by 10 to 18 million dollars from what they would have been had the control been left in place (see, for example, Sunkist Newsletter or Lindsey); and

3. Retail prices did not respond to declining f.o.b. prices, implying that food retailers were able to pocket significant economic profits and that consumers were unable to benefit from lower f.o.b. prices (Pryor).

These claims made by marketing order proponents address the issues which lie at the heart of the marketing order debate. As discussed, fruit and vegetable marketing orders were intended to reduce price and quantity variability, to ensure growers a fair return for their output, and to reduce the oligopsonistic power of the marketing sector. The claims made by growers as a result of the 1985 prorate suspension thus reflect the concerns among industry members that without the protection of the market controls, the very conditions which necessitated passage of the 1933 legislation would once again reassert themselves to the detriment of consumers and growers alike.

This study will consider only the third claim regarding the behavior of the f.o.b. to retail marketing margins during the prorate suspension. The first claim has already been addressed in the only other study on the prorate suspension (Powers, et al.). The second claim, while perhaps the most important from the growers' point of view, will not be considered since any evaluation of the revenue gained or lost by growers must necessarily be based on assumptions about what industry behavior would have been had the prorate remained in effect. As a result, conclusions drawn from these results would be conjecture and of questionable economic validity. In contrast, analysis of marketing margins based on actual price and quantity data is readily measureable by econometric methods and requires only the standard statistical assumptions.

4.4. Previous Studies

To date there has been one study related specifically to the 1985 suspension (Powers, et al.). The authors analyzed weekly data at the grower, handler, and wholesale levels and monthly data at the retail level. Observations were drawn from the deregulated period and from comparable regulated periods of previous seasons. They concluded that there was little change in the variability of prices and quantities during the suspension period. While they found higher prices at all levels during the suspension, this was attributable to a relatively short supply season. They summarize their results by saying that "the market for California-Arizona navels performed in about the same way during the 1984/85 season after the prorate was suspended as during comparable prorated periods" (p. 29). This study contained no explicit treatment of margins.

As mentioned, conclusions reached in this study were based on analysis of weekly observations at the f.o.b. and wholesale levels and monthly observations at the retail level. Although the retail observations were garnered from 22 urban markets, monthly data yields only four observations on the deregulated period. This paucity of observations compromises any conclusions about retail price behavior which the authors reach based on this data. Because retail prices are often quite variable on a week-to-week basis relative to f.o.b. or wholesale prices, monthly observations would tend to obscure price variability by "smoothing" the data. Since marketing orders are defended, in part, on the basis of their ability to reduce price variability at the consumer level, it seems necessary to use more disaggregate (e.g., weekly) observations to assess retail price behavior.

An earlier study of marketing in the California-Arizona navel industry concerns the 1973/74 period in which prorate levels increased voluntarily (Nelson and Robinson, 1978). Claims made by growers during the 1984/85 season echoed those made by NOAC as a result of the 1973/74 CLC action. In 1974, NOAC estimated that because of the "chaos and market instability" caused by the CLC intervention, growers lost 3 to 4 million dollars while "no reduction in retail prices of Navel oranges" was evident (NOAC Annual Report 1973/74). Nelson and Robinson examined these claims by studying the wholesale-to-retail margin behavior in two retail markets, Chicago and New York City.

Using monthly retail and wholesale price observations for the two cities, the authors estimated price-dependent specifications with price specified as a function of current and lagged values of California-Arizona navel quantities and Florida oranges, current values of quantities of substitute goods (apples and grapefruit), and five monthly binary variables. As with the Powers, et al., study, use of monthly retail price observations yielded few data points for the period of prorate relaxation. In this case, only three data points were available during this period; too few, it is argued here, to allow bonafide conclusions to be drawn.

While econometric results of the Nelson and Robinson study are generally illuminating, two outcomes of the estimation are disconcerting. First, the estimation yields significant coefficients on the variables representing the substitute products, apples and grapefruit. This is contrary to results of most other empirical analyses of the California-Arizona orange industry (see Thor; Rausser; or Prato). Second, as noted by the authors, the predictive power of the models is suspect: graphs provided by the authors indicate that the models overestimate changes in price levels and fail to capture turning points. In spite of these concerns, however, the models correctly indicated that the actual spread between retail and wholesale prices shrank as quantities shipped increased during the approximately ten week period of prorate relaxation. As a result, the authors concluded that "there is no indication that 'middlemen' were able to maintain retail prices at high levels while depressing shipping point prices as shipments rose" (p. 508).

4.5. Summary

Although the conclusions of the two studies mentioned above are limited by the quality of their retail data, it is interesting to note that both support the notion that market efficiency appears not to have been diminished by the removal or relaxation of market controls. This result naturally leads to questions concerning the present-day effectiveness and necessity of the controls. For example, are grower as well as consumer interests still served by volume regulation? Would fruit, nut, and vegetable markets function as well or better without the control? To begin to answer these questions, more detailed analysis of the retail level impacts of market control is necessary. The next chapter will formulate a framework in which to address this concern.

CHAPTER FIVE

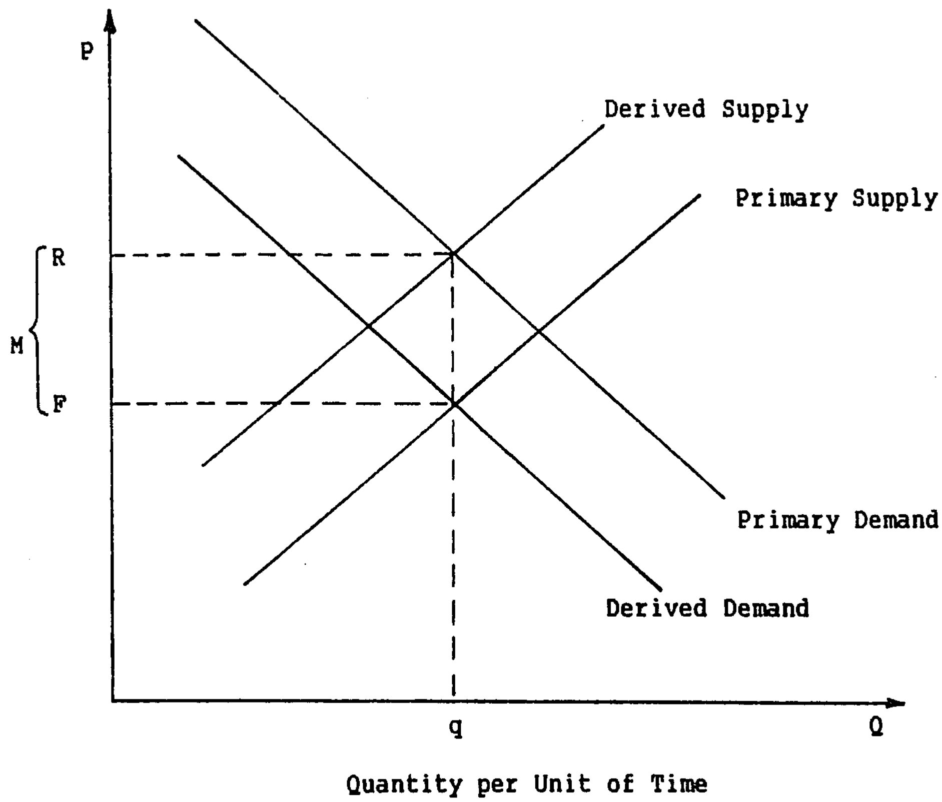
ECONOMETRIC MODELS OF MARKET MARGINS

The previous three chapters have described the economic and institutional environment of the California-Arizona navel industry and issues related to the prorate suspension. This chapter will develop the economic relationships necessary to specify econometric models of market margin behavior in the navel industry. The models are based on economic theory, industry observation, and interviews with industry members. The objective is to specify a model which most accurately depicts the behavior of the market, while minimizing any complicating irrelevancies. Assumptions are made to maintain model simplicity and to accomodate the nature and availability of the data.

5.1. Theoretical Determinants of Marketing Margins

Marketing margins may be defined as either: (1), the difference between the price paid by consumers and that obtained by producers; or (2), the price of a collection of marketing services which is an outcome of the supply and demand for those services (Tomek and Robinson). Given the first definition, the margin is simply the difference between two market-clearing prices corresponding to the intersection of the primary demand and derived supply curves (at the retail level) and the intersection of the derived demand and primary supply curves (at the shipping point level) (see Fig. 5.1.). The distance between these two prices represents the cost of marketing the product. Thus, a food item at the retail level consists of two components: the farm product and the marketing services.

Changes in the margin for a retail product depend on the relationship between the quantity supplied of the product at the farm level and the supply of marketing services. If the marketing services supply function has a positive slope (i.e., larger quantities of services demanded call forth higher prices for marketing services), an increase in farm



R = Retail Price F = Farm Price M = Margin

FIGURE 5.1.: ILLUSTRATION OF MARKETING MARGINS

From Tomek and Robinson, p. 121.

quantities marketed will increase the margin. In some cases, the supply function may be perfectly elastic or even negatively sloped. In the latter case, economies of scale may exist in the production of marketing services so that increased quantities of farm products lead to decreased margins.

The second definition of a margin states that they are determined by the prices of the collection of marketing services necessary to convey the product from farmgate to retail market. These services may include packing, transportation, and retailing. The prices of the individual services are functions of the supply and demand conditions in their respective markets. Changes in the prices of these inputs produces a change in the margin for the food product. For example, increased transportation costs, ceteris paribus, would lead to increased margins.

Shortrun changes in the margin tend to affect farm and wholesale level prices more directly than retail prices. In particular, it has been claimed that retail prices are "sticky" with respect to changes in marketing costs, that is they respond more quickly to rising farm prices than to falling prices. Reasons for this stickiness may be time lags in the marketing channel which delay price signal transmission, costs of repricing items at the retail level, retailer desire to minimize adverse consumer reaction to price changes, or market imperfections such as market power. Marketing firms which have market power may not pass cost decreases on to consumers as readily as price increases.

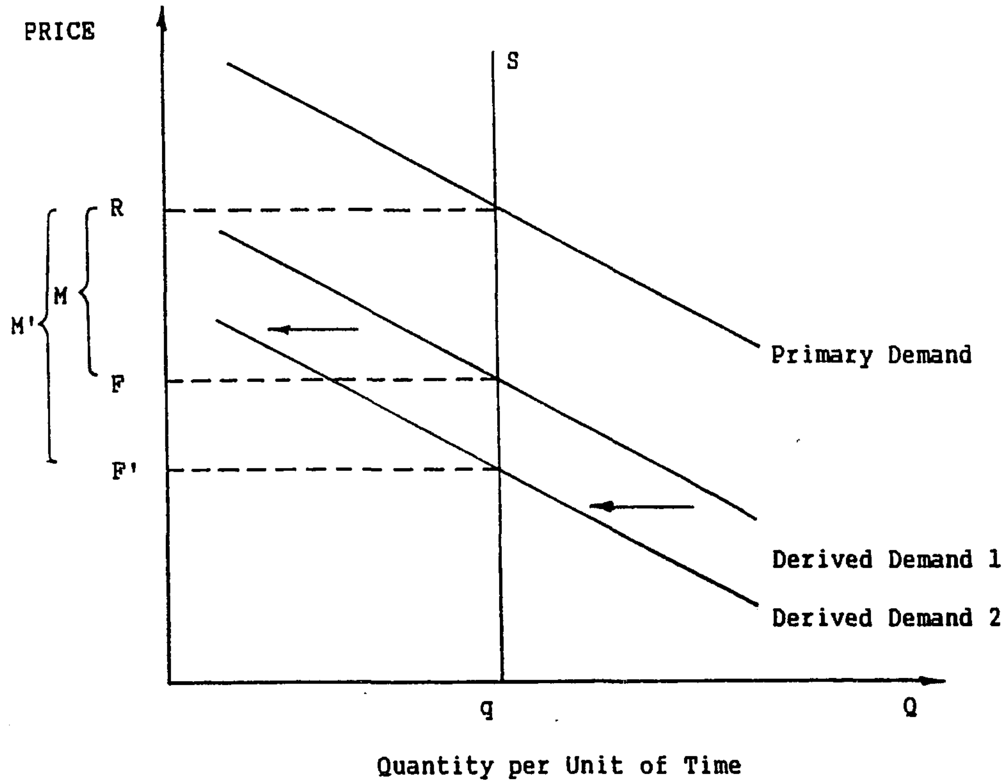
5.2. Previous Margin Studies

Early research on margins for agricultural products was performed by Buse and Brandow (1960). Using annual and quarterly data, OLS regression was performed on equations for twenty individual commodities, including oranges. The model specification contained both quantity and retail price as independent variables explaining farm-to-retail margins.

Two comments made by the authors regarding variable selection are worth repeating here. First, the percentage coefficients on the price and quantity variables are estimates of the unit impact of the independent variable on the dependent variable, ceteris paribus. Since a change in quantity yields a change in retail price, including both in the same equation complicates the interpretation of their coefficients. According to the authors, the two variables are included in the model in order to "free other coefficients of influences arising from the correlation of volume or price with the other variables" (p. 366).

Because of the price-quantity relationship, Buse and Brandow estimated the equations with price and quantity included and then alternatively with price omitted and then quantity. The restricted estimations provided estimates of the margin-on-volume and margin-on-price elasticities. Results were not invariant with respect to the specification chosen but were more consistent for the restricted equations. In most cases, the margin-on-volume elasticity was negative when significant and the margin-on-price elasticity was positive.

The second comment made by the authors concerns the causality of the dependent variable and the retail price variable. The model formulation implies that retail price is uninfluenced by margin. Implicit is the notion that retail price assumes some market-clearing level and that changes in margin (e.g., from a change in marketing input costs) are borne solely by an adjustment in the farm price. This assumption is realistic in cases in which supply is perfectly inelastic (see Fig. 5.2.). In this event, farm price simply becomes a residual after subtracting the margin from retail price. When farm price is a residual, changes in the margin for reasons other than a change in the retail price will not affect retail price. Hence, the authors argue that causality between margin and retail price is unidirectional from price to margin, in the presence of predetermined quantities.



R = Retail Price   F = Farm Price   M = Margin

FIGURE 5.2.: MARGINS WITH PERFECTLY INELASTIC SUPPLY CURVE

From Tomek and Robinson, p. 132.

Perfectly inelastic supply curves may or may not be a realistic modeling assumption, depending on the commodity. For perennial crops which are marketed under a marketing order (such as citrus), the notion of predetermined supplies seems plausible. In the navel industry, for example, weekly sales to the fresh market are constrained by the prorate quantities. Although prorate allotments may be overshipped or amended upward (but not downward), the degree of adjustment is limited by the committee. In any given week then, supply is essentially predetermined by the committee. In the absence of prorate, there is no administrative constraint on volume shipped. Technical constraints such as product quality and weather, however, continue to limit the extent to which supply may adjust. Hence, it is argued that shortrun supply conditions in the navel industry approximate those necessary for the assumption of an inelastic supply curve.

Subsequent research concerning margins was conducted by Waugh (1964). Waugh suggested that consumer demand (primary demand) is the controlling factor in the relationship between farm and retail prices. He proposed that food prices are determined at the primary level and that farm price is simply the retail price minus the costs of marketing inputs (p. 20). Waugh then assumed that spreads are a combination of absolute and percentage markups at the retail level over the farm price. This implied a margin specification which relates the retail-f.o.b. spread to retail prices and input costs.

Waugh's empirical analysis of seven agricultural commodities illuminated several interesting relationships between farm and retail prices for the fresh fruit and vegetable commodities analyzed. First, price flexibilities at the farm level were shown to be greater than price flexibilities at the retail level. This implied that a constant percentage markup between the farmgate and the retail level is not the case, since such a relationship would necessitate equal price flexibilities at both levels. Second, OLS regressions tended to yield intercept terms which were not significantly different from zero, reinforcing the applicability of a constant absolute markup. Third, there existed in all cases except one an inverse relationship between margin and quantity marketed.

Gardner (1975) proposed a structural model to explain margin behavior. Using static equations representing supply and demand in the primary, derived and input markets, Gardner demonstrated how the farm-retail spread is affected by shifts in the determinants of both the supply and demand for food. Two implications resulting from the Gardner analysis are that the margin must change whenever demand or supply shifts and that it will change in different ways depending on from which side the price movements originate. Thus margin analysis, concludes Gardner, must consider both supply and demand conditions.

The mathematical analysis used by Gardner served to illustrate the important role which elasticities play in determining margins. For example, if the own-price elasticity of the marketing inputs is greater than or equal to zero, increases in farm output will increase the price of marketing inputs, thus increasing the margin. Equally important is the elasticity of substitution between marketing inputs and farm product. When this elasticity is large (small), changes in farm supply have relatively smaller (larger) effects on the margin. As the elasticity approaches zero, then, the margin effects become more volatile. For most agricultural products, it is believed that this elasticity is relatively small.

Heien (1977) considered a price determination model in which agricultural product supply and prices are determined by retail demand. Using annual data for beef and pork, Heien demonstrated the impact of changes in marketing input costs and farm quantities on the farmer share of retail value. He concluded that "increases in marketing costs...will lower the farmer share [of retail value] while decreases in farm level output will increase it" (p. 128). The Heien notion of farm price adjusting to changes in the determinants of margins is similar to the Buse and Brandow model. In both these models, supply is assumed to be perfectly inelastic, retail demand drives retail price to a marketing-clearing level, and farm price is the residual which adjusts to changes in the margin.

Heien (1980) extended the Gardner analysis by incorporating a dynamic adjustment framework into the static model. Heien reasoned that while a static model is useful for longrun analysis when changes in inventories are relatively small compared to changes in demand, a dynamic approach is necessary to examine shortrun markup behavior. Thus, because shortrun supply and demand for agricultural commodities is often in imbalance, Heien specified a series of price adjustment relationships to reflect the existence of inventories.

The motivating theory behind the dynamic Heien model is that "store managers apply a markup over costs for each product in order to arrive at price" (p. 11). Retail price changes are seen as a function of price changes at lower levels in the marketing channel (p. 16). Empirical tests indicated that for a majority of commodities, Granger causality between wholesale and retail prices was unidirectionally upward. Hence, the markup hypothesis was largely substantiated in this case.

Wohlgenant and Mullen (1987) specified and estimated three separate models for margin behavior in the beef industry. The three specifications are reduced form, seeking to define the linkage between farm and retail prices. The models may be seen as representing the culmination of previous research on margins. They are identified by Wohlgenant and Mullen (WM) as the Markup model, the Relative price spread model, and the Real price spread model.

The Markup model (MU) defines the margin as a function of marketing input costs (wage rates for beef processors) and retail prices. It may be expressed as

$$M = f(RP, IC)$$

where M is the retail-farm margin, RP is retail price, and IC represents relevant input costs. This formulation follows the research developed by Waugh and Heien (1980). As noted by WM, Gardner pointed out that margin behavior may be due to changes in supply and demand conditions. Hence, a model which does not explicity incorporate supply conditions (e.g., contain a quantity variable) may not accurately describe margin behavior.

The Relative model (RM) is derived from Heien's previously described farm-retail price ratio model and the Gardner analysis. In the WM specification, this model defines margin as a function of retail price, quantity, and wage rates. It may be expressed as

$$M = f(RP, RP*Q, IC)$$

where the variables are defined as before and RP*Q is an interaction term between retail price and the total quantity marketed. With the inclusion of the quantity variable, the relative model explicitly captures both supply and demand conditions. The model is specified without a constant term because the price spread equation is homogeneous of degree one in input and output prices.

The third WM specification, the Real model (R), derives from the second definition of a margin, that is, as being composed of a "bundle of marketing services." In this case, it is hypothesized that marketing service firms provide services until the marginal cost of the service is equal to the marginal revenue. Marketing service costs, then, are determined solely by the quantity of farm output and the firm's cost function. Therefore, the specification includes only a quantity and a wage rate variable. It may be expressed as

$$M = f\,(Q, IC)\,.$$

This specification corresponds to the Buse and Brandow model after the omission of the retail price variable.

5.3. Econometric Specifications

Following the documented chronological development of previous margin models, four empirical model specifications will be estimated. These four models are the three found in WM and the Buse and Brandow (BB) model. The WM models were chosen because they represent a culmination of previous theoretical work on margin analysis. The BB model was added in order to compare the linear quantity term in that specification with the price-quantity interaction term in the WM relative model.

Specification of four separate models rather than a single model reflects the absence of any strong a priori theoretical basis for selecting among the alternative models. For example, the shortrun nature of the time series considered for this study may favor the application of the Markup model, since one would expect relatively little change in supply conditions over the time period. In contrast, incidence of the prorate suspension may have caused relatively large supply fluctuations so that supply as well as demand conditions are important; hence the applicability of the Relative model. Additionally, there is little reason to suspect that, given the second definition of margins, the resulting specification (the Real model) would be any less plausible than the others. Finally, inclusion of the BB model permits testing of the linear price and quantity terms in this model against the interaction term contained in the WM relative specification. The specification and testing of these four models against one another thus permits a comparison of alternative hypotheses regarding margin behavior.

The purpose of this study is to measure the effect of the prorate suspension on the margins for California-Arizona navel oranges. By quantifying these effects through econometric specification, it may be possible to make inferences about the claims of marketing order proponents and opponents regarding the prorate suspension. For this purpose, then, modifications of the models were performed to address these issues specifically and to exploit the nature of the available data.

The first modification was to specify the models so as to capture the regional impacts of the suspension. Since California-Arizona navels compete for market share in Eastern and mid-Western markets but dominate Western markets, it appeared desirable to assess suspension effects across spatially-separated markets. To incorporate the spatial aspects of the market, the data were collected on a city-by-city basis and the models were estimated using the seemingly unrelated regression (SUR) procedure for a system of equations. This formulation has three benefits: it increases the effective sample size; it permits comparison of margin behavior in markets traditionally reliant on Florida production with that of markets dominated by California-Arizona supplies; and it allows for a comparison of econometric results across different markets. The cities selected for analysis are Atlanta, Dallas, and San Francisco.

The resulting system of market equations was estimated using iterative SUR (SAS Version 5.16). The SUR procedure is appropriate given the satisfaction of the following two criteria: first, the independent variables are not identical in each equation of the model; and second, there exists contemporaneous correlation of error terms across equations. If these two criteria are fulfilled, SUR estimates will be unbiased and more efficient than OLS regression performed equation-by-equation (Kmenta and Gilbert). The first condition is easily satisfied on the basis of model specification and available data. The second condition is an empirical issue for which testing procedures exist. In the case of the prorate suspension, it is hypothesized that given the nature of the data used in this study (i.e., pooled cross-section time series), suspension impacts on margins in one market will be felt contemporaneously in other markets. Thus, error terms across the system of equations will be contemporaneously correlated and SUR is the approriate estimation procedure.

One method available for testing for the applicability of SUR estimation is presented in Breusch and Pagan and summarized in Judge, et al. (p. 476). The Lagrange Multiplier test for diagonality of the variance-covariance matrix involves estimating each of the equations in the SUR system individually by OLS and then testing the following set of hypotheses:

$$H_0: \sigma_{ij} = 0 \text{ ; all } i \neq j.$$

$$H_1: \sigma_{ij} \neq 0 \text{ ; all } i \neq j.$$

where σ_{ij} represents the set of off-diagonal elements in the variance-covariance matrix. Failure to reject the null hypothesis indicates that the off-diagonal elements are not significantly different from zero and that SUR estimation will yield estimates with greater standard errors than OLS estimates (Johnston, p. 338). The test statistic is calculated as follows:

$$LM = T \sum_{i=2}^{M} \sum_{j=1}^{i-1} r_{ij}^2$$

where

$$r_{ij} = \hat{\sigma}_{ij} / \sqrt{\hat{\sigma}_{ii} \hat{\sigma}_{jj}}$$

and $\hat{\sigma}_{ij} = (y_i - X_i b_i)'(y_j - X_j b_j)/T$, where T is the number of observations per equation. The LM statistic has an asymptotic Chi-square distribution with [M(M-1)/2] degrees of freedom where M refers to the number of eqautions in the system. After specifying and estimating the models to be defined in this section, this test was performed on each specification's estimated variance/covariance matrix. Results of the tests are presented in Table 5.3.1. For all four models, the null hypothesis was rejected at the 95% level, indicating the applicability of SUR estimation.

The second modification of the theoretical models is to include a pair of dichotomous variables. The first variable, a dummy for the deregulated period, is intended to isolate the prorate suspension effects on margin from the rest of the time series. The second dummy, for the month of May, was included when observation of

TABLE 5.3.1.: RESULTS OF TESTS FOR DIAGONALITY

Model	Test Statistic
MARKUP	10.94
RELATIVE	9.32
REAL	10.60
BUSE & BRANDOW	9.16

Tabled Chi-square Critical Value, df=3, at 95%: 7.815

data plots indicated erratic price behavior at the end of the navel marketing season. In one market (Atlanta), the f.o.b. price for navels actually exceeded the reported wholesale price. This phenomenon may be due either to reported prices which misrepresent actual prices or to the end-of-season pricing behavior of wholesalers. In the latter case, wholesalers may be forced to price-discount navel inventories at season-end, as the Valencia harvest increases rapidly and exerts downward pressure on navel prices.

The third modification was to replace the wage cost variable used in the WM specifications with a variable representing weekly truck rates for California citrus. This was deemed both necessary and appropriate for two reasons. First, adequate city-by-city data on other marketing inputs such as retail or wholesale wage rates were not available on a weekly basis. Second, unlike beef, fresh oranges are consumed in essentially the same form in which they are produced, implying minimal processing of the product. For this reason, truck rates (representing transportation costs) rather than wage rates are considered to be the primary marketing input for navels.

The four empirical models of margin behavior in the California-Arizona navel industry are specified as follows:

$M_{ti} = a_0 + a_1P_{ti} + a_2TR_{ti} + a_3D1985 + a_4DMAY + a_5TIME + e_{1t}$

(the Markup model);

$M_{ti} = b_1P_{ti} + b_2P_{ti}{*}Q_{ti} + b_3TR_{ti} + b_4D1985 + b_5DMAY + b_6TIME + e_{2t}$

(the Relative model);

$M_{ti} = c_0 + c_1Q_{ti} + c_2TR_{ti} + c_3D1985 + c_4DMAY + c_5TIME + e_{3t}$

(the Real model); and

$M_{ti} = d_0 + d_1P_{ti} + d_2Q_{ti} + d_3TR_{ti} + d_4D1985 + d_5DMAY + d_6TIME + e_{4t}$

(the Buse and Brandow model);

with $e_{mt} \sim N(\underline{0}, \Sigma \otimes I_t)$ where $\Sigma = \{\sigma_{ij}\}$ and $E[e_i e_j] = \sigma_{ij}$

where the first three specifications are the Wohlgenant and Mullen spread models, and the Buse and Brandow model has been augmented by an input cost variable. The variable descriptions are:

M_{ti} = the f.o.b.-to-retail margin for week t in city i in dollars per pound for fresh navel oranges.

P_{ti} = price at which oranges are purchased by consumers in week t in city i in dollars per pound.

Q_{ti} = quantity of unloads of navels for week t in city i in 10,000 pound units.

TR_{ti} = average truck rates for citrus shipped from Central California in week t to city i in dollars per 40,000 pound unit.

D1985 = (0,1) binary variable for the prorate suspension months of February, March, April, and May of 1985 with

$$D1985 = \begin{cases} 1, & \text{if month equals Feb, Mar, Apr, May, 1985.} \\ 0, & \text{otherwise.} \end{cases}$$

DMAY = (0,1) binary variable for the month of May with

$$DMAY = \begin{cases} 1, & \text{if month equal to May.} \\ 0, & \text{otherwise.} \end{cases}$$

TIME = a trend variable to capture growth which is not seasonal in nature.

5.4. Data and Variables Generated

This section explains how the quantitative variables used in the models were calculated from the data.

M_{ti}, the margin, was calculated as the difference between the California-Arizona f.o.b. price per pound and the retail price per pound for fresh navel oranges. The f.o.b. prices were collected from the Western Citrus Summary. F.o.b. prices from the Summary were used rather than weekly prices reported by NOAC for the reason that

NOAC reports a single aggregate quoted price rather than actual selling prices (ERS, p. 9). Thus NOAC prices may misrepresent actual selling prices. Retail prices were collected by a weekly survey of in-store prices in major metropolitan retail grocery stores. The margin may be expressed as:

(1) $M_{ti} = Pr_{ti} - Pf_{ti}$

where

M_{ti} = the retail-f.o.b. margin for week t in city i in dollars per pound.

Pr_{ti} = retail price of fresh navel oranges for week t in city i in dollars per pound.

Pf_{ti} = shipping point (f.o.b.) price of fresh navel oranges in week t for city i in dollars per pound.

and

(2) $Pr_{ti} = (\sum_{j=1}^{m} Pr_{tji} / N)$ j=sizes of oranges recorded for week t in city i.

(3) $Pf_{ti} = \{\sum_{j=1}^{m} Pfob_{tj} * (PERSIZE_j / PERCITY_i)\}$

with

$PERSIZE_j$ = percentage of size j oranges shipped from California-Arizona in week t.

$PERCITY_i$ = sum of the percentages of all sizes shipped from California-Arizona for which retail prices were recorded in city i.

and

(4) $Pfob_{tj} = \sum_{d=1}^{3} \{Pfob_{tjd} * (Q_d / \sum_{d=1}^{3} Q_d)\}$

(5) $Pfob_{tjd} = \sum_{g=1}^{2} (Pfob_{tjdg} * PER_{tdg})$

with

g = the percentage of grade 1 (first grade) or grade 3 (choice) oranges shipped during week t. Grade percentages used are those found in Table 5.4.

d = percentage of total weekly navel production in Districts 1, 2, or 3.

where

PER_{tdg} = percentage of fresh navels shipped in week t from district d of grade g.

Equation (2) is the simple average of all retail prices for all sizes of oranges which were recorded for week t in city i. Equation (3) calculates a single, weighted, f.o.b. price for week t in city i which reflects the percentage of oranges sold of size j based on the sum of size percentages for which retail prices were recorded in city i. Equation (4) calculates an f.o.b. price weighted by the quantity shipped from each production district (District 4 is neglected because of its relatively small volume). Equation (4) incorporates the district-price differential. Equation (5) calculates an f.o.b. price weighted by grade, incorporating the grade-price differential.

It may be argued that retail prices for different qualities (i.e., sizes) should not be aggregated but analyzed as separate products. Rausser, however, notes that at the f.o.b. level, prices for different size oranges move together, suggesting that "aggregated relationships for a particular variety across size groupings will not involve a great deal of bias" (p. 201). This implies that failure to account for size differences at the retail level does not represent a significant omission in the analysis.

The method of spread calculation expressed in equations (3), (4), and (5), i.e., computing the spread only on the basis of f.o.b. prices for sizes for which retail prices were recorded in any given week, ensures that the values obtained for M_{ti} reflect only relevant f.o.b. prices. Since in most weeks retail prices were recorded only for a subset of the total number of sizes of oranges shipped from California-Arizona, it would be inaccurate to calculate the spread based on an average f.o.b price computed from prices representing all possible sizes. Incorporation of grade-price and district-price differentials in the retail price calculation would also have been desirable. But as data on

TABLE 5.4.: GRADES: SEASON AVERAGES

Season	Percentage First Grade	Percentage Choice	Percentage Other
1984/85	67	30	3
1985/86	60.8	36.4	2.8
1986/87	68.7	26.5	4.8

Source: Interviews with Sunkist Growers, Inc.

grade and district of origin are unavailable at the wholesale or retail levels, they could not be included in calculation of the retail price.

Note that the independent variable, P_{ti} (price at which oranges are purchased by consumers), is not the retail price which is used to calculate the spread. Instead, P_{ti} is computed as

$$P_{ti} = \sum_{j=1}^{m} \{Pr_{tij} * (n_r/N) + AP_{ti} * (n_a/N)\}$$

with

P_{ti}	=	Average weekly price to consumers in dollars per pound.
Pr_{tij}	=	in-store price collected for week t, city i, size j in dollars per pound.
AP_{ti}	=	advertised price for week t in city i in dollars per pound.
n_r	=	number of retail price observations in week t, city i.
n_a	=	number of advertised price observations in week t, city i.
N	=	total number of retail and advertised price observations.

where

Pr_{tij} are retail prices collected weekly by Sunkist Growers, Inc., by an in-store audit of major food retailers in each market. Prices were collected and reported by date, store, size, and in some cases, brand and grade. Four supermarkets for each city were audited; and

AP_{ti} are advertised newspaper prices for local markets. The data were collected by means of a comprehensive audit of the major daily metropolitan newspaper in each city. The information collected included date, advertised price, size, and type of orange. Only prices collected for oranges identified as "Navel", "California Navel" or identified as having originated in California were recorded. This was the only form of advertising considered.

As mentioned, advertised prices have been included in the calculation of P_{ti} but not in the calculation of the spread. The rationale for this formulation stems from two considerations: one, advertised prices are an important determinant of the market price at which consumers purchase the commodity; and two, the respective definitions of market margins and advertised price precludes the latters' inclusion in the spread computation.

Advertised prices have been defined as "a temporary low price used to promote the store which is not justifiable in terms of the economics of cost or demand for the individual product" (Leed and German, p. 179). In some cases, advertised prices may be "loss-leaders" or "special prices below procurement costs" (Padberg, p. 136). In both cases, they represent a price which is below the equilibrium retail price. The margin has already been defined as the difference between two market-clearing equilibrium prices: the retail price and the shipping point price. Thus, by including advertised prices in the calculation of the margin, the resulting value will underestimate the spread.

Empirical evidence tends to support the concept of the advertised price as being a discount from an equilbrium retail level. For example, an NCFM study (NCFM Tech. Study No. 4) performed during an eight-week period in 1965 found that for all retail product categories, six out of seven advertised "specials" were true markdowns from the "regular" price (p. 174). (Regular price is presumed in this study to be the "equilibrium" price.) More recent evidence indicates that about three out of every four advertised prices for fruits and vegetables represent a reduction from the regular price (Mason and Wilkinson). This same study reported that the average markdown on fresh fruit and vegetables across all classifications of retail food outlets was approximately 30%. For the navel orange prices used in this study, data plots showed a consistent tendency for the average advertised price level to fall below the average retail price level in all cities considered for analysis (Figs. 5.3.1.-5.3.3.). Hence, it can be argued that advertised

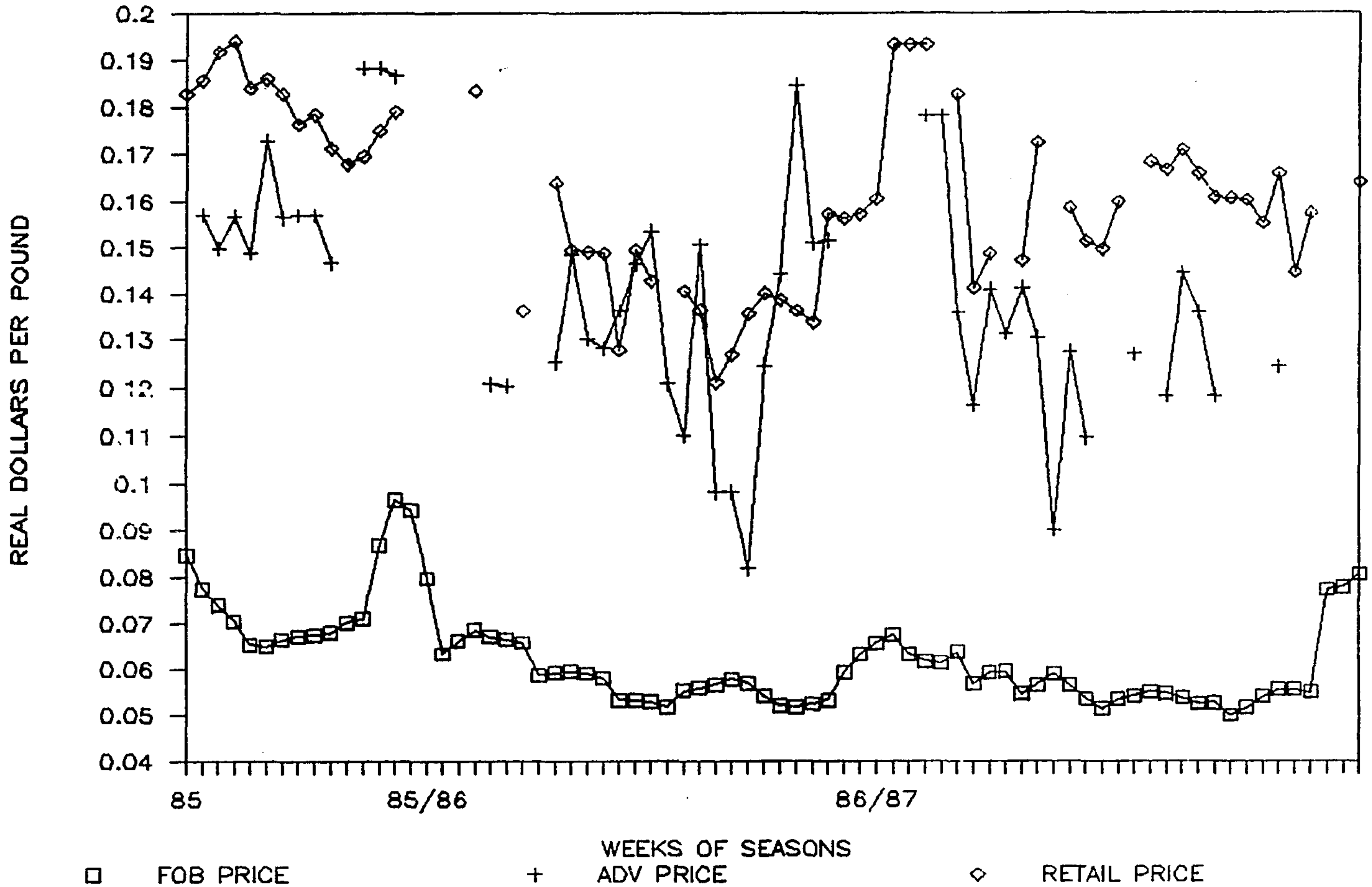


FIGURE 5.3.1.: ATLANTA

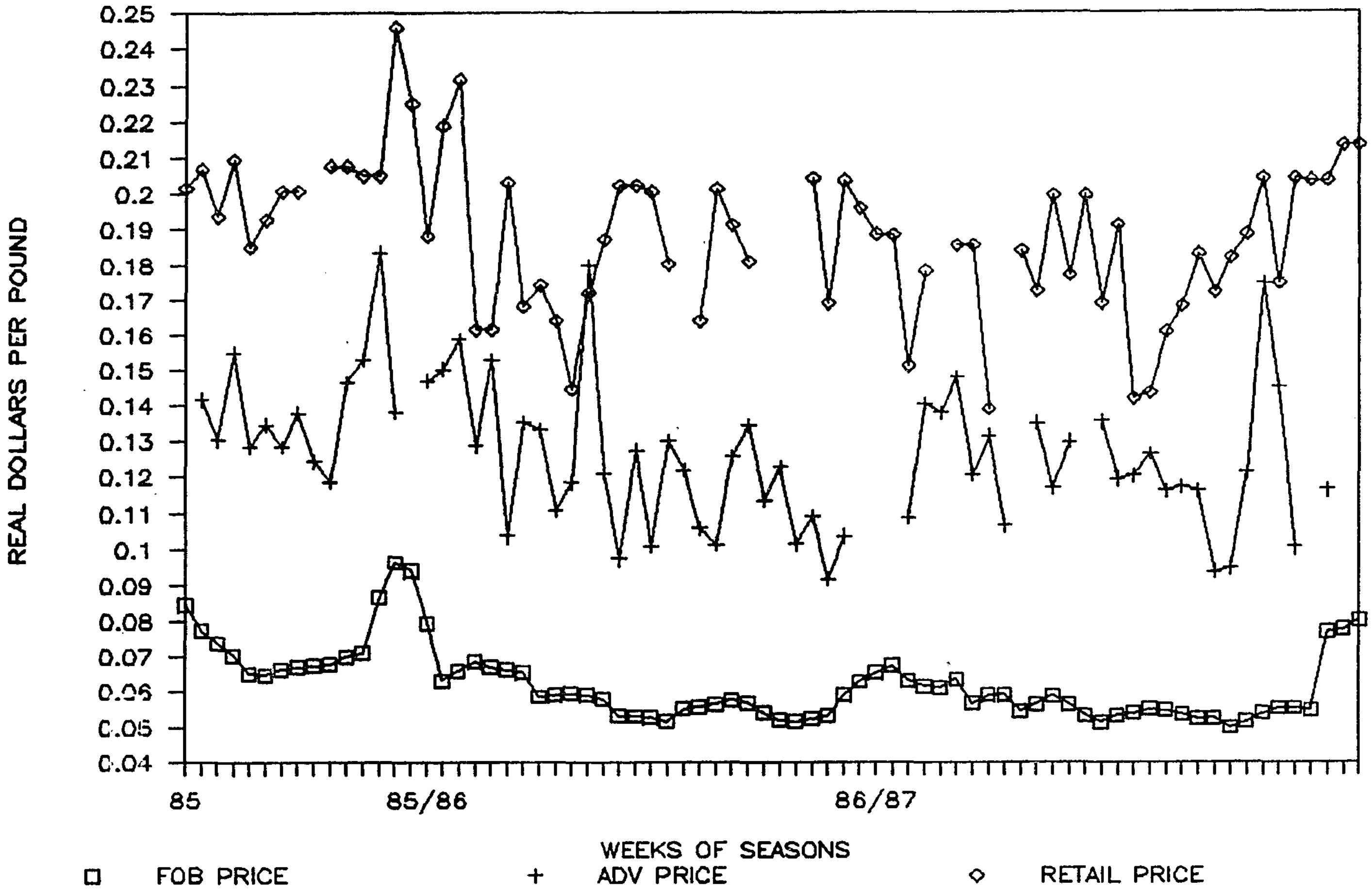


FIGURE 5.3.2.: DALLAS

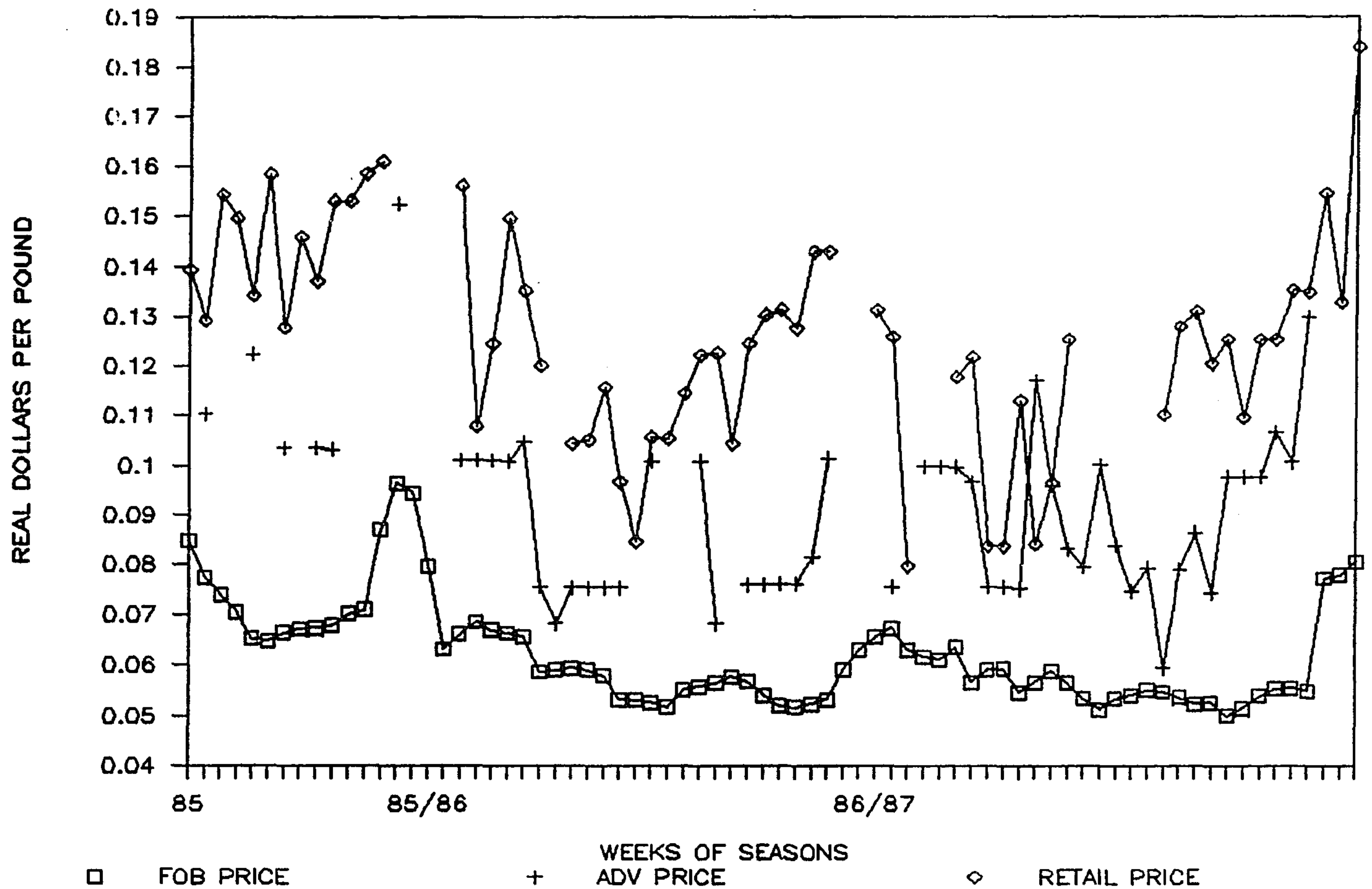


FIGURE 5.3.3.: SAN FRANCISCO

prices represent clear departures from the equilibrium retail level and therefore should not be included in margin calculation.

Also at issue is whether locally-advertised newspaper prices are significant factors in the purchase decisions of consumers. If they are not, then perhaps they are superfluous to the model and should not be included in the specification. Studies, however, suggest that they are important sources of consumer price information. For example, 63% of all retail grocery advertising is done in newspapers (Gold, et al.). A USDA study found that 73% of all consumers read newspaper ads prior to going shopping (Gallo and Boehm, p 16). Of the $600 million retail grocers spent on newspaper advertising in 1978, 10% was devoted to fresh produce (ibid.). Other researchers as well have recognized the importance of newspaper advertising in specifying retail demand functions (Funk, et al.). Thus, modelling a market-level price which reflects all possible prices at which consumers are offered the opportunity to purchase a commodity requires the inclusion of advertised prices.

The final quantitative variable in the margin specifications, TR_{ti}, represents the weekly average truck rates for citrus shipped from Central California in week t to city i. Rates were obtained from the Fruit and Vegetable Truck Rate and Cost Summary for various years. Since rates are not quoted for San Francisco, a proxy variable was calculated by multiplying the mileage from Los Angeles to San Francisco by the average cost per mile for owner-operator trucks during the relevant month. While not ideal, it is assumed that this formulation captures most of the variation in rates which would exist between these two relatively proximate markets.

5.5. Summary

A review of the previous research on marketing margins was performed in this chapter. Four econometric models of the farm-to-retail margin for California-Arizona navels were specified. In addition to the D1985 and DMAY dummies, the time trend, and the input cost variable, the Relative and Buse and Brandow models contain variables representing price and quantity, the Markup model includes only a price variable, and the Real model contains only a quantity variable. The four models represent a summary of the different theories of marketing margins which have been proposed by previous researchers.

CHAPTER SIX
STATISTICAL RESULTS

This chapter describes the data, reports results of the estimation, and describes tests used to determine if there exists a "preferable" model among the four models chosen to represent margin behavior.

6.1. Nature of the data

The four models proposed in Chapter Five were estimated for three U. S. cities: Atlanta, Dallas, and San Francisco. These three markets were selected for their proximity to the other major fresh orange production regions in the U.S., their location relative to the California-Arizona production districts, and the nature of retail navel prices in each market. San Francisco is generally a low-priced retail market, Atlanta is a medium-priced market, and Dallas (during the period studied) is a high-priced market. Weekly observations on prices, margins, quantities, and truck rates were used. All prices were deflated by the CPI-U as is appropriate when specifying margins (Foote). The time period considered is February 2, 1985, to May 16, 1985; November 1, 1985, to May 9, 1986; and October 31, 1986, to May 29, 1987. The first period covers the portion of the 1984/85 season when the prorate was suspended; the second and third periods cover the two navel marketing seasons following the season of the suspension. The time series is limited to these periods by the availability of the retail price data and quantity information. The analysis focuses only on the retail-f.o.b. margin spread, neglecting the wholesale sector. This is because most of the large supermarkets included in the retail price survey purchase citrus directly from the packinghouse.

To enable meaningful comparisons of regression results across markets and models, estimation was performed on an identical subset of observations across all markets and models. Since some cases included missing retail price observations for one or more of the markets, certain weeks had to be omitted from the analysis. Hence, the final data set does not represent a continuous time series of every week in each of the seasons. This is believed to pose no limitation on the analysis, however, since a majority of observations remain and subsets of up to ten continuous observations are retained.

Estimating the models with weekly observations represents an improvement over previous studies which have considered margin behavior during the periods of prorate relaxation and suspension. Whereas the monthly observations used in those analyses necessarily included a built-in lag between the initiation of the suspension/relaxation and the first observation, weekly observations are able to capture the full retail price variability essentially from the moment of the suspension.

6.2. Estimation Results

Estimation of the four models was performed using Zellner's iterative Aitken Estimator (IZEF), an extension of Zellner's two-stage Aitken Estimator (ZEF). ZEF has been shown to be asymptotically efficient, to have an asymptotically normal distribution and to be more efficient than OLS estimators when correlation across error terms is high and/or sample size is large (Zellner, p. 353). IZEF extends ZEF in that estimates produced by ZEF may be used to calculate a new set of residuals leading to a new estimate of the variance/covariance matrix which can then be employed to obtain new estimates for the independent variable coefficients. IZEF has been shown to be computationally equivalent to maximum likelihood estimators by Kmenta and Gilbert (p. 1191) which are themselves consistent and asymptotically efficient (Kmenta, p. 181).

The results of the empirical estimation of each of the four models are reported in Tables 6.2.1-6.2.5. Each model was estimated with a convergence criterion of 1E-08 for

TABLE 6.2.1.: ESTIMATION RESULTS MARKUP MODEL

Dependent Variable	Independent Variables							
	Constant	P	TR	D1985	DMAY	TIME	R2	DW
MAT	-0.0	0.99	-5.52E-05	-0.012	-0.024	0.0001	0.74	1.41
	[-1.14]	[11.96]	[-1.58]	[-2.02]	[-4.47]	[1.39]		
MDL	0.07	0.553	-1.62E-04	0.008	-0.022	0.0004	0.43	1.58
	[1.19]	[4.31]	[-1.37]	[.81]	[-2.14]	[2.39]		
MSF	-0.1	1.05	0.006	-0.012	-0.031	0.0003	0.74	1.49
	[-1.75]	[12.94]	[1.01]	[-1.74]	[-4.78]	[1.96]		

N = 42 T-stats in parentheses

Explanation of Variables in Tables:

MAT = F.o.b.-Retail Margin Atlanta ($/lb.)

MDL = F.o.b.-Retail Margin Dallas ($/lb.)

MSF = F.o.b.-Retail Margin San Francisco ($/lb.)

P×Q = Market price fresh oranges (P) times Quantity unloads (Q).

P = Market price of fresh oranges ($/lb.).

TR = Average Truck Rate per 40,000 lb. load (in dollars per load).

D1985= (0,1) Binary Variable for prorate suspensio period. D1985=1 if susupension in effect; 0, otherwise.

DMAY = (0,1) Binary Variable for May. DMAY=1, if month equal to May; 0, otherwise.

Q = Quantity of unloads (10,000 lb. units).

TABLE 6.2.2.: ESTIMATION RESULTS RELATIVE MODEL WITHOUT INTERCEPT

Dependent Variable	Independent Variables							
	P	P*Q	TR	D1985	DMAY	TIME	R2	DW
MAT	0.917	0.0002	-8.23E-05	-0.014	-0.022	0.0001	NA	1.43
	[10.68]	[.38]	[-4.30]	[-2.12]	[-4.66]	[1.30]		
MDL	0.587	-6.83E-04	-2.46E-05	0.013	-0.026	0.0005	NA	1.41
	[4.98]	[-1.65]	[.53]	[1.19]	[-2.50]	[2.78]		
MSF	0.973	0.0003	-4.48E-04	-0.015	-0.029	0.0001	NA	1.30
	[10.17]	[1.50]	[-5.91]	[-2.14]	[-4.52]	[1.00]		

N = 42 See Table 6.2.1. for Variable Explanation

TABLE 6.2.3.: ESTIMATION RESULTS RELATIVE MODEL WITH INTERCEPT

Dependent Variable	Independent Variables: Constant	P	P*Q	TR	D1985	DMAY	TIME	R2	DW
MAT	-0.02	0.945	0.0003	-5.82E-05	-0.012	-0.024	0.0001	0.76	1.47
	[-.81]	[10.60]	[.37]	[-1.59]	[-1.76]	[-4.41]	[1.36]		
MDL	0.049	0.558	-3.79E-04	-1.15E-04	0.0107	-0.023	0.0005	0.4	1.47
	[.81]	[4.42]	[-.82]	[-.99]	[.99]	[-2.12]	[2.44]		
MSF	-0.13	0.964	0.0003	0.0004	-0.013	-0.03	0.0003	0.75	1.42
	[-1.25]	[9.70]	[1.42]	[.59]	[-1.95]	[-4.63]	[1.57]		

N = 42

See Table 6.2.1. for Variable Explanation

TABLE 6.2.4.: ESTIMATION RESULTS REAL MODEL

Dependent Variable	Independent Variables: Constant	Q	TR	D1985	DMAY	TIME	R2	DW
MAT	0.066	4.96E-05	-7.77E-06	0.022	-0.027	0.0004	0.27	1.44
	[1.41]	[.23]	[-.12]	[2.26]	[-2.92]	[2.37]		
MDL	0.207	2.22E-05	-2.83E-04	0.019	-0.003	0.0006	0.28	1.57
	[2.68]	[.23]	[-1.86]	[1.70]	[-.28]	[2.91]		
MSF	-0.23	9.17E-05	0.0015	0.027	0.006	0.0006	0.41	1.87
	[-1.12]	[1.91]	[1.15]	[2.77]	[.71]	[2.23]		

N = 42

See Table 6.2.1. for Variable Explanation

TABLE 6.2.5.: ESTIMATION RESULTS BUSE AND BRANDOW MODEL

Dependent Variable	Independent Variables								
	Constant	P	Q	TR	D1985	DMAY	TIME	R2	DW
MAT	-0.022	0.947	5.13E-05	-5.86E-05	-0.012	-0.024	0.0001	0.75	1.47
	[-.82]	[10.40]	[.41]	[-1.60]	[-1.78]	[-4.42]	[1.38]		
MDL	0.057	0.536	-6.37E-05	-1.22E-04	0.01	-0.023	0.0005	0.4	1.48
	[.95]	[4.19]	[-.79]	[-1.05]	[.97]	[-2.13]	[2.42]		
MSF	-0.142	1.013	4.00E-05	0.0004	-0.013	-0.029	0.0003	0.75	1.41
	[-1.34]	[12.27]	[1.59]	[.61]	[-1.91]	[-4.59]	[1.61]		

N = 42

See Table 6.2.1. for Variable Explanation

the variance/covariance matrix. All models converged successfully. The Relative model is estimated both with and without an intercept term. As indicated in Table 6.2.3., estimation with an intercept yielded constant terms not significantly different from zero. This echoes the results of Wohlgenant and Mullen and lends support to their homogeneous relative model formulation.

In all cases except one, the Durbin-Watson statistic (DW) testing for the presence of first-order autocorrelation in the disturbance terms in individual equations yielded values falling in the inconclusive region. Utilizing lower bounds for the statistic proposed by King (1981b) for regressions without an intercept term and for regressions containing linear trend variables (1981a), only the DW value for the MSF equation in the Real model (Table 6.2.4.) indicated rejection of the null hypothesis of the existence of autocorrelation. Based on the inconclusiveness of these test results, no correction was performed. Thus subsequent discussion of empirical results carries the caveat of potential estimation problems associated with the possible existence of autocorrelated error terms.

The coefficients of multiple determination (R^2) for each of the equations are generally modest, especially so in the case of the MDL equation. The low R^2's are most likely symptomatic of the shortrun, disaggregated, cross-sectional nature of the analysis. Indeed, the R^2 values reported here are consistent with those found in much of the empirical research concerning shortrun demand relationships at the retail level (see, for example, Marion and Walker or Funk, et al.). Limitations on the availablity of data for estimating retail relationships generally precludes inclusion of all relevant quantitative variables in the models. This has compromised the ability of the retail demand models to capture all elements which contribute to variation in the shortrun. Therefore it is no surprise that margin models which consider the retail sector suffer the same consequences.

The especially low R^2 for the MDL equations relative to the others, however, suggests a more severe inability of the specifications to capture significant market elements. This situation likely arises from the chaotic condition of the Dallas retail navel market during the period of observation. As mentioned, the freezes of 1983 and 1985 destroyed the entire Texas citrus crop, resulting in no commercial fresh orange shipments for the 1985 season. Texas shipments increased only marginally in subsequent seasons. As a result, the Dallas market, which had historically relied on Texas production to supply 25 to 50% of their fresh winter orange demand, now came to rely on California-Arizona production for 100% of their supplies (see Tables 2.4.1. and 2.4.2.). This instantaneous shift to total dependence on California-Arizona navels must have affected the behavior and expectations of Dallas navel market participants. The dramatic transfer of supply dependence most likely introduced substantial uncertainty in the market which could not be captured by the model specifications.

The degree of adjustment necessary in the Dallas market was not evident in the Atlanta and San Francisco markets. Again referring to Tables 2.4.1. and 2.4.2., it is clear that in Atlanta, for example, substantial quantities of fresh Florida oranges were arriving despite the announced embargo on shipments from that state. Indeed, California-Arizona market share exceeds the historic average in Atlanta for only two months during the four-month prorate suspension. In San Francisco, California-Arizona navel producers continued to supply 100% of the fresh winter market as had been the case historically. Hence, whereas supply conditions during 1985 were significantly altered for Dallas, only marginal adjustments were necessary in Atlanta and essentially no change whatsoever occurred in San Francisco. The extent to which these three markets reacted to varying supply conditions could serve to explain the poor fit exhibited by the MDL equations, relative to the other markets.

The remaining discussion of the empirical estimation results will concentrate on the performance of the four models and the variables contained in each of the models. Rather than attempt a parameter-by-parameter analysis, discussion will focus first on the performance of the variables across models and then on general relationships existing across the models and across equations within specific models. The variable results are discussed below:

DMAY

As expected, DMAY, the binary variable representing margin behavior during the month of May, is generally significant and carries a negative sign. The implication is that at season-end, the retail-f.o.b. margin contracts by up to three cents per pound. This shrinkage may be due to a variety of simultaneous developments in the navel orange market occurring at this time. First, as navel quantities decrease, there is historically a substantial increase in navel f.o.b. prices. Second, with a reduction in navel quantities, costs associated with marketing services for the commodity fall as well (assuming a positively-sloped marketing services supply curve). Third, as navel quality deteriorates at season-end, Valencia supplies begin to increase rapidly, and Florida supplies remain strong, retail navel prices experience downward pressures. All of these factors would contribute to narrowing margins during the month of May. Noting the relative magnitudes of the DMAY coefficients, the estimates for San Francisco have the greatest value in all four of the models. This may reflect the relative proximity of San Francisco to the California-Arizona production districts and suggests a geographically-related sensitivity in the San Francisco retail navel market to changes in the supply conditions of navels as well as substitute products (e.g., Valencias).

TIME

The linear trend variable, TIME, is uniformly positive across all models and markets, but of mixed significance. Only for the Dallas market is the variable consistently significant across models. This suggests a positive trend of local rather than national origin since a national trend would tend to produce significant estimates of relatively equal magnitude for all markets. One explanation for the significant margin increase over time for the Dallas market may be the asymmetry of retail price movement with respect to f.o.b. price movement. In a recent study of four urban navel orange markets (including Dallas), Karrenbrock, et al., (1988) found evidence that retail navel prices in the Dallas market were substantially more responsive to f.o.b. price increases than to f.o.b. price decreases. In addition, price transmission elasticities estimated for the Dallas market indicated that when f.o.b. prices fell 10%, retail prices actually rose by .5%--certainly a perverse case of retail price stickiness. For the other three markets analyzed in the 1988 study, decreases in f.o.b. prices yielded proportionate decreases in retail prices. Such anomalous and persistent price behavior in Dallas may explain why the trend coefficient is both positive and significant in that market alone.

TR

The relative unimportance of the truck rate variable, TR, was not anticipated. Only three equations contain significant t-statistics on this variable and two of these are reduced to insignificance upon inclusion of the constant term in the relative model. This indicates a clear lack of robustness in the performance of this variable. In addition, on the occasions in which TR is significant, it carries the unexpected sign since we would normally expect a positive relationship between input costs and margins. This lack of importance and inconsistency with theory may be due to the nature of the data utilized. First, the truck rates used in this analysis are averages of reported weekly rate ranges.

This is consistent with the methodology used in other reseach regarding truck rates (see, for example, Beilock and Shonkwiler), but may disguise the often large variability of actual rates within a given week. Second, the rates are quoted not only for citrus but for other commodities as well (vegetables, in this case). Thus the data may contain seasonal trends associated with these other products. Third, the relationship between margins and truck rates may not be contemporaneous as specified in the models, but may instead be a lagged relationship. This would be the case if current period changes in truck rates do not manifest themselves at the retail level until the produce physically arrives in the terminal market. For some markets, this delay could be several days, enough time to require a lagged variable.

Q

In most cases, the variable representing the quantity of navel unloads in the terminal market, Q, is positively related to margin. This concurs with the results of Buse and Brandow's margin specification for oranges and lends support to the notion of a positively-sloped supply curve for marketing services. In only two cases, however, are the coefficients significant: for the MSF equations in the Real model (at about the 95% level) and in the Buse and Brandow model (at about the 85% level). That the variable is consistently insignificant for the more distant markets suggests once again the geographically-related sensitivity of the San Francisco terminal market to quantity-related developments in the California-Arizona production region. As noted, absent the availability of Texas supplies, San Francisco relies completely on California-Arizona production. Impacts on margins related to California-Arizona supply conditions in the other two markets, however, may have been mitigated by the existence of other supply sources (for Dallas, Mexico; for Atlanta, Florida). Taken as a whole, the results on this variable are somewhat mixed, but suggest a positive, though limited impact of quantity on margins.

P

As expected, the market price variable, P, is both significant and positive in all equations in which it appears. The magnitude of the parameter estimates and their respective t-statistics are essentially invariant within markets across models. This outcome demonstrates the strength of the results. In all three price-related models, the Atlanta and San Francisco price variables have coefficients approximating one while the Dallas coefficient ranges from .55 to .59. The coefficients for San Francisco and Atlanta indicate that a one cent increase in the market price will yield an approximately equivalent increase in the margin. The results in Atlanta and San Francisco, coupled with the assumption of causality running from retail price to margin (as the models imply), suggest that in the very shortrun, changes in the determinants of primary demand cause market price to change but do not affect farm price. This is because, in the very shortrun, changes in retail level conditions do not have adequate time to filter down to the farm level. This may be contrasted with the Buse and Brandow margin notion that retail price remains unchanged while farm price is the residual which adjusts to changes in economic variables.

The large discrepancy in the magnitude of the market price coefficient in the Dallas market and those of the Atlanta and San Francisco markets is interesting. In Dallas, the coefficients indicate that given a one cent per pound increase in the market price, margin increases by only about a half of a cent per pound. One explanation for this discrepancy relates to local marketing industry reaction to the elimination of Texas citrus supplies. Recall that market price is computed as a weighted average of retail and advertised prices whereas margins are calculated using only retail prices. Assuming shortrun supply inelasticity and a farm price fixed at Pf_0, the per unit response of margin to changes in the market price becomes dependent on the level and frequency of advertised pricing. To see this, consider the margin identity

(1) $$M = Pr - Pf$$

where M = f (P,...) as previously defined and P is a weighted average of Pr and AP, so that

(2) $$P = [Pr(1-x) + AP(x)]$$

and x is a variable representing the level of local market advertising. If (1) is expressed in terms of changes in the variables, so that

(3) $$\Delta M = \Delta Pr - \Delta Pf$$

and Pf is fixed at Pf_0, we can set $\Delta Pf = 0$ in the shortrun and $\Delta M = \Delta Pr$. Additionally, (2) can be expressed in the same manner as

(4) $$\Delta P = [\Delta Pr(1-x) + \Delta AP(x)]$$

so that $\Delta M = \Delta Pr = f(\Delta P)$. Now, consider the regression equation

(5) $$\Delta Pr = a_0 + a_1[\Delta Pr(1-x) + \Delta AP(x)].$$

If we assume a_0 equal to a constant (say, 0), Δ Pr may be expressed as a linear combination of Δ P so that

(6) $$\Delta Pr = a_1[\Delta Pr(1-x) + \Delta AP(x)].$$

Since ΔPr must be equivalent on both sides of the equation, the equality will hold only if adjustments in ΔAP and a_1 are made. If AP is volatile, a_1 must be relatively smaller. If AP is stable, a_1 must necessarily be larger. As x increases (decreases) [i.e., the frequency of advertising increases (decreases)], the magnitudes of ΔAP decrease (increase), and the volatility of AP relative to Pr remains comparatively large. Because in general we suspect that AP is less than Pr, a more volatile AP therefore requires a larger spread between Pr and AP than a stable AP, in order that AP remain less than Pr.

The above relationship is substantiated empirically by analysis of the data used for this study. Table 6.2.6. presents calculations of the mean, variance, and range for advertised prices and the retail-advertised price spread in each market for each season. As indicated, the variance of the Dallas market advertised price is up to five times greater than that of San Francisco and up to four times greater than that of Atlanta. Atlanta has a larger variance than San Francisco in two of the seasons, while the relationship reverses in the final season. The retail-advertised spreads for each of the cities follow essentially the same pattern.

The data in Table 6.2.6. are consistent with the relationships expressed by (6) and the estimated coefficients on the market price variables. Clearly, the more volatile is AP, the smaller the coefficient on P. That Atlanta advertised prices are more variable than San Francisco prices in two out of three seasons, while the reverse is true in the final season, explains the near-equivalence of the coefficients for these two markets. However, because Atlanta's advertised price is more variable overall, there is a slightly larger coefficient for P in San Francisco.

From (6), it is also apparent what the econometric ramifications would be if advertised prices were not included in the computation of P. If we suspect Pf is fixed, then with Pr on both sides of the regression equation $E(Pr_t, e_t)$ cannot be equal to zero and the basic econometric assumption of zero covariance between an independent variable and the error term is violated. Thus for OLS estimation, parameter estimates would be biased.

The foregoing analysis also has implications for the selection of an appropriate margin model. If it is assumed that Pf is fixed in the shortrun, then supply conditions are obviously of little consequence in explaining margin behavior. As a result, a model containing a quantity variable would be misspecified. This conclusion would tend to support the Markup model as the preferred specification. The argument may not extend, however, to models which seek to explain margins with annual, quarterly, or monthly data, since with longer time periods, Pf will be permitted adequate time to react to changing conditions at the retail level and ΔPf in (3) would most likely not be equal to zero.

The above analysis also serves to illuminate some aspects of the retail pricing and advertising behavior of Dallas grocers. As shown in Table 6.2.6., the annual seasonal averages of the retail-advertised price spread in each market indicate that for the three seasons under consideration, the spread in Dallas was between 5 and 7 cents per pound. In San Francisco, the spread was approximately 2.6 to 3.1 cents per pound while in Atlanta, it was 0.4 to 3 cents per pound. Apparently, Dallas retailers were heavily discounting regular navel prices, relative to the other two markets. In addition, Dallas retailers were advertising navels more frequently than in other markets. For example, of the 42 weeks contained in this study, Dallas grocers advertised navels in 36 weeks, San Francisco grocers advertised in 31 weeks and Atlanta grocers in 27 weeks. Clearly, Dallas retailers were using high-profile orange advertising in order to attract consumers.

This emphasis by Dallas retailers on orange advertising and substantial discounts seems counterintuitive, given the elimination of Texas fresh orange supplies. With Dallas dependent on more costly California-Arizona supplies as a result of the Texas freezes, the average per unit price of navels to consumers was higher. Indeed, Dallas

TABLE 6.2.6.: MEANS, VARIANCES, AND RANGES FOR ADVERTISED PRICES AND THE RETAIL-ADVERTISED PRICE SPREAD

	MEAN (in dollars per lb.)			VARIANCE (x 1E-03)			RANGE (in dollars per lb.)		
SEASON:	84/85	85/86	86/87	84/85	85/86	86/87	84/85	85/86	86/87
ADV'D. PRICE PER LB.:									
ATLANTA	.16	.14	.13	.25	.5	.11	.042	.07	.03
DALLAS	.14	.12	.12	.42	.54	.48	.07	.08	.08
SAN FRAN	.11	.09	.09	.08	.18	.28	.19	.03	.07
RETAIL-ADV'D. PRICE SPREAD:									
ATLANTA	.015	.004	.03	.37	.49	.22	.06	.07	.04
DALLAS	.054	.05	.07	.62	1.22	.8	.09	1.12	.10
SAN FRAN	.026	.03	.03	.27	.31	.24	.04	.057	.05

retail prices during the period of analysis were the highest of any market and margins were the largest. Apparently, Dallas retailers responded to the discontinuation of Texas supplies by offering California-Arizona navels as "loss-leaders". Perhaps Dallas grocers were attempting to exploit consumer reaction to high navel prices and a perceived "shortage" of fresh winter navels in order to enhance market share and sales. The loss-leader tactic is not unusual among retail grocery operations. Grocers routinely use loss-leaders to attract customers who then purchase a wide array of items at the regular price (see Preston or Grinnell).

D1985

The dummy variable for the prorate suspension period, D1985, provides direct measurement of the behavior of marketing margins during the period of open movement. Considering first the estimation results of the four models generally, most noticeable is the marked dissimilarity between the results of the three models which contain the market price variable and the Real model. For the Markup, Relative, and Buse and Brandow models, the coefficients on the D1985 variable are uniformly negative when significant, while the coefficients in the Real model are uniformly positive and significant. The exception in the three price-related specifications comes in the Dallas market, where the coefficient is positive, yet insignificant. Although somewhat contradictory at first glance, the results here are encouraging since the relative equivalence of magnitudes on D1985 across models and equations indicates that the variable is capturing general rather than local trends. This suggests that results obtained from the analysis of these three markets may be applicable to other markets as well.

Disregarding the Real model for the moment, the empirical evidence presented by the three price specifications weighs heavily against the grower argument that retail prices did not respond to declining f.o.b. prices during the prorate suspension. In Atlanta and San Francisco, the coefficients indicate that margins narrowed significantly during the suspension, by about 1.2 to 1.5 cents per pound. In Dallas, however, the positive, yet insignificant, coefficient is inconclusive but may imply that margins increased in that market. This abberant result in Dallas could be due to retail price reaction to the elimination of Texas supplies during 1985. In this case, complete reliance on California-Arizona supplies meant higher marketing costs for retailers (e.g., transport costs), higher average per-unit navel prices to consumers, and therefore larger retail-f.o.b. margins. In subsequent seasons, as less costly Texas supplies began to increase and exerted competitive pressure on California-Arizona retail navel prices, margins would tend to decrease. Since the value of the D1985 coeficient is relative to margin values in the following two marketing seasons, this would explain the positive sign for D1985. Given the magnitudes of the D1985 and TIME variables (the D1985 coefficient is 20 times the size of the TIME coefficient), this does not contradict the positive trend in margins reflected by the significant TIME variable.

The implications of the three price-related models are diametrically opposed to the Real model. Notwithstanding the low R^2's, the results of the Real model estimation provide contradictory evidence as to the behavior of margins in 1985, relative to subsequent years. In all three markets, the coefficients are positive and significant, indicating an increase in margins of between 2 and 2.7 cents per pound. This contrary result obviously supports the grower contention that margins increased during the prorate suspension period. Thus the Real model supports the credibility of the grower claim that retailers were able to pocket economic profits at the expense of both growers and consumers.

Considered together, the four models offer conflicting testimony as to the behavior of margins (and retailers) during the prorate suspension. On one side of the issue resides the price-related models offering evidence refuting the grower argument.

On the other side, the Real model supports the grower contention of increasing margins as a result of the lack of market control. Embracing one set of results rather than the other presents the possibility of Type I or Type II error. The costs of committing such errors have very obvious and important policy implications. On the one hand, the three price-related models imply that in the shortrun, marketing order volume controls may be unnecessary as threats to growers and consumers traditionally attributed to an oligopolistic marketing sector apparently failed to materialize. On the other hand, if the results of the Real model are accepted, it is clearly in the best interests of both consumers and growers to continue volume regulation. The next sections of this chapter will describe the attempts to resolve the contradictory implications of the estimation results.

6.3. Hypothesis testing

Evaluation of the merits of the four models can be performed using econometric procedures developed for hypothesis testing. The four specifications considered in this analysis contain both nested and non-nested hypotheses. This section will explain the procedures used to test both types of hypotheses.

6.3.1. Non-nested Testing Procedures

Since the Real, Relative, and Markup specifications are "non-nested", i.e., no single model contains a subset of variables found in another model, the traditional F-test for linear restrictions on a subset of coefficients does not apply for all four models. It has been suggested that one method for imposing linear restrictions on non-nested models is to specify a general (composite) model which contains all the variables. Linear restrictions are then imposed on the general model. This method, however, has numerous theoretical and practical drawbacks which are discussed in Pesaran (1974).

Instead, non-nested testing techniques must be used to choose between models. If we consider the set of four specifications to be a family of hypotheses, non-nested testing allows for pair-wise comparisons between the alternatives. This method has been deemed preferable to choosing among models based on statistical criteria, such as the R-squared or t-tests (Pesaran and Deaton, 1978). The Cox-type N-statistic is one test which can be used to make comparisons between models (Pesaran, 1974).

The procedure for deriving the Cox statistic in the iterative SUR case consists of estimating a series of regressions on the pair of models under consideration. While described in detail for nonlinear simultaneous equation maximum likelihood estimation in Pesaran and Deaton (1978), the methodology is outlined here to clarify the process as applied to SUR estimation.

The derivation begins by specifying two alternative models as competing hypotheses so that

$$H_0: \; y = X\beta + e_0 \qquad e_0 \sim N(\underline{0}, \Omega_0 \otimes I) \quad (1)$$

$$H_1: \; y = Z\gamma + e_1 \qquad e_1 \sim N(\underline{0}, \Omega_1 \otimes I) \quad (2)$$

where **X** and **Z** are alternative matrices of explanatory variables of size (nT x Σk_n) with n equal to the number of equations and T representing the number of observations per equation, Ω_i is the (n x n) variance/covariance matrix, **I** is a (T x T) identity matrix, and e_i is an (nT x 1) vector of normally distributed error terms. Variables contained in **X** cannot be identical to variables contained in **Z** although the two sets may have some common variables. The two design matrices need not be of the same dimension.

In the SUR case, the test statistic is calculated by first estimating H_0 and H_1 by iterative SUR. From the estimation of these two models, we obtain $\hat{\Omega}_0$ and $\hat{\Omega}_1$ the converged estimated variance/covariance matrices. An artificial model is then constructed from the predicted values of H_0, $\hat{y}_0$, and the explanatory variables of H_1 so that the following model is specified

$$H_{10}: \hat{y}_0 = Z\gamma + e_{10} \quad e_{10} \sim N(0, \Omega_{10} \otimes I) \quad (3)$$

Performing iterative SUR estimation on this model we obtain an estimate for Ω_{10} namely, $\tilde{\Omega}_{10}$, the converged variance/covariance matrix. This variance/covariance matrix is added to $\hat{\Omega}_0$ to obtain $\hat{\Omega}_{10}$.

The numerator of the Cox-test statistic is then calculated as

$$T_0 = (T/2) * \log (|\hat{\Omega}_1|/|\hat{\Omega}_{10}|) \quad (4)$$

where $|\hat{\Omega}_1|$ and $|\hat{\Omega}_{10}|$ are the determinants of the respective variance/covariance matrices. T_0 can be converted to a test statistic which is asymptotically distributed as a N(0,1) random variable by dividing by the square root of the variance of T_0.

Calculation of Var(T_0) procedes as follows. The residuals from the artificial model (H_{10}) are premultiplied by $(\hat{\Omega}_0 \hat{\Omega}_{10}^{-1} \otimes I)$ to yield **h**. A projection matrix **M** is then calculated as

$$\mathbf{M} = \mathbf{I}_{nT} - \mathbf{X}(\mathbf{X}'(\hat{\Omega}_0^{-1} \otimes \mathbf{I})\mathbf{X})^{-1} \mathbf{X}'(\hat{\Omega}_0^{-1} \otimes \mathbf{I}) \quad (5)$$

Mutiplication of **M** by **h** yields a vector **d** which can then be used to calculate the quadratic form for Var(T_0):

$$\mathrm{Var}(T_0) = \mathbf{d}' (\hat{\Omega}_0^{-1} \otimes \mathbf{I}) \mathbf{d} \qquad (6)$$

The statistic, N_0, is obtained by dividing (4) by the square root of (6). Similarly, we compute N_1 by interchanging (1) and (2) and following the identical procedure.

An heuristic explanation for the statistic can be obtained by comparing the variance/covariance matrices. Assume, given $|\hat{\Omega}_0|$, that $|\hat{\Omega}_1|$ is relatively large. This implies that y is not explained well by Z. If $|\hat{\Omega}_{10}|$ is relatively small, given $|\hat{\Omega}_0|$, then $|\hat{\Omega}_{10}|$ must also be relatively small, which indicates that $\hat{y}_0$ is explained relatively better by Z than by X. If Z explains $\hat{y}_0$ well but not y, then y does not approximate $\hat{y}_0$ and the residuals from H_0 must necessarily be large. In this instance, we reject the "truth" of H_0 against the data and the specific alternative, H_1.

If $|\hat{\Omega}_1|$ is "smaller" relative to $|\hat{\Omega}_{10}|$, then given $|\hat{\Omega}_0|$ (or the truth of H_0), $|\hat{\Omega}_{10}|$ must be "larger" than $|\hat{\Omega}_1|$ and Z explains $\hat{y}_0$ badly. If $|\hat{\Omega}_1|$ is smaller than $|\hat{\Omega}_{10}|$, Z explains y better than Z explains $\hat{y}_0$ and once again, y does not approximate $\hat{y}_0$ and X must therefore fit poorly. In this case, H_0 is rejected in favor of H_1 since Z explains y relatively better than X explains y.

In essence, the non-nested testing procedures permit us to assess whether the performance of an alternative model, H_1, against the data is consistent with the truth of H_0. The procedure utilizes model alternatives to test the validity of an hypothesis in much the same way that hypotheses are tested by data. Since non-nested tests are specified a priori with the same probability of "truthfulness", no model is maintained as truer than another. Therefore, it is possible that the behavior of a pair of models against one another will result in the rejection (or acceptance) of both hypotheses. This is contrary to the conventional F-test. By implication, the F-test is performed on a maintained model. Acceptance of the "true" specification is based on the belief that the true specification exists and is being tested. This is not the case with non-nested testing procedures.

Non-nested testing of models derives from the belief that there may exist no known true specification. As Pesaran has noted (1978, p. 678), this is wholly in keeping with the philosophy of empirical modelling. This philosophy states that if we consider hypotheses to be vehicles by which data is organized, then new hypotheses may serve to discredit or reinforce established hypotheses just as the discovery of new data may perform this same function. Therefore, we can specify an hypothesis that, while not being entirely satisfactory in itself, may contain enough information to discredit an alternative. Thus we may wish to reject both hypotheses on the basis of their pair-wise comparison. The ability to discredit all hypotheses may be considered one of the advantages of non-nested testing: that is, given the complexity of the economic systems which econometric specifications attempt to describe, there is little reason to believe that for any single system there exists a unique model which is true and certain.

The decision alternatives which exist for the Cox-test statistic are described below (Pesaran 1974, p. 161).

1. Accept H_0, reject H_1 when
   $|N_0| < 1.96$ and $|N_1| >= 1.96$.

2. Reject H_0, accept H_1 when
   $|N_0| >= 1.96$ and $|N_1| < 1.96$.

3. Reject both when
   $|N_0| >= 1.96$ and $|N_1| >= 1.96$.

4. Accept both when
   $|N_0| < 1.96$ and $|N_1| < 1.96$.

One limitation of the Cox statistic as used in the SUR format is its tendency to overreject the null hypothesis in small samples. In the case of a single equation, this tendency has been reduced by means of a small-sample adjustment (Godfrey and Pesaran). Unfortunately, this adjustment has not yet been extended to the case of a system of stacked equations.

6.3.2. Non-Nested Testing Results

The results of the non-nested testing procedure are reported in Table 6.3.2. In only one instance does the test succeed in clearly rejecting the null hypothesis. In the pair-wise comparison of the Buse and Brandow model with the Relative model, $|N_0|$ = .5955 and $|N_1|$ = 5.818, indicating rejection of the Buse and Brandow model given the Relative model alternative. In the other three pair-wise comparisons (Relative model vs. Real, Markup vs. Real, and Relative vs. Markup), both hypotheses reject one another. In these cases, the small-sample tendency of the Cox-statistic to reject too frequently appears to be influencing the results. Thus we are left with no unambiguous evidence as to which model may be considered "preferable".

Consideration of the relative magnitudes of the test results, however, does permit inferences to be drawn regarding the three remaining models. For instance, it is clear that the Real model is overwhelmingly rejected by both the Relative and the Markup models while the latter two are only weakly rejected by the Real model. In addition, the Markup model strongly rejects the Relative model while the Relative model only marginally rejects the Markup model. Assuming that the application of a small-sample adjustment to the test statistic would effect a monotonic reduction in the absolute values of the reported results, a clear pattern emerges: the Real model is rejected by both the Markup and Relative models and the Relative model is rejected by the Markup model. Hence, on this basis, the nonnested pair-wise comparisons indicate a preference for the Markup model.

6.3.3. Nested Tests and Results

Because the Markup model and the Real model are nested versions of the Buse and Brandow model, conventional methods of testing linear restrictions on the coefficients may be applied. Three statistics which can be calculated to test restictions are the Wald (W), the Likelihood ratio (LR), and the Lagrange multiplier (LM). The common testing procedure is to compare one of these statistics against the tabled value of the Chi-Square distribution (Judge, et al). Given the BB model

$$M_{ti} = d_0 + d_1P_{ti} + d_2Q_{ti} + d_3TR_{ti} + d_4D1985 + d_5DMAY + d_6TIME + e_{4t}$$

the Markup model corresponds to the restriction, $d_2=0$, and the Real model corresponds to the restriction, $d_1=0$. These two restrictions will be tested.

For linear multivariate regressions, Berndt and Savin have shown that a systematic inequality exists between the W, LR, and LM statistics (p. 1271). This result was corroborated for maximum likelihood estimation procedures by Breusch (1970). The relationship between the three statistics is W >= LR >= LM. This implies that rejection of the null hypothesis can be favored by selecting the W statistic as the criterion a priori. Conversely, failure to reject the null hypothesis can be favored by selecting the LM statistic a priori. In the current tests, the statistic most likely to reject the null (the Wald) is calculated for the hypothesis $d_2 = 0$ (i.e., the coefficient on the quantity variable is not significantly different from zero). For H_0: $d_1 = 0$ (i.e., the coefficient on the retail price variable is not significantly different from zero), the LM statistic, (the statistic most likely to fail to reject the null) is calculated. These statistics are reported in Table 6.3.2. along with the non-nested results. Using the tabled value of the Chi-square distribution with three degrees of freedom at the 90% level of significance (6.251), the hypothesis

TABLE 6.3.2.: HYPOTHESIS TEST RESULTS (Nested and Non-nested)

ALTERNATIVE (H1):	MAINTAINED HYPOTHESIS (H0): MARKUP	RELATIVE	REAL	BUSE-BRANDOW
MU		40.314	104.54	
RELATIVE	-8.62		105.29	5.818
REAL	-7.357	7.90		
BB	WALD = 4.96	.5955	LM = 120.26	

that $d_2 = 0$ fails to be rejected while the hypothesis that $d_1 = 0$ is overwhelmingly rejected. Thus the nested hypothesis testing results further substantiate the preference for the Markup model and the rejection of the Real model.

6.4. Results and Implications

Both the nested and non-nested hypothesis tests indicate a preference for the Markup model specification. Taken as a whole, the results suggest that in the shortrun, the Heien (1980) and Waugh hypotheses concerning margin behavior apply to the navel orange industry. The choice of the Markup model supports the Waugh notion that there exists a fixed relationship between retail price and margins. Also reinforced is the Heien hypothesis that store managers apply a markup over costs to arrive at a retail price (p. 11, 1980). This conclusion is strengthened by the preceding analysis in Section 6.2. regarding the coefficients on P and the relatively poor performance of the Real and Buse and Brandow models in the hypothesis tests. Both specifications include linear quantity terms; both specifications are overwhelmingly rejected by the alternatives. This result indicates that Gardner's conclusion that "no simple markup pricing rule...can in general accurately depict the relationship between the farm and retail price" (p. 406) may not be applicable to shortrun margin behavior. Instead the result supports the Heien (1980) contention that for shortrun models "pricing will be of the fixed markup variety" (p. 14). Thus modelling shortrun margins along the theoretical lines proposed by the Gardner analysis (e.g., with an explicit quantity term) may result in model misspecification.

Acceptance of the Markup model also has strong implications for grower arguments regarding retail price behavior during the prorate suspension. As mentioned, growers contended that retail prices did not decrease in the face of declining f.o.b. prices. Implicit in this claim is that without the volume control provision in effect, the agricultural marketing sector was able to exercise market power and gain economic profits to the detriment of consumers and growers. The empirical evidence embodied in the Markup model refutes this claim directly. Given the coefficient estimates and the significance levels for the D1985 variable in the Atlanta and San Francisco markets, it can be concluded that margins (hence, retail prices) fell significantly in these markets during the prorate suspension period. Furthermore, the equivalence of the coefficients suggests that in markets not influenced by Texas supplies (i.e., all markets except Dallas), there may have existed a general trend towards margin reduction. This conclusion, although limited by the fact that only three markets were analyzed, is buttressed by the strong rejection of the Real model specification, the only model which uniformly supports the grower contention.

6.4.1. Comparison to Previous Studies

As noted, there has been little previous research devoted to the analysis of margin behavior under marketing order controls. Much has been written, however, on the possible shortrun impacts of a marketing order termination on industry performance (Thor; Thor and Jesse; Shepard). These studies have used econometric simulations to compare industry behavior with controls to behavior without controls. As mentioned, conclusions drawn from these simulations are controversial since they are based on several assumptions and generally make comparisons against the benchmark of a perfectly competitive market.

These studies are lacking in another respect, however, since they tend to focus primarily on the impacts of a termination on producers and largely ignore the ramifications the controls have for consumers. The current analysis is the first to use highly disaggregated retail data to examine marketing order impacts on consumers.

Although Powers, et al., analyzed aggregate monthly Bureau of Labor Statistics (BLS) retail prices for 22 U. S. cities in their 1986 study, the data used and the scope of their analysis was too limited to develop conclusive results. In addition, no specific treatment of price spreads was attempted.

Limited analysis of spread behavior in the navel industry is contained in an Economic Research Service (ERS) publication and, as noted previously, in the 1978 article by Nelson and Robinson. The ERS report is an unsigned, typewritten document dated September 13, 1985, and apparently prepared as a first draft for the Powers, et al., publication (USDA 1988, p. 150). Using the same BLS data for 22 U. S. cities for the 1979/80 to 1984/85 seasons, the authors found that neither the mean nor variance of the retail-f.o.b. margin was significantly different during the prorate suspension than in previous seasons (p. 8). Nelson and Robinson also commented on the wholesale-retail spread behavior during the period of prorate relaxation, concluding that spreads shrank during the period in which volume constraints were eased.

The results of the current analysis are difficult to compare to these previous studies since the scope, nature, and time period of each of the studies are quite different. The ultimate selection of the Markup model as the preferred specification in this study does suggest, however, that margins decreased significantly with the removal of the prorate constraints. Thus while concurring with the findings of Nelson and Robinson, the current results are not consistent with the conclusions presented in the ERS report.

6.4.2. Policy Implications

The simulation studies have all largely agreed that the longrun effects of a marketing order termination would be substantially different from the shortrun effects (see Thor or Shepard). In the shortrun, the simulations suggest that grower prices would decrease, producer incomes would be reduced, larger quantities of navels would be shipped into the fresh market, and a general exodus of producers and handlers from the industry would occur as total revenues decrease. For consumers, estimates of per capita savings on navel orange expenditures for the first year after marketing order termination are between one and seven cents (Powers, et al.). Net gain in per capita economic welfare, according to this same study, is placed at between three and seven cents. Impacts on consumers, however, are largely dependent on how margins would respond to the control termination (Armbruster and Jesse).

The current analysis suggests that margins would react in the shortrun to a marketing order termination in a manner favorable to consumers. The empirical results of the Markup model indicate that in the wake of the 1985 prorate suspension, consumers in the San Francisco and Atlanta markets may have benefitted from lower retail prices. The results of the Markup specification also suggest that the marketing sector was unable to exploit what growers perceived to be elements of market power in order to gain economic profits at the expense of growers and consumers. On the contrary, the contracting margins indicated by the coeficient or the D1985 variable in the Atlanta and San Francisco markets may imply that gains in market efficiency were achieved with deregulation. For growers, falling f.o.b. prices generally reduced total revenues. But not all growers were hurt because of the lack of market control; some efficient producers of high-quality navels were able ship more fruit without the prorate controls and thus increase revenues (Klassen).

6.5. Summary

In this chapter, four models describing margin behavior in the California-Arizona navel industry were specified and estimated. The empirical results of the four estimations provide contradictory evidence as to the reaction of the retail-f.o.b. margin to the prorate suspension. The Real model supports the grower claim that retail prices did not respond to falling f.o.b. prices. The other three models refute this claim. Based on hypothesis tests performed on the estimated specifications, the Markup model emerged as the preferred specification. Acceptance of the results of the Markup model indicate that retail prices responded to declining f.o.b. prices and that retailers were unable to maintain retail prices artificially high while f.o.b. prices fell.

CHAPTER SEVEN
SUMMARY AND CONCLUSIONS

This chapter reviews and summarizes the study. Section 7.1. reviews the problem and objectives. The results of the empirical estimation and hypothesis tests are summarized in Section 7.2. Implications the current analysis has for the study of other commodities marketed under marketing orders are discussed in Section 7.3. Limitations of the analysis and directions for future research efforts will be considered in Section 7.4.

7.1. Review of Problem and Objectives

Marketing orders have influenced the production and marketing of certain fruits, nuts, and vegetables for 55 years. Originally legislated in a period of severe economic hardship for American farmers, they continue today, largely unchanged in scope and objective. Their relatively unabated use over the years has provided little opportunity for empirical examination of the impacts the controls have on consumers, distributors, and growers. Thus past research regarding the economic costs and benefits of marketing orders has largely been speculative and imprecise.

The prorate suspension of 1985 for California-Arizona navel oranges offered an opportunity to empirically evaluate the impacts of marketing orders on market participants. Comparison of prorated marketing seasons with the deregulated period provided an indication of how markets behaved in the absence of the controls. In addition, the specific claims made by marketing order proponents and opponents regarding the possible oligopolistic behavior of the retail marketing sector during the deregulated period were also able to be evaluated.

The specific objective of this study was to assess the impacts of the prorate suspension on industry marketing margins. Margins were chosen for analysis because they embody the contemporaneous impacts of changes in economic variables on all market participants: consumers, distributors, and growers. Margin analysis also offered evidence as to whether industry concerns about the potential exercise of market power by the retail marketing sector were justified.

7.2. Summary of Econometric Results

Because of the conflict of economic theory regarding how margin models should be specified, no modelling specification was favored a priori. Instead, four separate models were specified and estimated, each reflecting different theoretical considerations.

Review of the statistical results shows that the models differed in how they interpreted the data. Three models' results suggested that marketing margins decreased during the prorate suspension, while the fourth model indicated that margins increased. Because of the inability to reject any of the models a priori, they were tested to determine if there existed a preferable specification, given the data and the alternatives. The Markup model emerged as the preferred specification.

Acceptance of the Markup model had both theoretical and empirical implications. Theoretically, the choice implied that in the shortrun, supply conditions at the farm level may not be important determinants of retail-f.o.b. margin behavior. Thus inclusion of an explicit variable to capture supply conditions may result in model misspecification. These findings indicated that margin specifications suggested by Gardner or the Wohlgenant and Mullen Relative model may be inappropriate in shortrun modelling situations. Also implied is that, in the shortrun, there exists a fixed relationship between margin and retail price. This conclusion supports the Heien (1980) and Waugh analyses.

Choice of the Markup model also had empirical implications. Because the Markup model indicated that margins decreased during the period of prorate suspension, grower arguments regarding oligolistic marketing sector behavior appear to be largely unfounded. That the impacts of the prorate suspension on margins were nearly equivalent in the San Francisco and Atlanta markets across three models suggests that a general trend towards margin reduction may have existed in other markets which were not analyzed here.

7.3. Implications

While this study is specific to the California-Arizona navel orange industry, the results may be extended to other industries operating under similar controls, most notably other fruits which do not require much processing. Broadly speaking, this study provides evidence as to how consumers would be affected by shortrun grower and distributor reaction to the permanent termination of marketing order controls. Most importantly, it demonstrates that in the shortrun, consumers would benefit from lower retail prices and that agricultural marketing firms would not be able to exercise market power to the detriment of growers. Shortrun effects, however, are likely to be very different from longrun effects. It must therefore be noted that this study provides scant basis for speculation on the longrun impacts of a marketing order termination.

7.4. Limitations and Directions for Research

The analysis performed here was limited primarily by the lack of retail price data. One reason for the controversy surrounding the issue of marketing order impacts on consumers is that adequate retail price data is rarely available to applied economists. The problem reduced the number of cities available for this study to three, the minimum number considered necessary to carry out the empirical analysis. Inclusion of additional markets would have served to strengthen the analysis and increase the generality of the estimation results. Also limiting the analysis was the short time period; a more precise evaluation of how the margins in 1985 reacted relative to other marketing seasons could have been obtained had retail data been available for previous marketing seasons.

Perhaps more troubling than the limitations imposed by the data are concerns associated with the econometric specifications themselves. The analysis of the coefficients on the market price variable (in Section 6.2.) indicated the possibility of endogeneity for the independent price variable in the margin models. As demonstrated, had advertised prices not been included in the computation of the market price, it is very possible that endogeneity would have existed in the specifications. Econometrically, this would have resulted in biased OLS estimators. A practical implication of this condition is that the variance/covariance matrices for the models estimated would have been singular and iterative SUR estimation would not have converged.

There exists several possibilities for expanding the research contained in this study. Most immediate would be the inclusion of the wholesale price level in the analysis so that the behavior of margins between the various levels of the marketing channel could be compared to the overall retail-f.o.b. spread behavior. Secondly, as advertised prices played an important role in the analysis, future research could concentrate on how margins are affected by retail advertising behavior. For example, are retail-f.o.b. margins responsive to the frequency and level of advertised prices? Third, research into margin relationships which explicitly captures the structural elements contributing to margin behavior is necessary (for an example, see Lee, 1988).

Finally, the application of the Cox-type statistic to other modelling situations appears appropriate and advantageous. In the case of SUR estimation, it will be necessary to develop a small-sample adjustment to the statistic such as that which is already available for the case of a single equation. Perhaps one of the strengths of this study has been to demonstrate that in empirical applications of SUR estimation, there exists this tendency of the statistic to overreject the null hypothesis.

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