

ANALYSIS OF SUPPLY, TRADE AND PRICES
FOR ORANGES AND MANDARINS IN THE
MEDITERRANEAN AREA

A Thesis

Presented to the Faculty of the Graduate School
of Cornell University

in Partial Fulfillment for the Degree of
Doctor of Philosophy

by

Luis Miguel Albisu

January, 1981



ANALYSIS OF SUPPLY, TRADE AND PRICES FOR
ORANGES AND MANDARINS IN THE MEDITERRANEAN AREA

LUIS MIGUEL ALBISU, Ph.D.

Cornell University 1981



Market relationships for supplies, exports, imports, international and national prices for Mediterranean oranges and mandarins are estimated econometrically.

It is assumed that a recursive framework links these relationships together and ordinary least squares is an appropriate estimation technique. The analysis deals with the "winter" season which extends from October to June for oranges and from October to March for mandarins. Estimates were based on data extending from 1966/67 to 1975/76 except for Spanish supply for which data extends from 1964/65 to 1975/76.

Supply response in Spain, Israel and Morocco is analyzed by groups of varieties. Both area and yield equations are estimated for these countries. The residual quantity supplied from the "Rest of the Mediterranean Area" is also analyzed.

Capital and investment behavior theory is applied to area response. A combination of capacity utilization and expected profit theories is developed to explain farmers' decisions on plantings and removals. This provides an explanation of varietal selection based on relative prices,

proportion of the area that is bearing and the proportion of planted area made up of old trees.

Age structure and rain are selected as the most important factors influencing yields. Rain in the fall is critical for Spain and Morocco, but rain in the spring is more important in Israel.

Functions explaining Mediterranean exports to European and non-European markets are estimated. The results indicate that export fluctuations are directly determined by supply except for Israeli orange exports which are determined by quantities devoted to non industrial use.

An orange and mandarin "preference price" is constructed to reflect the impact of the European Community's complex import policy, involving a common external tariff, reference prices, varietal conversion coefficients and preferential tariffs. The level of the "preference" price has acted to raise orange prices in the Community and decrease prices in other European markets as supplies have been diverted to these markets. It has not had a measurable impact on international mandarin prices.

Import functions for oranges and mandarins by West European countries from the Mediterranean Area are estimated. These are divided into the following groups: 1) the original EC countries (France, Germany, Belgium, Luxembourg and the Netherlands), 2) the new EC countries (England, Ireland and Denmark), 3) Norway, Sweden and Finland, and 4) Switzerland and Austria. In all cases imports are explained by the import price, the price of pears and a time trend, reflecting changing preferences. A function explaining imports from non-Mediterranean countries is also estimated. Orange and mandarin imports into the East European countries are determined by international prices and a variable

reflecting the availability of foreign currency.

Relationships are established for the linkage between international orange and mandarin prices and Spanish and Israeli farmers' varietal prices in order to measure the impact that international prices have on new plantings.

The statistical relationships estimated using economic theory provide a framework for predicting future market behavior. Such questions as the consequences of further expansion of supplies in the Area, and the impact of EC import policy changes could be analyzed through this framework.

© Luis Miguel Albisu 1981

ALL RIGHTS RESERVED

BIOGRAPHICAL SKETCH

Luis Miguel Albisu was born on August 29, 1944 in Irun (Spain). After attending High School in Bilbao he studied Ingeniero Agronomo at Escuela Superior Ingenieros Agronomos in Madrid with major subjects in Agricultural Economics. He graduated in 1971.

He fulfilled the requirements for the Master of Science degree in the Department of Agricultural Marketing in Newcastle Upon Tyne (England) (1971-1973).

Mr. Albisu entered the Graduate School of Cornell University in January 1974 for studies leading to the degree of Doctor of Philosophy in the Department of Agricultural Economics.

Presently the author is employed as a Researcher in the Department of Economics and Sociology at Instituto Nacional de Investigaciones Agrarias (Zaragoza - Spain).

DEDICATION

To my parents

ACKNOWLEDGEMENTS

In the course of researching and writing this dissertation, I have benefitted from the advice and help of a considerable number of people.

I have received continuous encouragement and helpful comments from my thesis adviser, Professor Blandford, in all the different stages of this dissertation, from data collection to editing my broken English. Professor Forker, Chairman of my Graduate Committee, has been a constant source of support throughout my stay at Cornell University. Professor Rao has provided good suggestions.

The graduate program in agricultural economics at Cornell University and the Instituto Nacional de Investigaciones Agrarias provided funds to support this study.

Joe Baldwin has drawn expertly all the graphs and maps and Mary Ward has typed the final and most critical pages of this dissertation.

Many people have helped to collect the data. I would like to single out several organizations where they work - in Spain, the Ministry of Agriculture (Madrid and Valencia) and the Estacion Fitopatologica of the Ministry of Agriculture in Valencia; in Italy, the F. A. O.

I finally thank my friends Pedro Alba and his wife Maribel for their continuous moral support while writing this dissertation.

2.2.1.3	Critical Factors and Periods in the Mediterranean Area -----	32
2.2.2	Acreage Response -----	34
2.2.2.1	Farming Decisions -----	34
2.2.2.2	Nerlovian Models and Their Application to Perennial Plants --	35
2.2.2.3	A Review of Relevant Area Response Models -----	38
2.2.2.4	The Application of Investment Theory to Perennial Plants -----	40

CHAPTER III SUPPLY OF ORANGES AND MANDARINS IN THE MEDITERRANEAN

AREA:	EMPIRICAL FINDINGS -----	50
	Preamble -----	50
3.1	Acreage Response Analyses -----	50
3.1.1	Spain -----	50
3.1.2	Israel -----	63
3.1.3	Morocco -----	68
3.2	Yield Response Analysis -----	71
3.2.1	Spain -----	71
3.2.2	Israel -----	73
3.2.3	Morocco -----	75
3.3	Supply analyses -----	78

CHAPTER IV ORANGE AND MANDARIN EXPORTS FROM MEDITERRANEAN

COUNTRIES -----	80
-----------------	----

	Page
Preamble -----	80
4.1 Orange and Mandarin Exports to Europe -----	81
4.1.1 Spain -----	81
4.1.2 Israel -----	83
4.1.3 Morocco -----	84
4.1.4 The Rest of the Mediterranean Area -----	85
4.1.5 Empirical Approach and Results -----	86
4.2 Orange and Mandarin Exports to non-European Countries -----	94

CHAPTER V

FORMATION OF INTERNATIONAL PRICES AND THEIR RELATION- SHIP TO NATIONAL PRICES -----	100
Preamble -----	100
5.1 Formation of International Prices -----	100
5.1.1 European Community Trade Policies -----	100
5.1.2 Other Western European Countries' Trade Policies -----	104
5.1.3 Eastern European Countries' Trade Policies -----	105
5.1.4 Implications of the European Community's Trade Policy -----	107
5.1.5 Orange and Mandarin Price Formation in the European Community. Empirical Analysis -----	110
5.1.6 Orange and Mandarin Price Formation in the Rest of the European Markets -----	113

	Page
5.2 Relationship between International and National Prices -----	116
5.2.1 Spain -----	117
5.2.2 Israel -----	120
 CHAPTER VI ORANGE AND MANDARIN EUROPEAN IMPORTS -----	 123
Preamble -----	123
6.1 Orange and mandarin imports in Western European Countries -----	124
6.2 Orange and mandarin Imports in Eastern European Countries -----	132
6.3 Western European Orange Imports from non-Medi- terranean Countries -----	135
 CHAPTER VII SUMMARY AND CONCLUSIONS -----	 141
7.1 Summary -----	141
7.1.1 Supply -----	147
7.1.1.1 Spain -----	147
Area -----	147
Yield -----	148
7.1.1.2 Israel -----	148
Area -----	148
Yield -----	148
Supply -----	149
7.1.1.3 Morocco -----	149
Area -----	149
Yield -----	150

	Page
7.1.1.4 Rest of Mediterranean Area -----	150
7.1.2 Exports -----	150
7.1.2.1 To European Countries -----	150
7.1.2.2 To non-European Countries -----	151
7.1.3 International Prices -----	151
7.1.4 Imports -----	152
7.1.5 Overall Prices Received by Farmers -----	153
7.1.6 Varietal Prices Received by Farmers -----	154
7.2 Conclusions -----	154
BIBLIOGRAPHY -----	157
A. APPENDICES: Data Used in Area, Yield and Supply Analyses -----	160
A-1: Spain -----	161
A-2: Israel -----	195
A-3: Morocco -----	200
A-4: Rest of the Mediterranean Countries -----	210
B. APPENDICES: Data Used in Price Analysis -----	213
B-1: Data to Analyze Preference Prices in the European Community -----	214
B-2: Data to Analyze European Market Prices -----	308
B-3: Data to Analyze National and International Price Relationships -----	342
APPENDICES BIBLIOGRAPHY -----	349

LIST OF TABLES

Table	Page	
2.1	SPAIN: Groups of Oranges and Mandarins Analyzed -----	22
2.2	SPAIN: Harvesting Periods for the Orange and Mandarin Groups Analyzed -----	24
3.1	SPAIN: Orange and Mandarin Prices, 1959/60 - 1976/77 -----	54
3.2	SPAIN: Wholesale Food Price Index, 1960 - 1977 -----	55
3.3	SPAIN: Real Orange and Mandarin Average Price (1955 Prices), 1959/60 - 1976/77 -----	55
3.4	SPAIN: Adjusted Real Orange and Mandarin Average Price (1955 Prices), 1959/60 - 1976/77 -----	58
3.5	SPAIN: Estimated Change of Total Area for the 5 Main Varieties, 1964/65 - 1975/76 -----	62
3.6	SPAIN: Estimated Total Area for the Rest of the Varieties ---	64
3.7	ISRAEL: Estimated Bearing Area by Variety, 1966/67 - 1975/76 -----	67
3.8	MOROCCO: Estimated Change of Total Area of Oranges and Mandarins, 1966/67 - 1975/76 -----	70
3.9	SPAIN: Estimated Yield by Variety -----	74
3.10	ISRAEL: Estimated Yield by Variety, 1966/67 - 1975/76 -----	76
3.11	MOROCCO: Estimated Yield by Variety, 1966/67 - 1975/76 -----	77
3.12	Estimated Supply in Israel and the Rest of the Mediter- ranean Area by Variety, 1966/67 - 1975/76 -----	79
4.1	MEDITERRANEAN AREA: Orange Supply by Country, 1966/67 - 1975/76 -----	88
4.2	ISRAEL: Estimated Quantity Going for Industrial Use, 1966/67 - 1975/76 -----	90
4.3	MEDITERRANEAN AREA: Orange Exports by Country and Des- tination, 1966/67 - 1975/76 -----	91
4.4	MEDITERRANEAN AREA: Estimated Orange Exports by Country, 1966/67 - 1975/76 -----	93
4.5	MEDITERRANEAN AREA: Mandarin Supply by Country, 1966/67 - 1975/76 -----	95
4.6	MEDITERRANEAN AREA: Mandarin Exports by Country and Destination, 1966/67 - 1975/76 -----	96
4.7	MEDITERRANEAN AREA: Estimated Mandarin Exports by Country, 1966/67 - 1975/76 -----	97
4.8	MEDITERRANEAN AREA: Estimated Quantity Exported to non- European Markets by Variety, 1966/67 - 1975/76 -----	99
5.1	ENGLAND: Tariff Barriers for Oranges and Mandarins from non-Commonwealth Countries -----	106
5.2	SPAIN: Number of Days without Tariff Preferences in the European Community for Oranges and Mandarins, 1969/70 - 1975/76 -----	106
5.3	EUROPEAN COMMUNITY: Estimated Market Prices by Variety, 1966/67 - 1975/76 -----	114
5.4	SPAIN: Estimated Overall Farmers' Price, 1966/67 - 1975/76 -----	117

Table	Page	
5.5	SPAIN: Estimated Farmer's Price by Variety, 1966/67-1975/76 -----	121
5.6	ISRAEL: Estimated Overall Orange Farmers' Price, 1966/67 - 1975/76 -----	122
5.7	ISRAEL: Estimated Orange Farmers' Price by Variety, 1966/67 - 1975/76 -----	122
6.1	Orange Consumption, 1966/67 - 1975/76 -----	125
6.2	Mandarin Consumption, 1966/67 - 1975/76 -----	126
6.3	EUROPEAN COUNTRIES: Population, 1966/67 - 1975/76 -----	127
6.4	FRANCE: Pear Prices, 1966/67 - 1975/76 -----	129
6.5	UNITED KINGDOM: Pear Prices, 1966/67 - 1975/76 -----	129
6.6	WESTERN EUROPE: Estimated Orange Imports, 1966/67 - 1975/76 -----	131
6.7	WESTERN EUROPE: Estimated Mandarin Imports, 1966/67 - 1975/76 -----	133
6.8	EASTERN EUROPEAN COUNTRIES: Population, 1966/67 - 1975/76 -----	134
6.9	EASTERN EUROPEAN COUNTRIES: Fruit and Vegetable Imports, 1966/67 - 1975/76 -----	136
6.10	EASTERN EUROPEAN COUNTRIES: Estimated Orange and Mandarin Imports, 1966/67 - 1975/76 -----	137
6.11	WEST EUROPE: Orange Imports from non-Mediterranean Countries, 1966/67 - 1975/76 -----	138
6.12	WEST EUROPE: Estimated Orange Imports from non-Mediterranean Countries, 1966/67 - 1975/76 -----	140
7.1	Equations Specified in the Different Block for the Orange Market Relationships -----	145
7.2	Equations Specified in the Different Block for the Mandarin Market Relationships -----	146
A-1.1	SPAIN: Total Mandarin and Orange Area by Variety, 1964/65 - 1975/76 -----	162
A-1.2	SPAIN: Census Estimates of Planted Area by Variety and Age Group, 1964/65 -----	163
A-1.3	SPAIN: Adjusted Census Estimates of Planted Area by Variety and Age Group, 1964/65 -----	163
A-1.4	SPAIN: Adjustment Ratios for the 1964/65 Census by Variety and Age Group, 1964/65 -----	165
A-1.5	SPAIN: Census of Planted Area by Variety, Region and Age Group, 1964/65 -----	166
A-1.6	SPAIN: Adjusted Planted Area by Variety, Region and Age Group, 1964/65 -----	166
A-1.7	SPAIN: Percentage of Different Age Groups for Each Region by Variety, 1964/65 -----	167
A-1.8	SPAIN: Area by Variety, Region and Age Group, 1964/64 -----	167
A-1.9	SPAIN: Percentage of Different Age Groups for Each Region by Variety, 1970/71 -----	168
A-1.10	SPAIN: Area by Variety, Region and Age Group, 1970/71 -----	168
A-1.11	SPAIN: Rate of Change in Area by Variety, Region and Age Group between 1964/65 and 1970/71 -----	170

Table	Page
A-1.12	SPAIN: Plantings by Variety and Region, 1964/65 - 1968/69 ----- 171
A-1.13	SPAIN: Area by Variety, Region and Age Group, 1964/65 - 1975/76 ----- 173
A-1.14	SPAIN: Area by Variety and Age Groups, 1964/65 - 1975/76 ----- 175
A-1.15	SPAIN: Percentage of Different Age Groups for All Regions by Variety, 1964/65 - 1975/76 ----- 176
A-1.16	SPAIN: Average Percentage of Total Marketing by Month (October - May) and Variety, 1973/74 - 1975/76 ----- 178
A-1.17	SPAIN: Monthly and Seasonal Price Received by Farmers for Oranges Sold for Fresh Use, by Variety, 1964/65 - 1975/76 ----- 179
A-1.18	SPAIN: Verna and Valencia Production, 1964/65 - 1975/76 ----- 182
A-1.19	SPAIN: Seasonal Price Received by Farmers for Produce Sold for Fresh Use for the Late Orange Group, 1964/65 - 1975/76 ----- 182
A-1.20	SPAIN: Orange and Mandarin Production by Variety, 1964/65 - 1975/76 ----- 183
A-1.21	SPAIN: Production for Industrial Use by Variety, 1972/73 - 1975/76 ----- 184
A-1.22	SPAIN: Percentage of Total Production Going to Industrial Uses by Variety, 1972/73 - 1975/76 ----- 184
A-1.23	SPAIN: Estimated Percentage of Total Production Going to Industrial Uses by Variety, 1964/65 - 1971/72 ----- 185
A-1.24	SPAIN: Estimated Production for Industrial Use by Variety, 1964/65 - 1971/72 ----- 185
A-1.25	SPAIN: Subsidized and non-Subsidized Quantities Going to Industry by Origin and Variety, 1974/75 - 1975/76 ----- 186
A-1.26	SPAIN: Quantity Delivered by Farmers to Industry by Variety, 1964/65 - 1975/76 ----- 187
A-1.27	SPAIN: Prices Paid by Industry by Variety, 1964/65 - 1975/76 ----- 187
A-1.28	SPAIN: Subsidy Paid to Farmers by Variety, 1969/70 - 1975/76 ----- 188
A-1.29	SPAIN: Total Price Received by Farmers for Oranges Delivered to Industry, 1964/65 - 1975/76 ----- 188
A-1.30	SPAIN: Real Price Received by Farmers, by Variety, 1964/65 - 1975/76 ----- 189
A-1.31	SPAIN: Real Price Received by Farmers, by Variety ----- 191
A-1.32	SPAIN: September Precipitation by Region, 1964/65 ----- 192
A-1.33	SPAIN: October Precipitation by Region, 1964/65 ----- 193
A-1.34	SPAIN: September and October Precipitation, 1964/65 ----- 193

Table	Page	
A-1.35	SPAIN: Orange and Mandarin Yield, by Variety, 1964/65 - 1975/76 -----	194
A-2.1	ISRAEL: Bearing Area by Variety, 1966/67 - 1975/76 -----	196
A-2.2	ISRAEL: Farmers Price by Variety, 1966/67 - 1975/76 -----	196
A-2.3	ISRAEL: Price Indices of Output in Citri- culture by Variety, 1965/66 - 1969/70 -----	197
A-2.4	ISRAEL: Value and Production of Citrus Fruit by Variety, 1962/64 - 1964/65 -----	197
A-2.5	ISRAEL: Rain in March and April at Nahariyya, 1966 - 1976 -----	198
A-2.6	ISRAEL: Total Production by Variety, 1966/67 - 1975/76 -----	198
A-2.7	ISRAEL: Yields by Variety, 1966/67 - 1975/76 -----	199
A-3.1	MOROCCO: Total Orange and Mandarin Area, 1966/67 - 1975/76 -----	201
A-3.2	MOROCCO: Orange and Mandarin Area, 1966/67 - 1975/76 -----	201
A-3.3	MOROCCO: Non-bearing and Total Area for Oranges and Mandarins, 1966/67 - 1975/76 -----	202
A-3.4	MOROCCO: Bearing and Non-bearing Orange and Mandarin Area, 1966/67 - 1975/76 -----	205
A-3.5	MOROCCO: Percentage of Bearing Area with Respect to Total Area by Variety, 1966/67 - 1975/76 -----	206
A-3.6	MOROCCO: Production of Oranges and Mandarins, 1966/67 - 1975/76 -----	206
A-3.7	MOROCCO: Total Orange and Mandarin Area by Region, 1973/74 -----	207
A-3.8	MOROCCO: Precipitation in September by Region, 1966/67 - 1975/76 -----	207
A-3.9	MOROCCO: Precipitation in October by Region, 1966/67 - 1975/76 -----	208
A-3.10	MOROCCO: Precipitation in September and October, 1966/67 - 1975/76 -----	208
A-3.11	MOROCCO: Orange and Mandarin Yields, 1966/67 - 1975/76 -----	209
A-4.1	REST OF THE MEDITERRANEAN COUNTRIES: Orange Production by Country, 1966/67 - 1975/76 -----	211
A-4.2	REST OF THE MEDITERRANEAN COUNTRIES: Mandarin Production by Country, 1966/67 - 1975/76 -----	212
B-1.1	European Community's External Tariff Rates for Oranges and Mandarins, 1966/67 - 1975/76 -----	215
B-1.2	Amount of Tariff Reduction Granted by the European Community on Oranges from the major Exporting Mediterranean Countries, 1966/67 - 1975/76 -----	215
B-1.3	EUROPEAN COMMUNITY: Reference Prices at Customs Level for Oranges and Mandarins, 1966/67 - 1975/76 -----	217
B-1.4	EUROPEAN COMMUNITY: Orange and Mandarin Varieties Included in Each Group -----	218

Table	Page	
B-1.5	EUROPEAN COMMUNITY: Correction Coefficients to Compare Market and Reference Prices, 1966/67 - 1975/76 -----	220
B-1.6	MEDITERRANEAN AREA: Periods and Varieties Used to Calculate Mandarin Entry Price in the European Community -----	221
B-1.7	MEDITERRANEAN AREA: Varieties and Periods Used to Calculate Orange Entry Price in the European Community -----	223
B-1.8	SPAIN: Satsuma Exports to Germany by Month, 1969/70 - 1975/76 -----	224
B-1.9	SPAIN: Clementine Exports to Germany by Month, 1969/70 - 1975/76 -----	224
B-1.10	SPAIN: Monreal Exports to Germany by Month, 1969/70 - 1975/76 -----	225
B-1.11	SPAIN: Common Mandarin Exports to Germany by Month, 1969/70 - 1975/76 -----	225
B-1.12	SPAIN: Wilking Exports to Germany by Month, 1969/70 - 1975/76 -----	226
B-1.13	SPAIN: Satsuma Exports to Belgium by Month, 1969/70 - 1975/76 -----	226
B-1.14	SPAIN: Clementine Exports to Belgium by Month, 1969/70 1975/76 -----	227
B-1.15	SPAIN: Monreal Exports to Belgium by Month, 1969/70 - 1975/76 -----	227
B-1.16	SPAIN: Common Mandarin Exports to Belgium by Month, 1969/70 - 1975/76 -----	228
B-1.17	SPAIN: Wilking Exports to Belgium by Month, 1969/70 - 1975/76 -----	228
B-1.18	SPAIN: Satsuma Exports to France by Month, 1969/70 - 1975/76 -----	229
B-1.19	SPAIN: Clementine Exports to France by Month, 1969/70 - 1975/76 -----	229
B-1.20	SPAIN: Monreal Exports to France by Month, 1969/70 1975/76 -----	230
B-1.21	SPAIN: Common Mandarin Exports to France by Month, 1969/70 - 1975/76 -----	230
B-1.22	SPAIN: Wilking Exports to France by Month, 1969/70 - 1975/76 -----	231
B-1.23	SPAIN: Satsuma Exports to Holland by Month, 1969/70 - 1975/76 -----	231
B-1.24	SPAIN: Clementine Exports to Holland by Month, 1969/70 - 1975/76 -----	232
B-1.25	SPAIN: Monreal Exports to Holland by Month, 1969/70 - 1975/76 -----	232
B-1.26	SPAIN: Common Mandarin Exports to Holland by Month, 1969/70 - 1975/76 -----	233
B-1.27	SPAIN: Wilking Exports to Holland by Month, 1969/70 - 1975/76 -----	233
B-1.28	SPAIN: Satsuma Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	234

Table	Page
B-1.29 SPAIN: Clementine Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	234
B-1.30 SPAIN: Wilking Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	235
B-1.31 SPAIN: Navelina Exports to Germany by Month, 1969/70 - 1975/76 -----	236
B-1.32 SPAIN: Navel Exports to Germany by Month, 1969/70 - 1975/76 -----	236
B-1.33 SPAIN: Navelate Exports to Germany by Month, 1969/70 - 1975/76 -----	237
B-1.34 SPAIN: Salustiana Exports to Germany by Month 1969/70 - 1975/76 -----	237
B-1.35 SPAIN: Cadenera Exports to Germany by Month, 1969/70 - 1975/76 -----	238
B-1.36 SPAIN: Castellana Exports to Germany by Month, 1969/70 - 1975/76 -----	238
B-1.37 SPAIN: Macetera Exports to Germany by Month, 1969/70 - 1975/76 -----	239
B-1.38 SPAIN: Sanguinelli Exports to Germany by Month, 1969/70 - 1975/76 -----	239
B-1.39 SPAIN: Sangina Exports to Germany by Month, 1969/70 - 1975/76 -----	240
B-1.40 SPAIN: Washington Sanguina Exports to Germany by Month, 1969/70 - 1975/76 -----	240
B-1.41 SPAIN: Verna Exports to Germany by Month, 1969/70 - 1975/76 -----	241
B-1.42 SPAIN: Valencia Late Exports to Germany by Month, 1969/70 - 1975/76 -----	241
B-1.43 SPAIN: Blanca Comun Exports to Germany by Month, 1969/70 - 1975/76 -----	242
B-1.44 SPAIN: Viciada Exports to Germany by Month, 1969/70 - 1975/76 -----	242
B-1.45 SPAIN: Navelina Exports to Belgium by Month, 1969/70 - 1975/76 -----	243
B-1.46 SPAIN: Navel Exports to Belgium by Month, 1969/70 - 1975/76 -----	243
B-1.47 SPAIN: Navelate Exports to Belgium by Month, 1969/70 - 1975/76 -----	244
B-1.48 SPAIN: Saustiana Exports to Belgium by Month, 1969/70 - 1975/76 -----	244
B-1.49 SPAIN: Cadenera Exports to Belgium by Month, 1969/70 - 1975/76 -----	245
B-1.50 SPAIN: Castellana Exports to Belgium by Month, 1969/70 - 1975/76 -----	245
B-1.51 SPAIN: Macetera Exports to Belgium by Month, 1969/70 - 1975/76 -----	246
B-1.52 SPAIN: Sanguinelli Exports to Belgium by Month, 1969/70 - 1975/76 -----	246
B-1.53 SPAIN: Sanguina Exports to Belgium by Month, 1969/70 - 1975/76 -----	247

Table	Page
B-1.54	SPAIN: Washington Sanguine Exports to Belgium by Month, 1969/70 - 1976/76 ----- 247
B-1.55	SPAIN: Verna Exports to Belgium by Month, 1969/70 - 1975/76 ----- 248
B-1.56	SPAIN: Valencia Late Exports to Belgium by Month, 1969/70 - 1975/76 ----- 248
B-1.57	SPAIN: Blance Comun Exports to Belgium by Month, 1969/70 - 1975/76 ----- 249
B-1.58	SPAIN: V ieda Exports to Belgium by Month, 1969/70 - 1975/76 ----- 249
B-1.59	SPAIN: Navelina Exports to France by Month, 1969/70 - 1975/76 ----- 250
B-1.60	SPAIN: Navel Exports to France by Month, 1969/70 - 1975/76 ----- 250
B-1.61	SPAIN: Navelate Exports to France by Month, 1969/70 - 1975/76 ----- 251
B-1.62	SPAIN: Saluvtiana Exports to France by Month, 1969/70 - 1975/76 ----- 251
B-1.63	SPAIN: Cadenera Exports to France by Month, 1969/70 - 1975/76 ----- 252
B-1.64	SPAIN: Castellana Exports to France by Month, 1969/70 - 1975/76 ----- 252
B-1.65	SPAIN: Mautera Exports to France by Month, 1969/70 - 1975/76 ----- 253
B-1.66	SPAIN: Senguinelli Exports to France by Month, 1969/70 - 1975/76 ----- 253
B-1.67	SPAIN: Hamlin Exports to France by Month, 1969/70 - 1975/76 ----- 254
B-1.68	SPAIN: Sanguina Exports to France by Month, 1969/70 - 1975/76 ----- 254
B-1.69	SPAIN: Washington Janguine Exports to France by Month, 1969/70 - 1975/76 ----- 255
B-1.70	SPAIN: Verna Exports to France by Month, 1969/70 - 1975/76 ----- 255
B-1.71	SPAIN: Valencia Late Exports to France by Month, 1969/70 - 1975/76 ----- 256
B-1.72	SPAIN: Blance Comun Exports to France by Month, 1969/70 - 1975/76 ----- 256
B-1.73	SPAIN: Navelina Exports to Holland by Month, 1969/70 - 1975/76 ----- 257
B-1.74	SPAIN: Navel Exports to Holland by Month, 1969/70 - 1975/76 ----- 257
B-1.75	SPAIN: Navelate Exports to Holland by Month, 1969/70 - 1975/76 ----- 258
B-1.76	SPAIN: Jalustiena Exports to Holland by Month, 1969/70 - 1975/76 ----- 258

Table	Page
B-1.77 SPAIN: Cadenesa Exports to Holland by Month, 1969/70 - 1975/76 -----	259
B-1.78 SPAIN: Castellana Exports to Holland by Month, 1969/70 - 1975/76 -----	259
B-1.79 SPAIN: Macetera Exports to Holland by Month, 1969/70 - 1975/76 -----	260
B-1.80 SPAIN: Sanguiuelli Exports to Holland by Month, 1969/70 - 1975/76 -----	260
B-1.81 SPAIN: Hamlin Exports to Holland by Month, 1969/70 - 1975/76 -----	261
B-1.82 SPAIN: Sangunia Exports to Holland by Month, 1969/70 - 1975/76 -----	261
B-1.83 SPAIN: Washington Janguine Exports to Holland by Month, 1969/70 - 1975/76 -----	262
B-1.84 SPAIN: Verna Exports to Holland by Month, 1969/70 - 1975/76 -----	262
B-1.85 SPAIN: Valencia Late Exports to Holland by Month, 1969/70 - 1975/76 -----	263
B-1.86 SPAIN: Blance Comun Exports to Holland by Month, 1969/70 - 1975/76 -----	263
B-1.87 SPAIN: V ieda Exports to Holland by Month, 1969/70 - 1975/76 -----	264
B-1.88 SPAIN: Navelina Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	264
B-1.89 SPAIN: Navel Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	265
B-1.90 SPAIN: Navelate Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	265
B-1.91 SPAIN: Jalustiena Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	266
B-1.92 SPAIN: Cadenera Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	266
B-1.93 SPAIN: Janguinelli Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	267
B-1.94 SPAIN: Janguine Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	267
B-1.95 SPAIN: Verna Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	268
B-1.96 SPAIN: Valenie Late Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	268
B-1.97 SPAIN: Blance Comun Exports to Luxembourg by Month, 1969/70 - 1975/76 -----	269
B-1.98 SPAIN: Orange Exports by Month and Variety, 1969/70 -----	270
B-1.99 SPAIN: Orange Exports by Month and Variety, 1969/70 -----	271



Table	Page	
B-1.100	SPAIN: Mandarin Exports by Month and Variety, 1969/70 - 1970/71 -----	272
B-1.101	SPAIN: Orange Exports by Month and Variety, 1966/67 -----	273
B-1.102	SPAIN: Orange Exports by Month and Variety, 1967/68 -----	274
B-1.103	SPAIN: Orange Exports by Month and Variety, 1968/69 -----	275
B-1.104	SPAIN: Mandarin Exports by Month and Variety, to the European Community, 1966/67 - 1968/69 -----	276
B-1.105	SPAIN: Orange Exports to the European Community by Variety Group and Relevant Periods, 1966/67 - 1975/76 -----	277
B-1.106	SPAIN: Mandarin Exports to the European Community by Variety Group and Relevant Periods, 1966/67 - 1975/76 -----	278
B-1.107	ISRAEL: Orange Exports to the European Community Countries by Variety and Quarter, 1971 - 1973 -----	280
B-1.108	ISRAEL: Orange Exports by Month, 1971/72 - 1972/73 -----	281
B-1.109	ISRAEL: Orange Exports to the European Community by Group Variety and Relevant Periods, 1966/67 - 1975/76 -----	282
B-1.110	MOROCCO: Mandarin and Orange Exports to the European Community, 1966/67 - 1975/76 -----	284
B-1.111	MOROCCO: Mandarin Exports to the European Community by Variety, 1966/67 - 1975/76 -----	284
B-1.112	MOROCCO: Mandarin Monthly Exports, 1966/67 - 1975/76 -----	285
B-1.113	MOROCCO: Orange Monthly Exports, 1966/67 - 1975/76 -----	286
B-1.114	MOROCCO: Mandarin Exports to the European Community by Variety Group and Relevant Periods, 1966/67 - 1975/76 -----	287
B-1.115	MOROCCO: Orange Exports to the European Community by Variety Group and Relevant Periods, 1966/67 - 1975/76 -----	288
B-1.116	GERMANY: Orange Imports by Month, 1966/67 - 1975/76 -----	289
B-1.117	GERMANY: Orange Exports by Month, 1966/67 - 1975/76 -----	290
B-1.118	HOLLAND: Orange Imports by Month, 1966/67 - 1975/76 -----	291
B-1.119	HOLLAND: Orange Exports by Month, 1966/67 - 1975/76 -----	292

Table	Page	
B-1.120	BELGIUM-LUXEMBOURG: Orange Imports by Month, 1966/67 - 1975/76 -----	293
B-1.121	BELGIUM-LUXEMBOURG: Orange Exports by Month, 1966/67 - 1975/76 -----	294
B-1.122	FRANCE: Orange Imports by Quarter, 1966/67 - 1975/76 -----	295
B-1.123	FRANCE: Orange Exports by Quarter, 1966/67 - 1975/76 -----	295
B-1.124	GERMANY: Mandarin Imports by Month, 1966/67 - 1975/76 -----	296
B-1.125	HOLLAND: Mandarin Imports by Month, 1966/67 - 1975/76 -----	297
B-1.126	BELGIUM-LUXEMBOURG: Mandoniu Imports by Month, 1966/67 - 1975/76 -----	298
B-1.127	GERMANY: Mandarin Exports by Month, 1966/67 - 1975/76 -----	299
B-1.128	HOLLAND: Mandarin Exports by Month, 1966/67 - 1975/76 -----	300
B-1.129	BELGIUM-LUXEMBOURG: Mandoniu Exports by Month, 1966/67 - 1975/76 -----	301
B-1.130	FRANCE: Mandarin Imports by Quarter, 1966/67 - 1975/76 -----	302
B-1.131	FRANCE: Mandarin Exports by Quarter, 1966/67 - 1975/76 -----	302
B-1.132	EUROPEAN COMMUNITY: Orange Imports in Relevant Periods, 1966/67 - 1975/76 -----	303
B-1.133	EUROPEAN COMMUNITY: Mandarin Imports in Relevant Periods, 1966/67 - 1975/76 -----	304
B-1.134	REST OF THE MEDITERRANEAN AREA: December Orange and November Mandarin Exports to the European Community, 1966/67 - 1975/76 -----	305
B-1.135	Exchange Rates for Units of Account and Dollars in Florins, 1966/67 - 1975/76 -----	305
B-1.136	HOLLAND: Consumer Price Index, 1967 - 1976 -----	307
B-1.137	EUROPEAN COMMUNITY: Orange and Mandarin Minimum Entry Price at a Wholesale Level, 1966/67 - 1975/76 -----	307
B-2.1	ROTTERDAM: Spanish Navel Price, 1966/67 - 1974/75 -----	309
B-2.2	ROTTERDAM: Spanish Castellane Price, 1966/67 - 1974/75 -----	311
B-2.3	ROTTERDAM: Spanish Salustiana Price, 1966/67 - 1974/75 -----	312
B-2.4	ROTTERDAM: Spanish Cadenera Price, 1966/67 - 1974/75 -----	314
B-2.5	ROTTERDAM: Spanish Blood Orange Price, 1966/67 - 1974/75 -----	315

Table	Page	
B-2.6	ROTTERDAM: Spanish Verna Price, 1966/67 - 1974/75 -----	316
B-2.7	SPAIN: Castellana, Salustiana and Cadeuera Monthly Exports, 1966/67 - 1974/75 -----	317
B-2.8	ROTTERDAM: Spanish Orange Prices by Variety, 1975/76 -----	318
B-2.9	SPAIN: Navelina Monthly Exports, 1966/67 - 1975/76 -----	319
B-2.10	SPAIN: Navel Monthly Exports, 1966/67 - 1975/76 -----	320
B-2.11	SPAIN: Navelate Monthly Exports, 1966/67 - 1975/76 -----	321
B-2.12	SPAIN: Select White Orange Monthly Exports, 1966/67 - 1975/76 -----	322
B-2.13	SPAIN: Blood Orange Monthly Exports, 1966/67 - 1975/76 -----	323
B-2.14	SPAIN: Verna Monthly Exports, 1966/67 - 1975/76 -----	324
B-2.15	SPAIN: Valencia Monthly Exports, 1966/67 - 1975/76 -----	324
B-2.16	EUROPEAN COMMUNITY: Orange Price, 1966/67 - 1975/76 -----	325
B-2.17	ROTTERDAM: Jatsume and Clementine Price, 1966/67 - 1975/76 -----	325
B-2.18	GERMANY: Spanish Clementine Price, 1966/67 - 1967/68 -----	327
B-2.19	SPAIN: Jatsuma Monthly Exports, 1966/67 - 1975/76 -----	328
B-2.20	SPAIN: Clementine Monthly Exports, 1966/67 - 1975/76 -----	328
B-2.21	ROTTERDAM: Manderin Price, 1966/67 - 1975/76 -----	329
B-2.22	REST OF EUROPE: Orange Price, 1966/67 - 1975/76 -----	329
B-2.23	EUROPEAN COMMUNITY: Peer Consumption from Internal Production by Country, 1966/67 - 1975/76 -----	330
B-2.24	GERMANY: Peer Imports by Month, 1966/67 - 1975/76 -----	332
B-2.25	GERMANY: Peer Exports by Month, 1966/67 - 1975/76 -----	333
B-2.26	FRANCE: Peer Imports by Month, 1966/67 - 1975/76 -----	334
B-2.27	FRANCE: Peer Exports by Month, 1966/67 - 1975/76 -----	335

Table	Page
B-2.28	HOLLAND: Peer Imports by Month, 1966/67 - 1975/76 ----- 336
B-2.29	HOLLAND: Peer Exports by Month, 1966/67 - 1975/76 ----- 337
B-2.30	BELGIUM-LUXEMBOURG: Peer Imports by Month, 1966/67 - 1975/76 ----- 338
B-2.31	BELGIUM-LUXEMBOURG: Peer Exports by Month, 1966/67 - 1975/76 ----- 339
B-2.32	PARIS: Arrivals Quantity Peers by Month, 1966/67 - 1975/76 ----- 340
B-2.34	MEDITERRANEAN AREA: Mandoniu and Orange Exports, 1966/67 - 1975/76 ----- 341
B-3.1	SPAIN: Exports by Variety, 1966/67 - 1975/76 ----- 343
B-3.2	SPAIN: Overall Mederin and Orange Farmer's Price, 1966/67 - 1975/76 ----- 344
B-3.3	SPAIN: Exchange Rate (Pesetas per Dollar), 1966/67 - 1975/76 ----- 344
B-3.4	SPAIN: Overall Manderin and Orange Farmer's Prices in Dollars per Ton, 1966/67 - 1975/76 ----- 345
B-3.5	ROTTERDAM: Current Manderin and Orange Price, 1966/67 - 1975/76 ----- 345
B-3.6	ISRAEL: Exports by Variety, 1966/67 - 1975/76 ----- 346
B-3.7	ISRAEL: Farmer's Price by Variety in IL/Ton, 1966/67 - 1975/76 ----- 346
B-3.8	ISRAEL: Overall Orange Farmer's in IL/Ton, 1966/67 - 1975/76 ----- 347
B-3.9	ISRAEL: Exchange Rate (IL per Dollars), 1966/67 - 1975/76 ----- 347
B-3.10	ISRAEL: Overall Orange Farmer's Price in Dollars per Ton, 1966/67 - 1975/76 ----- 348

LIST OF ILLUSTRATIONS

Figure		Page
1.1	Orange Production in the Mediterranean Area -----	3
1.2	Mandarin Production in the Mediterranean Area -----	4
1.3	Total Orange and Mandarin Exports from the Mediterranean Area (CLAM) -----	6
1.4	Export Shares with Respect to Total Mediterranean Orange Exports (CLAM) -----	7
1.5	Export Shares with Respect to Total Mediterranean Mandarin Exports (CLAM) -----	8
1.6	Orange Import Shares with Respect to Total Mediterranean Area Orange Exports Specified by Economic Bloc (CLAM) -----	13
1.7	Mandarin Import Shares with Respect to Total Mediterranean Area Mandarin Exports Specified by Economic Bloc (C.AM) -----	13
1.8	Orange Import Shares with Respect to Total Mediterranean Area Orange Exports Specified by Country (CLAM) -----	14
1.9	Mandarin Import shares with Respect to Total Mediterranean Area Mandarin Exports Specified by Country (CLAM) -----	14
3.1	SPAIN: Marketing Channels for Produce Going to Industrial Use -----	53
3.2	Real Orange and Mandarin Average Price in Spain (1955 Prices) 1959/60 - 1976/77 (pts/ton) -----	56
3.3	Adjusted Real Orange and Mandarin Average Price in Spain (1955 Prices, 1959/60 - 1976/77 (pts/ton) -----	59
5.1	Effects of the Loss of European Community Preferential Tariff Reductions for a Mediterranean Exporter -----	109
7.1	Market Relationships for Oranges and Mandarins -----	142
7.2	The Mediterranean Study Area -----	144

CHAPTER I

INTRODUCTION

1.1 Production and trade structure for Mediterranean oranges and mandarins

Oranges and mandarins are grown in many areas of the world with tropical and subtropical climates. Their cultivation is spread over regions that are 40° North and South of the Equator. When reference is made to "oranges" this denotes all sweet oranges unless otherwise specified. The group "mandarins" relates collectively to mandarins, tangerines, clementines and satsumas unless otherwise specified.

In this study, the Mediterranean Area consists of those countries with a coastline in the Mediterranean Sea plus Portugal. This Area is between latitudes 30° to 40° North and it benefits from a subtropical climate, characterized by having distinct winter and summer seasons and greater frost risk than other subtropical areas closer to the Equator. These climatic conditions and the availability of water for irrigation are the main elements in the growth of oranges and mandarins of high internal and external quality.

Orange and mandarin seasons vary in different Hemispheres. The "winter" season refers to fruit harvested from October to June and the "summer" season extends from May to November. Although there is some overlap, the bulk of each harvest is marketed during different periods.

The Mediterranean Area belongs to the "winter" season. Oranges are harvested during the entire season while mandarins are picked from October to March. Only small quantities of both commodities are harvested outside these time periods. The entire Mediterranean

Area grows the fruits because of the climatic conditions and their high profitability relative to other crops.

Figures 1.1 and 1.2 show production of oranges and mandarins in the Mediterranean Area from 1966/67 to 1977/78. Spain, Israel and Morocco are graphed separately from the Rest of the Mediterranean Area in the case of oranges. Spain and Morocco are graphed separately in the case of mandarins. That is because of the significance of these countries in the Mediterranean trade in each case. A "Rest of the Mediterranean Area" was formed from the Mediterranean countries that both grow and export oranges or mandarins. Algeria, Egypt, Tunisia, Cyprus, Gaza, Lebanon, Turkey, Greece and Italy are included in this group.

During the period covered in the charts, the production of oranges has not changed significantly in Spain, Israel and Morocco but it has followed an increasing trend for the Rest of the Mediterranean Area. Spain has had the most noticeable increasing trend for mandarin production but both Morocco and the Rest of the Mediterranean Area also show a similar trend.

World trade value for fresh oranges and mandarins ranks first among all fruits and vegetables according to the latest FAO trade figures (FAO, Trade Yearbook). The Mediterranean Area accounts for 75 percent of the total quantity traded in the world and exports its fresh produce almost exclusively to the European markets, with less than 5 percent on the average going to other countries. It is only at the beginning and end of the season that countries from other geographical areas (primarily the Southern Hemisphere countries of South Africa, Argentina and Brazil) compete in European markets.



FIGURE I.I. ORANGE PRODUCTION IN THE MEDITERRANEAN AREA

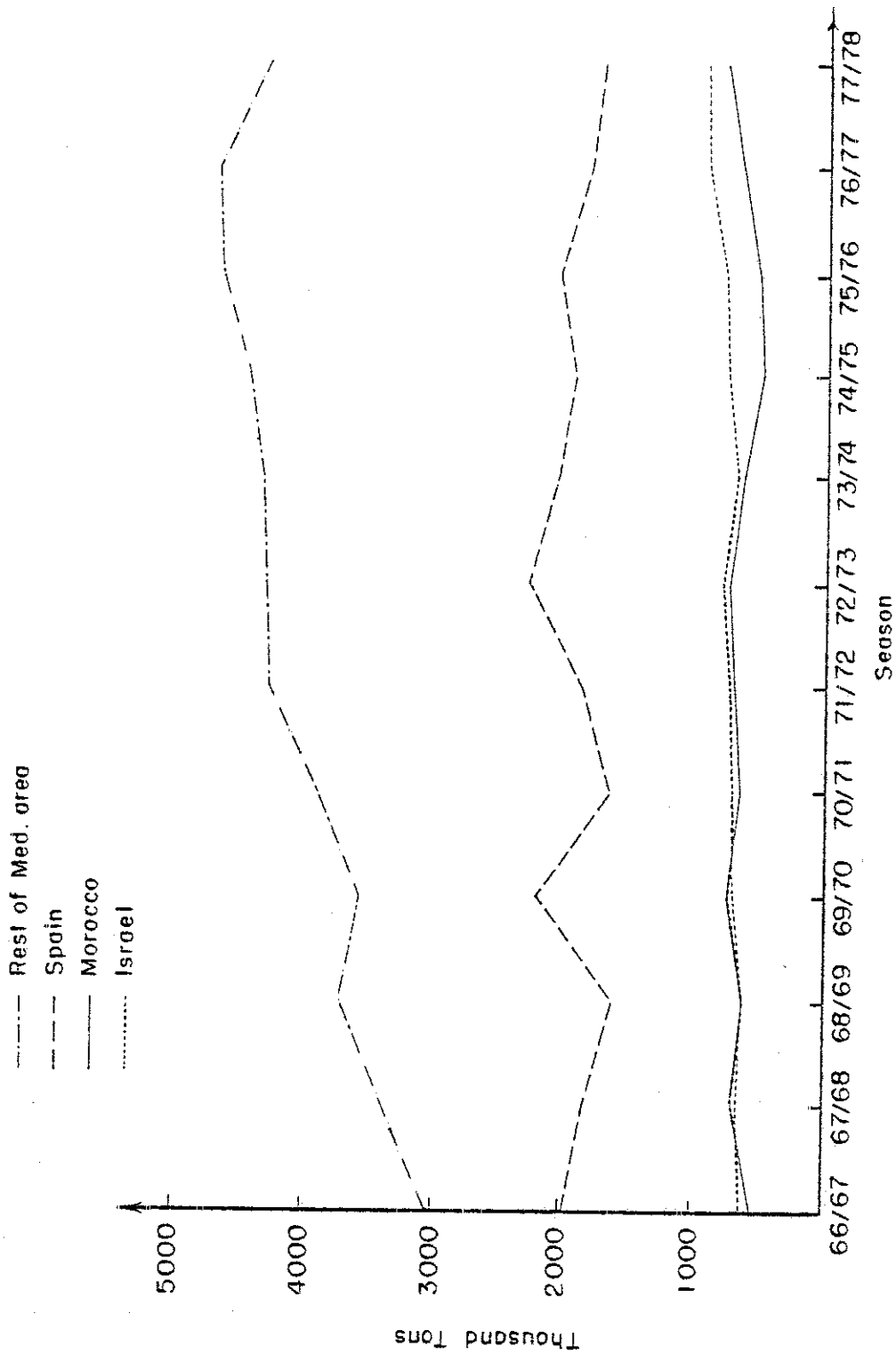
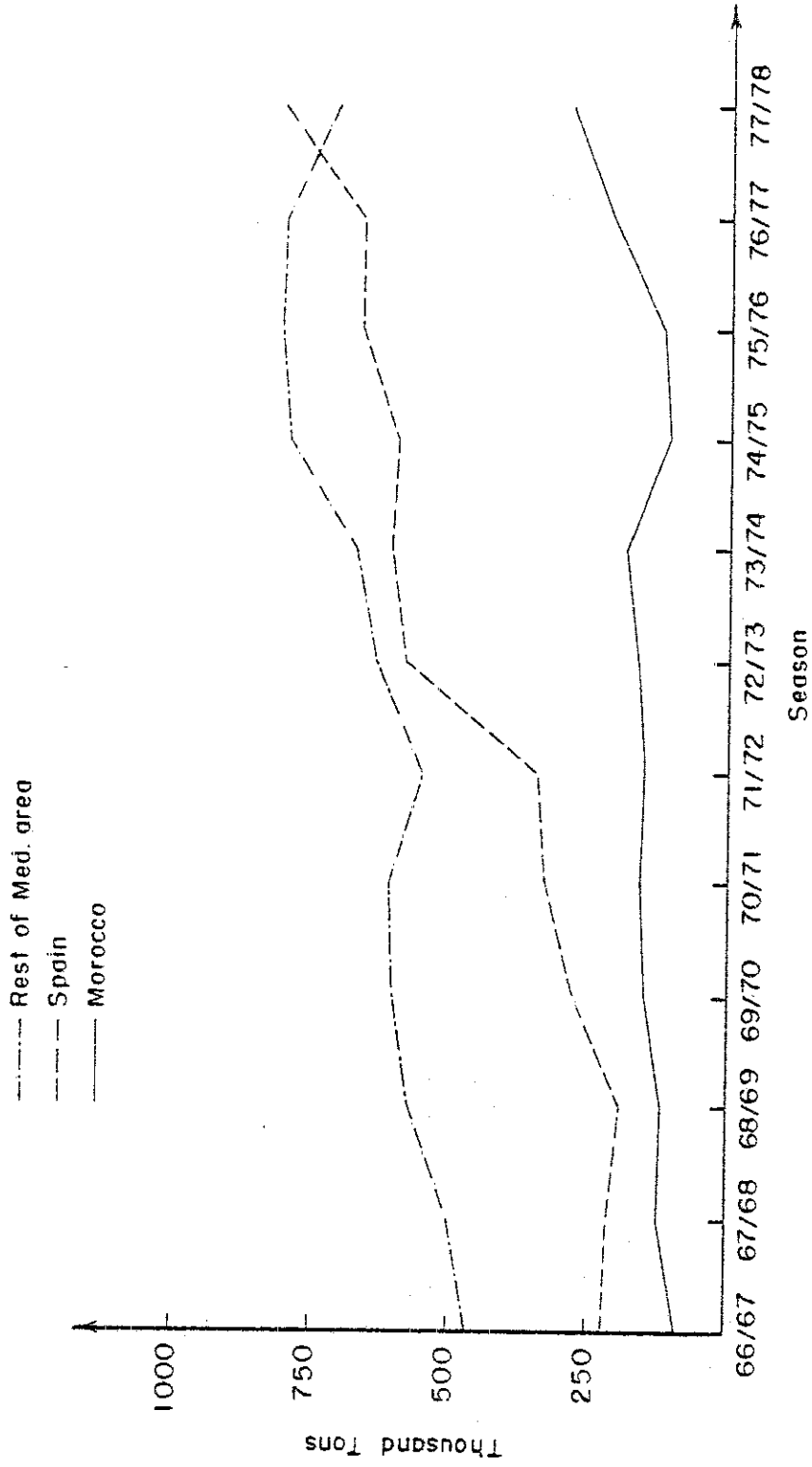


FIGURE 1.2. MANDARIN PRODUCTION IN THE MEDITERRANEAN AREA



Those provide about 10 percent of total imports during the winter season.

It is reasonable to assume that the Mediterranean supplying countries and the European consuming countries form a "world" market. Both areas are totally interdependent. Lack of supplies from the Mediterranean Area in a season of poor weather conditions is not made up by supplies from other producing areas because sufficient fruit of similar quality does not exist in these areas. Likewise a year of exceptionally good weather may create severe problems for Mediterranean producers who cannot find alternative markets. In such cases suppliers try to dispose of a greater proportion of their production in their national markets or to export to more distant markets. Both solutions have not prevented international prices from falling in seasons of a large crop.

International prices in European markets reflect seasonal or short term variations in exports, mainly due to weather conditions, and long term trends caused by the overall supply and demand situation in the Area.

1.2 Recent trade trends and general outlook

1.2.1 Mediterranean exporting countries

Total orange and mandarin exports from the Mediterranean Area are shown in Figure 1.3. Oranges followed an upward trend until 1972/73 and then began to decline. A persistent increasing export trend is apparent for mandarins.

Spain, Israel and Morocco are the leading exporting countries in the Area. Figures 1.4 and 1.5 show their export shares with respect

FIGURE I.3. TOTAL ORANGE AND MANDARIN EXPORTS FROM THE MEDITERRANEAN AREA (CLAM)

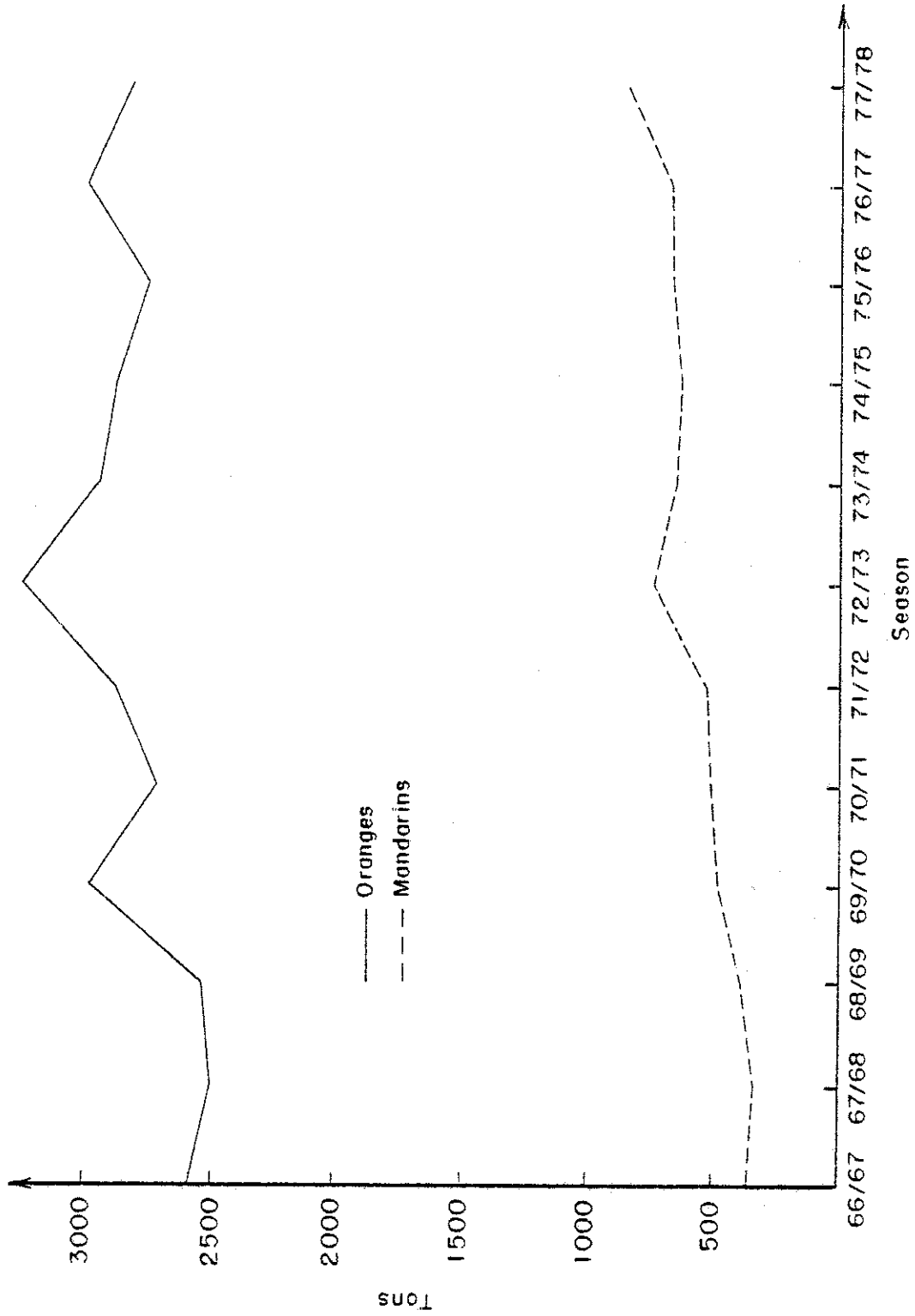


FIGURE 1.4. EXPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN ORANGE EXPORTS (CLAM)

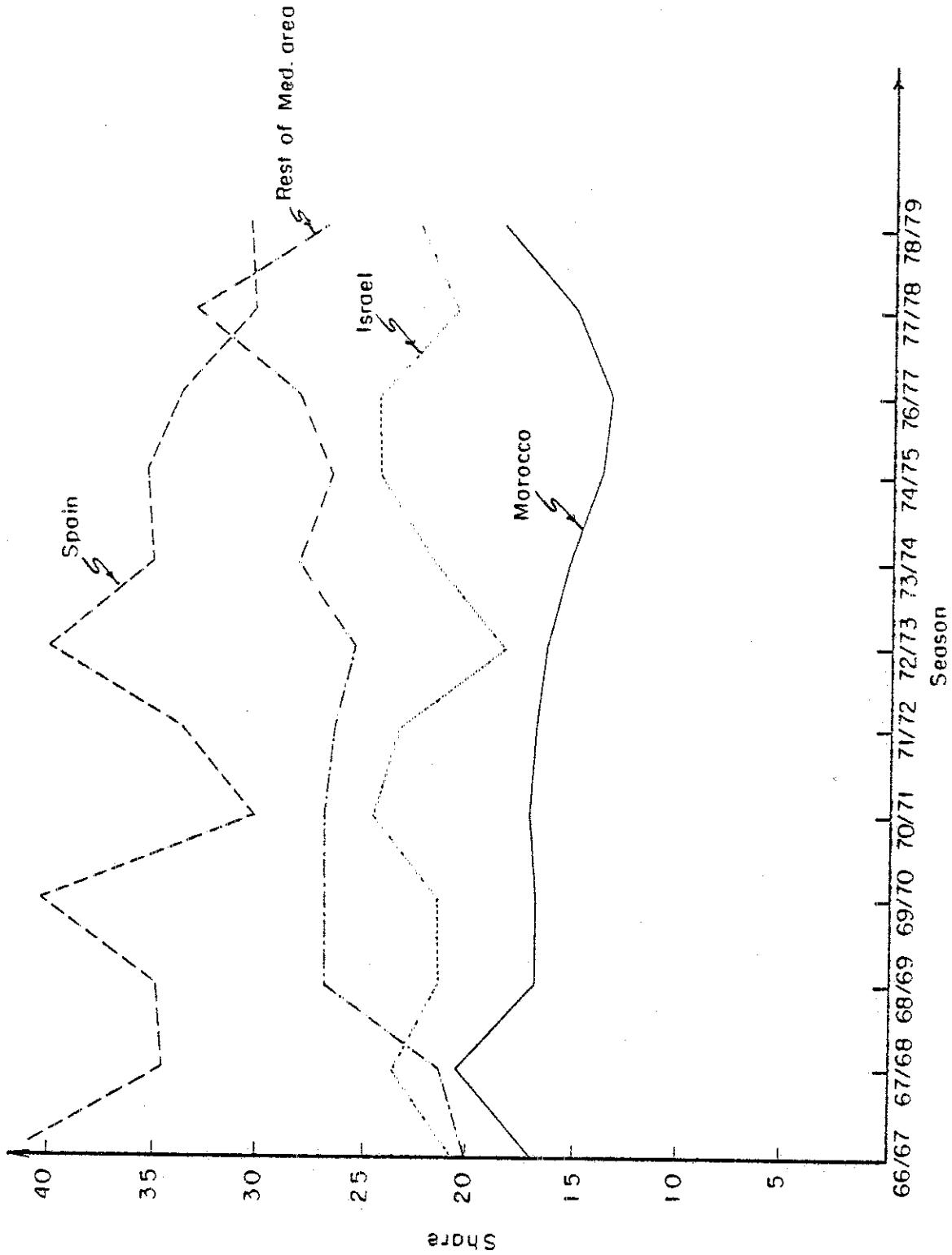
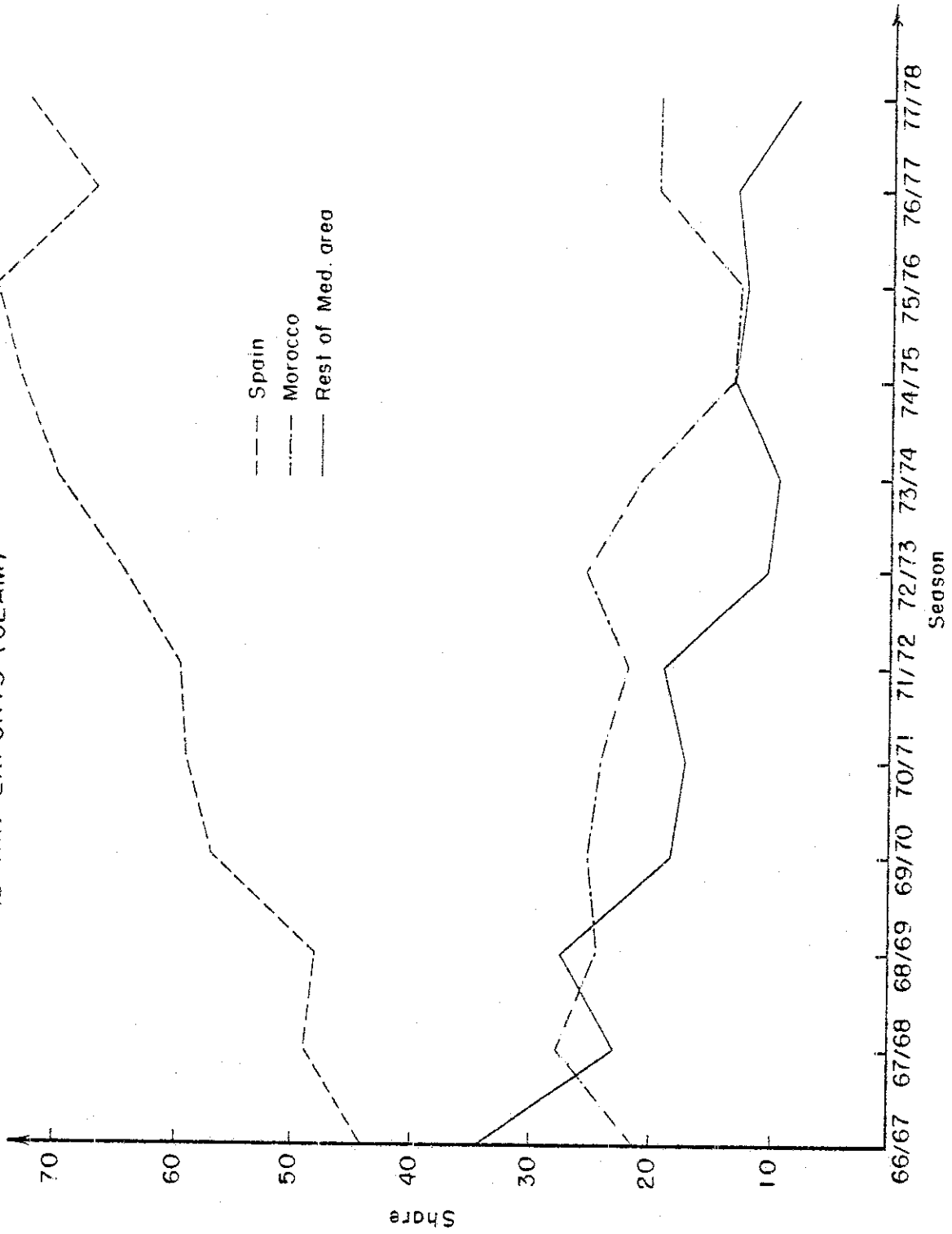


FIGURE 1.5. EXPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN MANDARIN EXPORTS (CLAM)



to total Mediterranean orange and mandarin exports. For oranges a decreasing share is apparent for Spain. However, Spain still remains the leading exporter, followed by Israel, with an average share around 22 percent but with substantial annual fluctuations due to good or bad productive years. More or less the same has happened to Morocco with a 17 percent share. The Rest of the Mediterranean countries have been exporting around 27 percent of the total for most of the period with a tendency for an increase in their share in recent years.

In the case of mandarins Spain has been steadily increasing its share to roughly 70 percent, to the detriment of both Morocco and the Rest of the Mediterranean Area.

Spain, Morocco and Israel collectively have accounted for around 75 percent of total Mediterranean orange exports on the average and the former two countries have increased their combined mandarin export share from around 70 to roughly 90 percent.

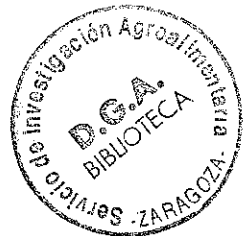
Market allocation for Spain, Israel and Morocco has been influenced by their geographical location, historical trade linkages, tariff barriers or preferences and marketing decision making structure. Thus Spain benefits from being geographically close to the major importing countries, France and Germany. Most of the exports to these countries are trucked with two to five days the normal delivery time. Israel and Morocco need to ship their exports by boat. This means of transportation introduces some inflexibility in their decisions and a greater lapse of time between packing and distribution through wholesale markets.

Israel and Morocco have had strong ties with England and France, respectively. These have affected their trade, either by creating sound channels of distribution as in the case of Israel in England, or via tariff advantages granted by France to its previous colony, Morocco.

The most important European consuming countries have set tariffs for both oranges and mandarins but with the exception of the European Community these have been at low levels. Lack of internal production is the main reason for low tariffs in most cases. The European Community has a high tariff to protect Italian producers. The European Community has a common external tariff system but has established preferential tariff levels for individual Mediterranean exporters.

Producer market allocation decisions are affected by marketing structure in each exporting country. Israel and Morocco have Marketing Boards with complete control over exports, whereas Spain has a decentralised system. However the Spanish system has become more regulated in recent years in order to deal with the European Community's tariff system. Since 1972 Spain has had a regulatory committee whose main objective is to limit Spanish exports if prices fall to low levels in the European Community. The setting of quality export standards and promoting Spanish oranges and mandarins in European markets are its other activities.

Italy is the second largest producer of oranges in the Mediterranean Area but its exports have remained at a low level, accounting for less than 5 percent of total Mediterranean orange exports. Its varietal production, which is dominated by Blood and White orange types, is not well accepted in European markets and provides probably the most



important reason for its low export activity. Although Italy has enjoyed the tariff advantages of membership of the European Community its exports are primarily sent outside to Austria, Switzerland and the Scandinavian countries.

Greece, Egypt, Cyprus, Tunisia, Algeria, Turkey and Libano comprise the rest of the Mediterranean exporting countries. The market shares of each has been under 5 percent of the total orange and mandarin exports in the Mediterranean Area during the last decade. Some countries like Greece and Egypt have been expanding their exports whereas Algeria has decreased in significance since becoming an independent country.

1.2.2 European importing countries

European countries are almost the exclusive importers of oranges and mandarins from the Mediterranean Area. Western and Eastern European markets have distinct characteristics, differentiating a capitalist from a socialist economy. In Western Europe the European Community (EC) members and the rest of the countries have followed different importing policies. The European Community has enlarged its membership from its original 6, to 9 countries. The founder members were: Germany, France, Italy, Holland, Belgium and Luxembourg. Great Britain, Ireland and Denmark are the new members. Sweden, Norway, Finland, Switzerland, and Austria comprise the other Western European consuming countries.

In this study the consuming countries are divided into groups in which importing policy has been relatively homogeneous from 1966/67 to 1975/76. Importing markets were divided into 5 groups: 1) the 6 original European Community members, 2) the 3 new European Community

members, 3) the rest of the Western European countries, 4) the East European countries and, 5) countries from outside Europe that import from the Mediterranean Area.

In Figure 1.6 the relative significance and share of each group for oranges imported from the Mediterranean Area is given. The 6 original EC members are by far the leading group. With the exception of Eastern Europe, all the groups have not significantly changed their relative share over the period. The East European countries, with low consumption per capita, have been increasing their share of imports from the Area and gaining importance with respect to other groups. The enlarged European Community of 9 members accounts for 60 percent of the total imports from the Mediterranean Area. At the other extreme, non-European countries have been importing around 5 percent of the total exports from the Area. For mandarins (Figure 1.7) the difference between the original EC and the rest is even more pronounced. Import shares for all economic groups have been constant. Non-European countries are not represented because they have not accounted for 1.5 percent of total mandarin Mediterranean exports in any year. The enlarged EC accounts for more than 80 percent of total mandarin exports.

Similar information for both orange and mandarin import shares by individual countries is given in Figures 1.8 and 1.9. Only countries with a share greater than 5 percent have been graphed. The United Kingdom and Ireland are aggregated because they were jointly reported in the statistical sources employed. Germany and France are the two most important importers with very similar import shares. The United Kingdom plus Ireland and Holland also have similar shares. Relative

FIGURE 1.6. ORANGE IMPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN AREA ORANGE EXPORTS SPECIFIED BY ECONOMIC BLOC (CLAM)

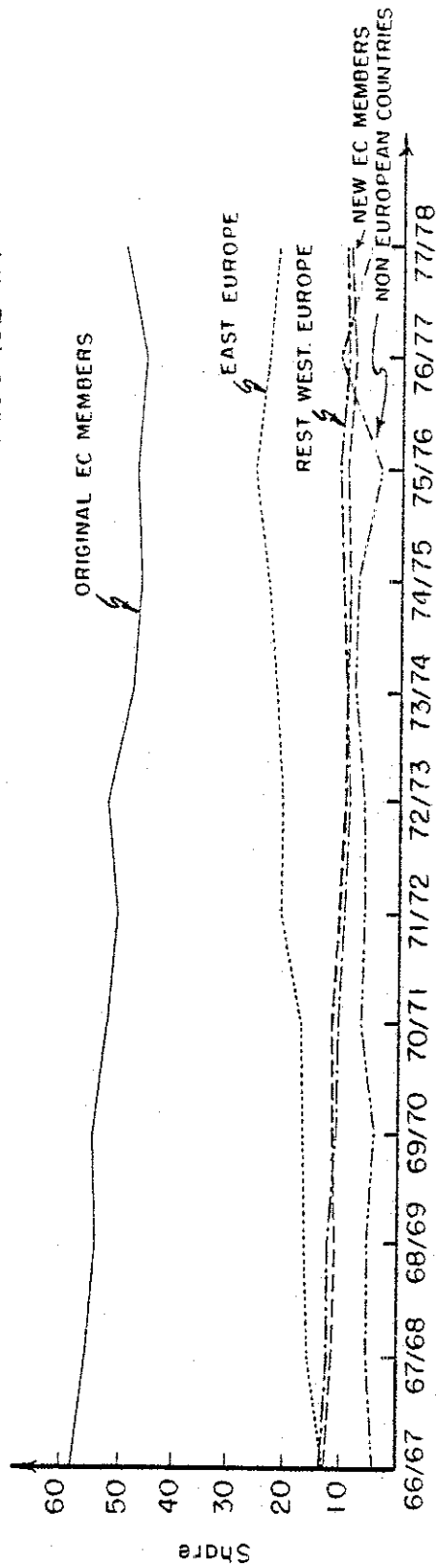


FIGURE 1.7. MANDARIN IMPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN AREA MANDARIN EXPORTS SPECIFIED BY ECONOMIC BLOC (CLAM)

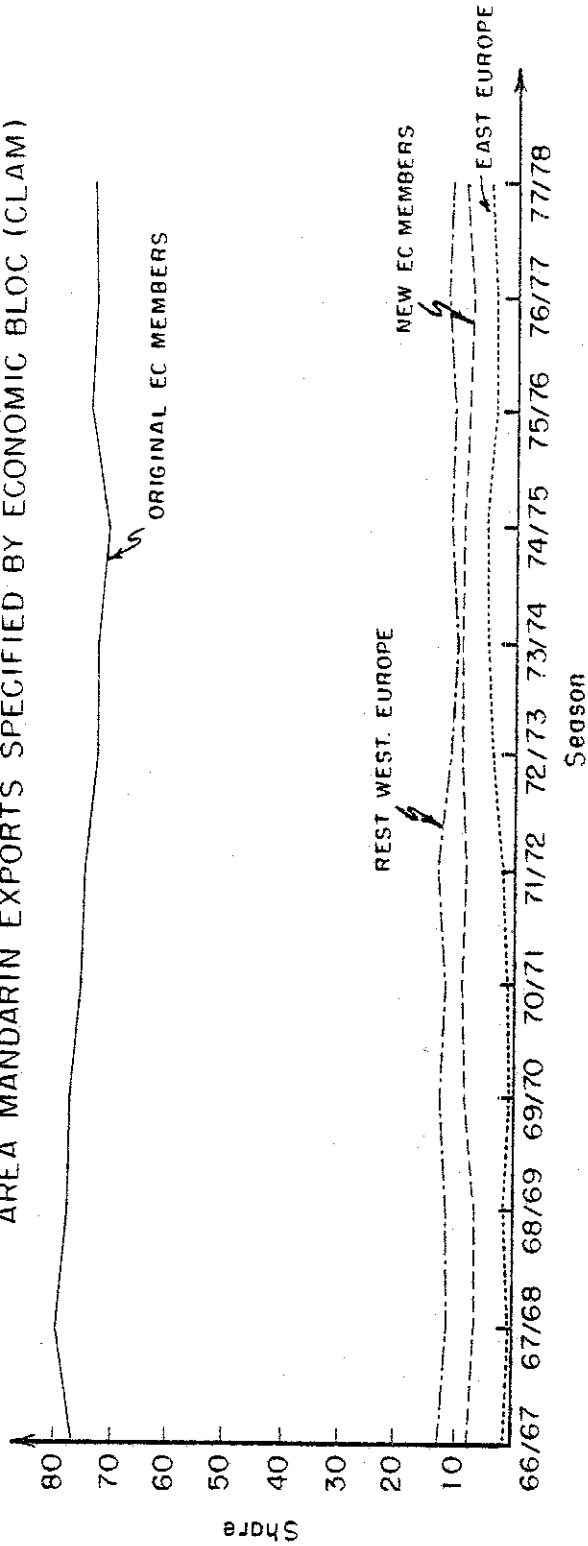


FIGURE 1.8. ORANGE IMPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN AREA ORANGE EXPORTS SPECIFIED BY COUNTRY (CLAM)

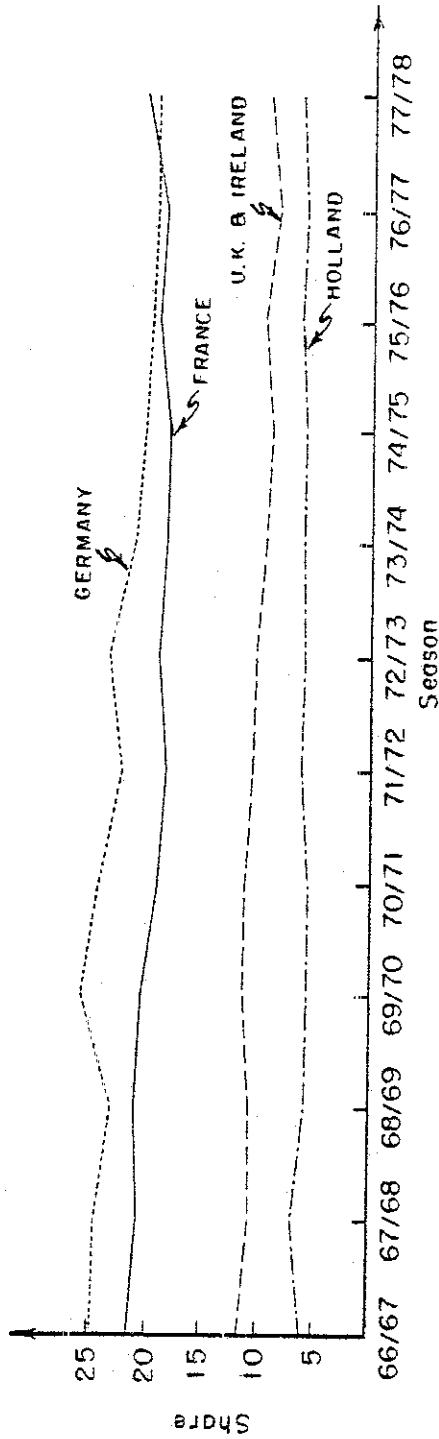
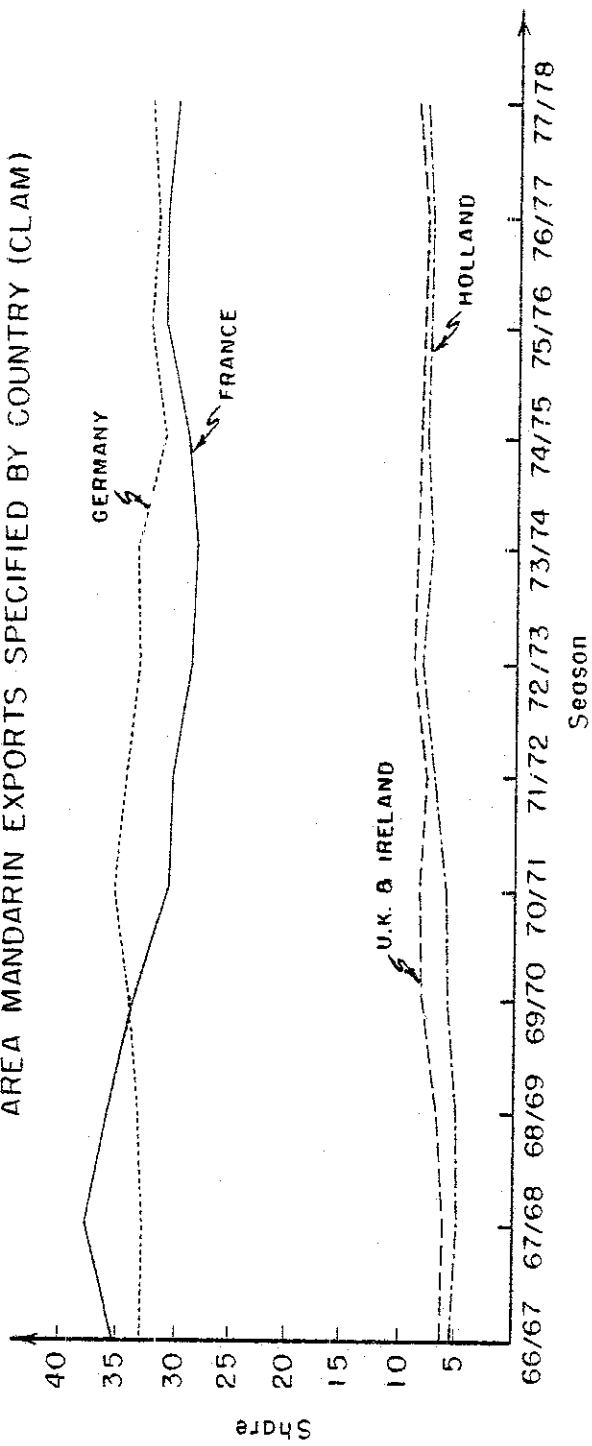


FIGURE 1.9. MANDARIN IMPORT SHARES WITH RESPECT TO TOTAL MEDITERRANEAN AREA MANDARIN EXPORTS SPECIFIED BY COUNTRY (CLAM)



shares among these leading countries have not changed substantially over the period.

1.3 Main factors affecting consuming patterns and their implications for production and trade

In the long run the preferences of European consumers have been the most important determinant of trade. Their tastes have been constantly changing during the last 30 years. From consuming oranges of the Blood type with a high juice content and red flesh they switched to sweet seedless orange varieties and more recently to mandarins, which combine seedless sweet characteristics with a loose easy-to-peel skin.

Changes in consumer preferences have had a direct influence on international market prices, on farmers' prices and their planting decisions. Marketing Boards have had a tendency to standardize production more than the decentralized Spanish system where a greater varietal diversity has existed. Planting decisions are particularly important because an investment decision extending for a period of over 20 years ahead is involved. The kind of variety selected also determines whether production is to be dedicated mainly to fresh consumption or processed juices.

Consumers' tastes vary from country to country with consumption primarily depending on the time of the day when the fruit is taken, the segment of the population consuming the fruit, the image and attributes that consumers recognize and overall quality.

"Juiciness" and "healthiness" have been the two most important attributes determining consumers attitudes towards oranges. Increasing imports of citrus juices in European markets with a stagnant market

for fresh oranges and an increasing preference for fresh mandarins seem to indicate the existence of a substitution effect among different varieties and juices. Spain and Morocco have dedicated more effort to the improvement of their mandarin production to cope with these trends and Israel has emphasized juice production and alternative fruits such as grapefruit. Grapefruit exports from the Mediterranean Area, however, still represent less than 10 percent of the amount of orange and mandarin exports from the Area.

The main exporting countries have been devoting a greater part of their marketing budget for promotional activities. Extensive use of television advertising in critical periods is common practice with emphasis on health and vitamin C content and on the fact that the fruit spends only a few days from picking until it reaches the market.

Reliable and standard quality has been a constant desire by consumers and a constant problem for suppliers who see the quality of their fruit changing each season according to weather conditions. In order to cope with this problem, exporters have tried to be more strict in controlling quality by not allowing exports of substandard fruit. Each country has created brand names through which consumers can identify quality and upon which they can rely from season to season.

The spread of supermarket chains in European countries and consequently consumers' expectation of quality standards and price has had a definite impact on exporters. Neat produce presentation, regular supplies and high quality are normal requirements in these market outlets.

The total marketing period of 9 months for the "winter" season can be divided into three quarters. Each has unique consumption peculiarities and price fluctuations. Varieties are normally harvested during a span of three to four months. Planting diversification tries to avoid the effects of having all production locked into a particular quarter as well as trying to minimize the frost damage that might occur at different times during the season.

1.4 Long and short run problems for Mediterranean exporting countries

Oranges and mandarins are perennial plants with a long productive cycle. Their main feature is that once a tree is planted it remains in production for many years. At least ten years are necessary for the plant to reach full production. Long run market predictions are essential elements for individual farmers or countries involved in these crops in order to plan ahead and to estimate investment returns. For Spain this need is even more indispensable for the next few years since a large amount of hectares are going to become irrigated as a result of diverting the headwaters of the river Tajo to the Southeast.

Market prices in competitive European markets are interrelated and basically the result of the demand and supply situation. Mediterranean exporting countries are concerned about future market prices and their determinants. During the last few years fears have risen among Mediterranean countries that oversupply will be a threat in the near future. It is believed that consumption is stagnant while supply is constantly rising.

A better knowledge of this potential problem is a great relevance for the Area. If the problem is real then exporters would wish to know the amount of produce that European markets might consume in the future at prices not too low for their profit expectations. If market saturation is going to be a common trend in the future, Mediterranean countries will be interested in knowing how to allocate in the short run among different European markets and the quantity they might need to divert to other geographical areas in order to preserve prices in Europe.

Oranges and mandarins have been analyzed together in this study because Spanish farmers consider the two fruits as close investment alternatives when they plant their trees.

1.5 Objectives

In order to have a better analytical insight into the market the main factors affecting supply, exports, imports, international market prices and the relationship between international and farmers' prices in exporting countries must be determined. Therefore the objectives of the analysis are the following,

- 1) To analyze the main factors affecting supply of oranges and mandarins in the Mediterranean Area.
- 2) To determine the relationship between supply and exports for both oranges and mandarins in the Mediterranean Area.
- 3) To evaluate the impact that the European Community tariff policy has had on orange and mandarin prices in the Community and in other European markets.
- 4) To establish the elements that determine orange and mandarin imports in Western and Eastern European countries.
- 5) To explain relationships between international and farmers' prices at a national level.

6) To provide a quantitative framework for supply, exports, imports and prices for oranges and mandarins from the Mediterranean Area which could be used for policy analysis.



CHAPTER II

SUPPLY OF ORANGES AND MANDARINS IN THE MEDITERRANEAN AREA: STRUCTURAL AND ANALYTICAL FOUNDATIONS

2.1 Geographical and Socioeconomic Characteristics

Spanish, Israel and Moroccan orange exports are studied separately from other Mediterranean countries because of their importance in total orange exports from the Mediterranean Area. In the case of mandarins only Spain and Morocco were selected for the same reason. A "Rest of the Mediterranean Area" was used for other Mediterranean countries in each case.

2.1.1 Spain

Oranges and mandarins are found in Spain mainly along the Mediterranean coast and the Andalusian provinces since these regions have favorable climatic conditions. The most important factors are a comparatively low probability of frost, adequate daily temperature and temperature variation, and availability of sufficient irrigation water. All the orchards need to be irrigated due to insufficient total precipitation and poor distribution of rain throughout the year. Rain mainly falls between September and April. Most of the irrigation is done by canal with water coming primarily from private wells and also from public irrigation channels. Spain has the largest frost risk of all Mediterranean orange exporters.

Valencia, Castellón and Alicante in the Levante or Southeast region are the three most important provinces with around 75 and 95 percent of total Spanish production of oranges and mandarins,

respectively. Valencia has more than half the total planted area for each commodity. Significant future crop expansion is not expected because agricultural land is being absorbed in the traditional citrus areas by industrial, urban and tourist use. These activities pay higher prices for the land than agriculture. However, new irrigated land will be available as a result of diversion of water from the Tajo river to the Southeast part of Spain and this could lead to expansion in the near future.

A large number of orange and mandarin varieties exist. Information on about 25 varieties has been reported in the Spanish Agricultural Statistical Yearbook (Anuario de Estadística Agraria). In this study, orange and mandarin varieties were aggregated into 8 and 3 groups, respectively. Aggregation was performed by taking into consideration similarities among varieties as well as restrictions imposed by available data. In general, the greatest possible disaggregation was maintained in forming the groups.

Table 2.1 shows the groups analyzed and the varieties included in each group. Bitter oranges were excluded because of their small overall importance. Their production is localized in Seville province and their end use is specialized for marmalade products. In this thesis, whenever a Spanish varietal name is mentioned it refers to the group's name defined in Table 2.1 unless otherwise specified.

Fresh consumption is the main end use of oranges and mandarins in Spain. Varieties that are not acceptable in the market because of changes of consumers' tastes, produce of low quality and un-exportable surpluses in seasons of excess supply are the reasons why fruit

Table 2.1 SPAIN: Groups of Oranges and Mandarins Analyzed

Group's English Name	Included Varieties by Their Spanish Name
<u>Mandarins</u>	
Satsuma	Satsuma
Clementine	Clementina Fina, Clemenules, Oroval, Monreal
Other Mandarins	Mandarina Común, Wilking
<u>Oranges</u>	
Navelina	Navelina
Navel	Navel: Washington and Thomson, Navelate
Common White	Imperial, Común Temprana, Común Media Estación, Común Tardía, Comuna, Otras Variedades
Salustiana	Salustiana
Other Select White	Cadenera, Castellana, Macetera
Blood Oranges	Sanguina Redonda, Sanguina Oval, Sanguinelli, Navel Sangre, Sanguina Común, Murtera
Late Oranges	Verna, Valencia Late

is diverted to industrial uses. Industrial consumption is only of a residual character and usually accounts for about 10 percent of total production.

The typical orchard is small, especially in the Levante region where it is around one hectare (2.47 acres). Small groves receive garden-like attention difficult to achieve in large commercial plantations. Planting density is very high to ensure maximum use of the small area and interplanting of old and young trees is common practice. The introduction of mechanization is difficult in such orchards. Most of the owners have other activities which provide the bulk of their income or at least provides their major occupation.

Farmers enjoy total freedom to make decisions related to their orchards in terms of varieties planted, management practices, harvesting periods and commercial transactions. The lack of central guidance has resulted in a great diversity of varieties produced. Farmers have been able to minimize risks with respect to frost and market fluctuations by cultivating varieties with different harvesting periods. Table 2.2 indicates the approximate harvesting period for each of the groups defined in Table 2.1. Sometimes notable differences exist between harvesting periods for varieties belonging to the same group.

2.1.2 Israel

Oranges and mandarin production is primarily concentrated along the Mediterranean coastal plain although there are some groves in the desert areas of the interior. The coastal area has high humidity throughout the year and the rainy season extends from November to February. All orchards are irrigated since total rainfall is inadequate for plant requirements. Water is pumped from wells and its

Table 2.2 SPAIN: Harvesting Periods for the Orange and Mandarin Groups Analyzed

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.
<u>Mandarins</u>									
Satsuma									
Clementine									
Other Mandarins									
<u>Oranges</u>									
Navelina									
Navel									
Common White									
Salustiana									
Other Select White									
Blood Orange									
Late Orange									

scarcity has encouraged farmers to develop techniques such as sprinkler irrigation, for its use in the most efficient manner. Lack of water is the main physical impediment to future crop expansion but the desire of the Ministry of Agriculture to diversify crop production is an additional constraint. Frosts are generally of a lower frequency and intensity than in Spain.

The Citrus Marketing Board has exerted a fundamental influence on the industry by regulating production and marketing of oranges and other citrus crops. The Government and the growers are represented on the Board and its marketing policies have had a definitive impact on farmers' decisions. Prices received by farmers reflect a pooled price system that distributes revenue according to the time the fruit is picked and by variety, size and quality. Payments are given in installments throughout the season.

Shamouti is by far the leading variety as a result of high levels of standardization in productive practices. Grapefruit has received great attention as a plausible alternative crop. Valencia, Washington Navel and Clementine are other orange varieties cultivated but are small in comparison to the Shamouti.

In the study, three varietal groups were formed for Israel:

1) Shamouti, 2) Late Oranges and, 3) "Other Oranges and Mandarins." The first group is composed of the variety Shamouti, the second is mainly composed of Valencia but includes other varieties harvested late in the season and the third group is mostly composed of Navels but includes Clementines and remaining orange and mandarin varieties.

Shamouti is mainly a mid-season variety and is harvested from December to March. Other varieties follow a similar schedule to those given for Spain in Table 2.1 for the same varieties.

The greatest share of total Israel production goes into fresh consumption but industrial use for juice has at times amounted to 40 percent of the total crop. Industrial use receives greater emphasis in Israel than in the other Mediterranean countries but always employs the lowest quality produce.

Orchards have achieved a high degree of mechanization in order to compensate for high labor costs. Yields are the highest in the Mediterranean Area. Groves are both communally and privately owned but the former mode of tenure is the more common. This kind of organization favors the transmission and enforcement of policies determined by the Citrus Marketing Board.

2.1.3 Morocco

Oranges and mandarins are cultivated in scattered areas, from the Mediterranean coast in the Northeast to the most southerly areas on the Atlantic Coast around Agadir. Such variation of location is due to the low risk of frost and the existence of a number of geographical areas with suitable conditions to grow oranges and mandarins. However, the country can be partitioned into two major zones, the first around Rabat, extending to the Mediterranean Coast and the second to the south of Casablanca along the Atlantic Coast and extending into the interior.

Areas along the coast and in the North have greater precipitation than those located in the South closer to the desert and in the interior. Rain mostly falls from October to April or May all over the

country. As in other Mediterranean countries, water is the main limiting factor since the plants need to be irrigated because of insufficient precipitation. New irrigation projects have considerably expanded the area planted, for example, in Tadla where water is drawn from the Omm er Rbia and there is potential for further increases in the future.

The Gharb region on the Atlantic Coast between Rabat and Larache, the Souss region on the southern Atlantic coastline around Agadir, the Tadla region in the interior around Beni-Mellal and the Oriental region in the North along the Mediterranean Coast and around Bercane, account for more than 80 percent of the total area planted to oranges and mandarins.

A large number of orange and mandarin varieties are cultivated. However, only two groups are identified in this study, "Oranges" and "Mandarins," because of the lack of annual data by variety. Exports of fresh fruit dominate with marginal and low quality produce going for industrial use and for internal fresh consumption.

The Government has exercised a great deal of control on farmers by not allowing exports of certain outmoded varieties to European markets, subsidizing the uprooting of plants and by providing technical services.

The O.C.E. (Office de Commercialisation et d'Exportation) is a Marketing Board which controls all exports and fixes the prices received by farmers. The O.C.E. signs contracts with farmers desiring to export their production. Farmers receive part-payment when the contract is signed in accordance with total expected exportable production. Further payment is made when the crop is harvested and



finally at the end of the season. Half of total profits on trading in each season is taken by the O.C.E. and the other half is distributed to farmers. Recent policy, based on future export market expectations, has tended to encourage plantings of three varieties; Clementines, Navels and Late Oranges for the early, mid and late harvesting seasons respectively.

Harvesting periods vary slightly from the ones in Spain since maturity is reached somewhat earlier.

2.1.4 Rest of the Mediterranean Area

The remainder of the Mediterranean exporting countries have been studied together either because of lack of data for a particular country or its minor impact on total exports from the Area.

Italy, Greece, Turkey, Lebanon, Egypt, Cyprus, Lybia, Algeria and Tunisia are included in the group. All of these have orchards along their Mediterranean coastlines. They have similar climatological characteristics to the countries described above and their orchards also require irrigation.

In general, the varieties of oranges and mandarins produced are similar to the ones described for the three leading exporting countries but in some cases (for example, Italy) adjustment towards improved varieties has not occurred at the same rate as in those countries. Oranges and mandarins were neglected in Algeria after the granting of independence from France and a large proportion of total production in Greece has been dedicated to juices.

A diverse range of Governmental marketing and production arrangements exist in these countries, from full regulatory marketing boards to a total absence of central intervention.

2.2 Analytical Approach

2.2.1 Yield Response

2.2.1.1 Yield Profile and Other Factors Affecting Yields

Both oranges and mandarins are derived from perennial plants. Perennials are primarily characterized by a life cycle of more than two years although usually it extends beyond this period and in some cases for as much as one hundred years or more. What basically distinguishes perennials is a four-stage productive profile; first they remain unproductive, then yields increase, in the third stage they remain at peak production and finally yields decrease towards zero productivity again.

Oranges and mandarins follow this general yield pattern but the number of years spent in each stage varies with climate, variety, soil, and cultural practices. In the case of oranges, the most appropriate climates are the subtropical climates ranging between 30° and 40° north and south of the Equator.

The Mediterranean Area and California belong to this climatic belt. Rausser (1971) compiled data on yield by age of tree for Navel and Valencia orange varieties in California. In his study both varieties were observed to have similar yield trends. The average profile of the two varieties indicates that the first two years are unproductive, in the third year, production reaches over 25 percent of peak level, around 75 percent is achieved the seventh year, full production is maintained between the 13th and the 16th years, and from then on yields decrease slowly to around 50 percent of peak production when the tree reaches 60 years of age.

Factors affecting yields can be divided into long and short run. Physical and management factors primarily determine yields in the long run whereas the weather has a greater impact in any particular season.

Age is the most important physical factor because the great productive variability that exists across the life cycle of the plant. Soil depth determines the size of the root surface which is directly related to the bearing surface. Soil fertility and its ability to hold moisture have a major impact on yields. Density of planting can have a negative effect if it is too high, as happens in many instances. Yield differences exist among varieties and the combination of a particular variety and rootstock. Management and cultural practices include the use of pesticides, insecticides, fertilizers and operations like irrigation and pruning. A good irrigation program during the season is crucial in the Mediterranean Area to compensate for the lack of precipitation in certain periods of the year.

Rainfall and temperature are the two main weather factors. Their effects are primarily manifested through the level of soil moisture which, under normal climatological conditions, is the most relevant determinant of yield response (Parvin, 1970). Koo (1969) indicates that an optimum balance of soil moisture with respect to water holding capacity might be the best indicator of the need for extra irrigation. This could be calculated through evapotranspiration scales based on rain and temperature.

Oranges and mandarins do not grow constantly throughout the season. They have active and dormant periods linked to climate. They enter a dormant period to protect themselves against unfavorable

climatic conditions. A minimum temperature and humidity is needed for them to grow and if these are not met, the plant remains inactive. In the Mediterranean Area the trees are dormant in the winter season for two to four months. Once climatological conditions remain favorable for a sufficient period the plants react by developing buds and blossoming. Blossoms develop in the spring, usually from three to five months after the winter solstice depending on weather conditions and other physical and cultural factors.

There is a period around two months after blossoming when the tree retains only the fruit that it is able to support and sheds the rest. This is called the "June drop" because of the month during which it primarily occurs. High temperatures and low rainfall in May and June increase the size of the "drop."

2.2.1.2 Previous Models

Several researchers have used econometric models to study the influence of some of the factors mentioned above under circumstances similar to those in the Mediterranean Area. Some of the models dealing with actual macroclimatic conditions (not those of a controlled environment) have been useful in helping select factors to consider. Jones and Cree (1965) analyzed yields of Washington Navels in California, reaching the conclusion that high temperatures in May-June, which affect the "June drop," have the most adverse effects. Kuznets (1950) specified the following weather variables for oranges in California: number of entirely cloudy days during December 16 to February 15 (the period preceding bloom), average temperature from February 15 until March 15 (period of peak bloom), and average maximum temperature between the 46th and 75th day after bloom. Kuznets et al. (1950),

in a different study, uses similar variables but splits the last one into two periods. Rausser (1971) experiments with different specifications of Navel and Valencia yield equations which include variables to reflect age structure, moderate and intense frost periods, maximum temperatures during May and June, and total rainfall in March and April.

2.2.1.3 Critical Factors and Periods in the Mediterranean Area

In this section, only Spain, Israel and Morocco are discussed among all the Mediterranean countries because they are the only countries where yields will be studied.

The significance and intensity of factors that affect yields are difficult to generalize for large geographical areas. Some of them, for example frost damage, should be analyzed on a regional or county level if possible to produce the most meaningful results. The scope of this study prevents such detail. Countries are adopted as the geographical unit to be analyzed and some adjustments will be introduced to account for regional differences.

The age structure of the orchards has an impact on yields, but this influence is unlikely to be homogeneous over the whole Area because of differences in varieties and diverse geographical and cultural practices.

Cultural and managerial practices differ among countries in the Mediterranean Area but they reflect a long period of adjustment to optimum practices given physical and other restrictions in any particular country. Gradual changes in practices are difficult to include in a regression analysis.

In a single season the weather provides the main source of variations. It is this element which needs to be analyzed with care for each country. Frosts have the strongest negative influence. There are two periods when frosts can have a damaging affect, either during the blooming period, in which case the consequences will be felt during the next cropping season, or during the ripening period, especially during December to February. The first kind of frost is not as dangerous as the second because the plant is usually able to reestablish a physiological balance and to partially compensate for the loss. The second kind of frost exerts a more damaging effect. The duration of the frost is as important as the minimum temperature reached when frost occurs. Spain has the greatest frost hazard, Israel suffers from a bad frost every six or seven years. Morocco has a very low frost risk but the North is more exposed to this kind of hazard.

Extreme high temperatures can create problems, but are not common in Spain. If they occur their duration is usually limited and can usually be offset by timed irrigation. Moroccan orchards are subject to severe periods of heat that can be aggravated by strong winds (the Sirocco) coming from the Sahara desert.

During the season a lack of precipitation is offset by irrigation. Spain and Morocco have generally had enough water resources available during acute water shortages. Israel has been more restricted in its water resources. The most water is required during March and April, the blooming period, but during the early fall it has been noticed that abundant precipitation exerts a beneficial effect (Gonzalez-Sicilia, 1960). The plant's photosynthetic activity is

increased by cleaning the dust which accumulates on the leaves during the summer. An increase in yields results.

2.2.2 Acreage Response

2.2.2.1 Farming Decisions

Planting is the most crucial decision the farmer makes. This is because of the number of years that the land is to be committed and the diverse economic conditions that might result from the choice of a particular variety. Oranges and mandarins are considered to be the most profitable crop alternatives in areas where water is available for irrigation and benefit from the moderate Mediterranean climate, for example in the case of the Southeast coastal region in Spain (Maass et al., 1978).

Given that appropriate physical and climatological conditions exist, the variety to be planted needs to be selected. Although oranges and mandarins can be productive for many years, their profitable marketing period might be considerably shorter. This is due to the fact that varieties can become "obsolete" in the market quicker than their physical profile might indicate because of the continuous change in consumer preferences. A sharp decline in market price occurs for those varieties that do not fulfill consumer requirements. Thus, it is important to differentiate between physical and marketing decay. The first is generally longer than the second. Physical decay occurs when yields diminish with respect to maximum potential production. Marketing decay reinforces physical decay and is the period when both effects, decreasing yields and low prices, occur. Marketing decay will affect farmers' expectations about future returns and the profitable life span of the plant.

Planting density needs to be chosen and has an influence on yields. This decision is determined to a great degree by labor practices and the extent of mechanization. Optimal patterns with respect to existing local conditions are usually found in areas where oranges and mandarins have been grown for a long period of time and where the farmers follow well established practices.

Uprooting or removal is probably the second most important decision to be made. It is stimulated by the absolute level of returns, or their level in comparison to other varieties. Expectations about future prospects for other varieties can be of as much influence as current returns. Marketing decay and profitable life expectancy are therefore both elements that influence this decision. Catastrophes like severe frosts and disease, can also have a forceful impact on the decision to remove an existing variety.

Plantings and removals affect the area planted to any particular variety. Removals could be followed by replacements of the same variety or plantings of a new variety. Actual abandonment is usually not practiced in the Mediterranean Area because land usually has too high a value to remain idle.

There are many other decisions that the farmer must make but in terms of area response these are not as important as the ones mentioned above.

2.2.2.2 Nerlovian Models and Their Application to Perennial Plants

Nerlove's work (1958) has had a major effect on studies of perennial supply. It provided a dynamic interpretation for Hicks' definition of the elasticity of a particular person's expectations

of the price of a commodity x as the ratio of the proportional rise in expected future prices of x to the proportional rise in its current price (Hicks, 1946).

This can be expressed by the following formula

$$\xi_{Px}^* = \frac{\frac{\Delta P_x^*}{P_x^*}}{\frac{\Delta P_x}{P_x}},$$

where, P_x and P_x^* are the price and expected price, respectively, for commodity x . This elasticity tries to express the linkage between the continuous evolvement of expected and actual prices.

The rationale behind Nerlove's model is that farmers make investments based on particular long-run expectations. These expectations are continuously evaluated each season by comparing expected and actual values. New expected values continuously emerge.

By defining P_x^* as the long-run "normal" price, Nerlove's model states that expected "normal" price in time period t is equal to last period's expected "normal" price plus an adjustment factor which is proportional to the difference between last period's actual and expected "normal" price, or in algebraic terms as

$$P_{x,t}^* = P_{x,t-1}^* + \beta [P_{x,t-1} - P_{x,t-1}^*],$$

β is termed the coefficient of expectations (Nerlove, 1958).

Whenever this approach is applied to perennial supply response, it should be borne in mind that expected "normal" prices should be



The same applies if quantity is replaced by area. Total area is sometimes broken down into different components, for example, plantings, bearing acreage and removals. In all of these cases, the same productive adjustment problems occur and Nerlove's formulations are therefore of doubtful use.

2.2.2.3 A Review of Relevant Area Response Models

Perennial supply studies, while not scarce in the literature, are not as abundant as studies for annual plants. They cover a wide range of tropical and subtropical commodities, especially for the former where cocoa, coffee, rubber and tea have received a great deal of attention.

Previous studies for perennial crops have used different approaches to analyze final production. The development of supply theory and the amount of data available have been the main constraints to refinement.

Total quantity produced is the dependent variable for a great number of econometric studies. Whenever possible, production is disaggregated and analyzed by various components. Separate analysis of area and yield response is a further refinement. Plantings and removals have been studied separately if data were available and sometimes bearing and non-bearing trees have been treated independently. Abandonments, if applicable, have been specified as a separate equation.

Studies exist at regional, national and world levels but most focus on a single country as a natural aggregate in which farmers face similar prices and agricultural policies. International models have usually tried to capture the most important operating forces in the

interrelated world markets and their implications for a particular country, or a set of countries.

Among all the studies of perennial plants, four deserve special mention for their innovative contribution to the field.

Bateman (1965, 1969) extensively studied cocoa in Ghana and derived several models to deal with perennial supply response. He assumed that farmers invest with the idea of maximizing the present discounted value of the future stream of net returns and concluded that expected discounted prices are the main determinant of plantings.

The main shortcomings of the approach is the extensive use of Nerlovian adjustment for expected and observable values which, as argued above, is inappropriate for perennial plants.

A supply response model for perennial crops was formulated by French and Matthews (1971). They defined separate structural equations for desired production, desired bearing acreage, plantings, removals and yields. A partial adjustment relationship is specified between expected and actual plantings. This model, although attractive in both theory and scope, results in cumbersome formulations with limited usefulness for empirical studies. In order to achieve more usable specifications and to interpret all the expected variables contained in the model many assumptions need to be made. In the process the final forms generally bear little resemblance to the original specifications. Also Nerlovian adjustment is applied in the planting equation.

Wickens and Greenfield (1973) studied coffee for Brazil. Dissatisfied with Nerlove's approach for perennial plants, they disaggregated total output into two decisions: the investment or long-run decision

and the harvesting or short-run decision. An investment function is derived by maximizing expected discounted net revenue subject to the constraints imposed by the production function. As a result, they obtain a function for plantings which is dependent on expected discounted net revenue. Finally, expected discounted net revenue is calculated as a distributed lag of current and past prices. Their estimated equation has total area dependent on area and prices lagged several periods. The final specification closely resembles the Nerlovian models.

This model overcomes some of the criticisms of previous models. Its main weakness is the considerable gap that seems to exist between theoretical development and empirical application. The lack of suitable data forces the authors to simplify extremely their original specification.

Oranges in California and Arizona were studied by Rausser (1971). Plantings, removals and yields were specified separately. The explanation of both plantings and removals is based on the neoclassical theory of investment. This model seems to better represent the elements involved in the investment process than any of the models mentioned above. Whether the neoclassical approach or other alternative investment theories are the most suitable for perennial plants is not clear.

2.2.2.4 The Application of Investment Theory to Perennial Plants

Growing perennial plants has features common to other investment processes where capital needs to be committed for several years. Investment decisions are made bearing in mind long planning horizons.

The time lag structure between plantings and removals, the productive cycle of the plant and the asset fixity involved can best be explained by capital and investment behavior theory.

Investment behavior has received a great deal of attention by econometricians. Several theories have been developed and their common starting point has been to consider that net investment, or the expansion of capital stock, occurs as a result of discrepancies between actual and desired capital, for example

$$I_t = K_t - K_{t-1} = F(K_{t-1}^* - K_{t-1}),$$

where I = net investment, and
 K and K^* = current and desired capital, respectively.

Theories differ when they try to specify desired capital (Elliot, 1973). There are four basic approaches,

1. The capacity utilization or accelerator theory postulates that high levels of investment are associated with high rates of output to capital.
2. The expected profit theory identifies expected profits as the key determinant of investment.
3. The liquidity theory suggests that the internal cash flow of the firm, which determines the supply of funds, is the limiting factor for future investments.
4. The neoclassical theory states that desired capital is equal to the value of output deflated by the price of capital services. The price of capital services depends on the price of investment goods, the cost of capital and the tax structure.

An important characteristic of the debate on these theories has been that different authors while trying to show the superiority of one theory over the other, have treated them as being mutually exclusive.

Numerous efforts have been made to demonstrate the advantages of a particular theory but overall the results are so far inconclusive. There is no clear empirical evidence from time series studies that one theory consistently performs better than any other.

The four theories are not necessarily in conflict but stress factors that might have different relevance or influence depending on the investment circumstances in each particular case. In some instances they may be complementary.

In the current study the liquidity theory was disregarded because in some countries oranges and mandarins receive a great amount of funds which are not derived from the farming sector but from Governmental agencies and external sources like the industrial or service sectors. The neoclassical approach relies on indicators such as taxes and interest rates to measure the cost of capital services which do not have a substantial impact on orange and mandarin investment in the Mediterranean countries. It was therefore also disregarded.

An attempt was made to formulate and apply capacity utilization and expected profits theories. This choice was made based on the opinion that these theories jointly provide an appropriate framework to analyze the elements that characterize investment behavior for perennial plants. Both were developed as alternatives to the rigid accelerator theory which propounds that investment is proportional to changes in output. The rigid accelerator theory has been rejected by empirical research.



Expected profits have a straightforward meaning although when observable variables need to be introduced several alternatives are possible. The capacity utilization concept has generated a wide range of interpretations. Technical and economic capacity (whether an engineering or a cost concept is employed) present two different measures of the same concept and according to Hickman (1957) there is no qualitative dichotomy between them. Capacity should reflect the long-run demand expectations of a firm or industry. Winston (1977) in an attempt to define capacity at a micro and macro level finds that the technical and economic versions might reach the same conclusion as to optimal idling of capital.

The concept of capacity utilization has been particularly useful in cases where business cycles exist. Utilization of capacity is usually defined as actual production over "optimum" capacity.

This concept could apply to perennial crops and varieties which have been regarded as highly profitable for many years, in either developed or underdeveloped countries. The crops may cover vast areas in comparison to other alternatives in a region, implying that the crop has been broadly accepted by farmers. Suitable irrigated land is the main constraint and there are close substitutes that require similar investment patterns in the farming community. Substitutes could be other perennial crops or varieties belonging to the same perennial crop.

The overall economic performance of the perennial crop needs to be regarded as favorable over the years by farmers and investors. The perceived risk of experiencing low returns for the capital invested over a long time horizon is small.

It is assumed that market prices reflect market forces such as changing consumer habits, tastes, trade regulations, transportation costs, marketing services and the overall supply and demand situation.

Plantings and removals are the two most critical decisions that farmers make. In any particular season the difference between plantings and removals results in a net investment or change in capital stock.

Removals may be followed by two possible actions, the first is replanting and the second is idling or removal, without replanting. Consequently

$$\text{net investment} = \text{new plantings} + \text{replantings} - \text{removals without replantings.}$$

In the current case, and using Feldstein and Rothschild's terminology (1974), new plantings correspond to investment for expansion, replantings to replacement and removals to scrapping.

From now on, new plantings plus replantings will simply be called plantings and removals without replantings will be labeled removals. That is to say that investment for expansion and replacement will be affected by the same factors but these are different from the ones affecting removals or scrapping. The final balance can be written

$$\text{net investment} = \text{plantings} - \text{removals.}$$

Although the capital stock should be specified by the physical number of trees, if it is assumed that planting density has not changed markedly over time then area will be an accurate proxy. Net invest-

ment each season can therefore be determined by calculating the difference in total planted area

$$A_{i,t} - A_{i,t-1} = A_{i,t}^P - A_{i,t}^R, \quad (2.1)$$

where A = total acreage planted,
 A^P = plantings,
 A^R = removals, and
 i = variety.

It is hypothesized that farmers determine investment (plantings) based on two main considerations, by comparing expected profitability among similar alternatives and by taking into consideration the "capacity utilization" of each variety or crop. Neither of these two factors fully determine investment and they might reinforce each other or have opposite effects. This could be written for any particular variety as

$$A_{i,t}^P = F_1 (\pi_{1,t}^*, \pi_{i,t}^*, U_{1,t}), \quad (2.2)$$

where A_1^P = plantings for variety 1,
 π_1^* = expected profits for variety 1,
 π_i^* = expected profits for variety i ,
 U_1 = capacity utilization factor for variety 1, and
 $i = 1, 2, 3, \dots, n$.

A plausible way to express the relationship between expected profits for different varieties is in terms of the ratio between a particular variety and an average of all other varieties. By doing so it is assumed that farmers do not necessarily invest only in a leading variety with the greatest expected profits but instead may diversify their investment into varieties that are considered to have greater

expected profits than the average or "normal" expected profit. This could very well reflect the manner by which farmers diversify against future unknown market prices because of changes in consumer preferences and the possibility of physical disasters such as frost and disease. Thus, formula (2.2) becomes

$$A_{1,t}^P = F_2 \left(\frac{\pi_{1,t}^*}{\sum_{i=1}^n \pi_{i,t}^*/n}, U_{1,t} \right). \quad (2.3)$$

Expected profits can be reexpressed in terms of expectations of the three most important components, prices, yields and costs

$$\pi_{i,t}^* = F_3 (P_{i,t}^*, Y_{i,t}^*, C_{i,t}^*), \quad (2.4)$$

where Y_i^* = expected yields for variety i ,
 C_i^* = expected costs for variety i , and
 P_i^* = expected prices for variety i .

It is assumed that in the same physical and economic environment expected yields and costs are very similar for all varieties

$$\begin{aligned} Y_1^* &\cong Y_2^* \cong Y_3^* \cong \dots \cong Y_n^*, \text{ and} \\ C_1^* &\cong C_2^* \cong C_3^* \cong \dots \cong C_n^*. \end{aligned} \quad (2.5)$$

Taking into consideration formulas (2.4) and (2.5), formula (2.3) can be transformed into

$$A_{1,t}^P = F_4 \left(\frac{P_{1,t}^*}{\sum_{i=1}^n P_{i,t}^*/n}, U_{1,t} \right). \quad (2.6)$$

Expected prices are formed on the basis of past price

$$P_{i,t}^* = F_5 (P_{i,t-k}), \quad (2.7)$$

and $K = 1, 2, 3, \dots, m$.

The utilization factor has been usually defined as the ratio of output to capital. If total capital stock reflects demand expectations in the long-run, output is the response to demand conditions in the short-run with all the inflexibilities and peculiarities that an industry or enterprise has to face in terms of time adjustments and its ability to react in an environment of scarce resources.

In the case of perennial plants the "long-run" could be related to the full productive life span of the plant and the short-run to the lag between planting and when the plant begins to bear. Once the plant starts to produce, it is assumed that other productive inputs or managerial care are not affected by product market prices. Capital can be represented by the capital stock of plants or total area planted for each particular variety and output will be closely related to the bearing area

$$U_{i,t} = \frac{A_{i,t-k}^b}{A_{i,t-k}}, \quad (2.8)$$

where A_i^b = bearing area for variety i .

Substituting (2.7) and (2.8) into (2.6) yields

$$A_{1,t}^P = F_6 \left(\frac{P_{1,t-k}}{P_{t-k}}, \frac{A_{1,t-k}^b}{A_{1,t-k}} \right), \quad (2.9)$$

where

$$\bar{P} = \frac{\sum_{i=1}^n P_i}{n}.$$

In an explicit form

$$A_{1,t}^P = a + b \frac{P_{1,t-k}}{P_{t-k}} + c \frac{A_{1,t-k}^b}{A_{1,t-k}}, \quad (2.10)$$

where $b > 0$ and $c > 0$.

The same utilization concept it assumed to influence removals but it is measured in a different manner. If high ratios of bearing area to total area are an incentive for farmers to plant, it can be argued that a high ratio of area with old plants to total area is an incentive for removal. Removals can be formulated as

$$A_{i,t}^R = F_7 (D_{i,t}), \quad (2.11)$$

where D_i = capacity disutilization factor for variety i ,

and in explicit form for variety 1

$$A_{1,t}^R = d + e \frac{A_{1,t-k}^O}{A_{1,t-k}}, \quad (2.12)$$

where A_1^O = old bearing area for variety 1,

and $e > 0$.

CHAPTER III

SUPPLY OF ORANGES AND MANDARINS IN THE MEDITERRANEAN AREA; EMPIRICAL FINDINGS

Preamble

Separate area and yield response analyses have been performed to study supply whenever possible. Total supply was analyzed if data were not available on area. This was the case for part of the Israeli supply and total supply from the "Rest of the Mediterranean Area."

As a norm throughout the empirical analyses, the coefficient of multiple determination (R^2), the Durbin-Watson statistic (d) for serial autocorrelation and the standard errors of the estimates (in parenthesis) are reported. Whenever the Durbin-Watson d statistic has inconclusive values, no attempt is made to use an alternative statistical test for autocorrelation.

There will be no specific comments made about the level of significance of the t -values of the coefficients since only the "true" model is reported but not other specifications which were tried.¹

3.1 Acreage response analyses

3.1.1. Spain

Spain has diverse production of both oranges and mandarins. The greatest disaggregation attainable has been used in the application of the theoretical concepts explained in Chapter II. More

¹ For further details about the significance of the t -values, see T.D. Wallace, "Pretest Estimation in Regression: A Survey," American Journal of Agriculture Economics, 59 (August 1977): 431-443; and G.S. Maddala, Econometrics, (N.Y.: McGraw-Hill Book Co., 1977), 122:123.

data were available for some varieties in this country than in Israel and Morocco. Therefore the theoretical analysis could be tested more thoroughly in Spain. Data, data sources, and the derivation of data are described in detail in Appendix A-1. In this chapter discussion will be limited to a description and explanation of the main courses of action and empirical results.

Data were available for the seasons 1964/65 to 1975/76. For five of the groups of varieties described in Table 2.1, all the necessary information about area and prices existed viz. Satsuma, Clementine, Navel, Blood Orange and Late Oranges. These five varieties accounted for around 75 percent of the total orange and mandarin area in 1975/76. For the rest of the varieties either information about area by age groups, or about prices did not exist or was incomplete.

In the season 1969/70 the Agricultural Statistical Yearbook (Anuario de Estadística Agraria) changed its methods for reporting varieties. Those varieties that were not separately reported before 1969/70 were included in a general group called "Other Oranges." Therefore for the main varieties the entire period from 1964/65 to 1975/76 could be used but for many others only 1969/70 to 1975/76 existed. Consequently the analysis of each was performed in a different manner.

In Table A.1.1 a sharp increase in the total area of Satsuma, Clementine and Naveline is apparent. Common Mandarin, Blood Orange and Common White Oranges show a clear downtrend. Navel, Late Oranges and Salustiana have increased their area at a slow rate while Other Select White oranges show the opposite trend. Total area dedicated to mandarins has increased at a much faster rate than total orange area.

Three censuses for oranges and mandarins have been published in Spain during the period 1964/65 to 1975/76. Two were carried out by the National Syndicate for Fruits and Horticultural Products (Sindicato Nacional de Frutos y Productos Hortícolas) and one by the Ministry of Agriculture. The latter was the most accurate of the three because it was done by aerial photography and intercropping patterns were accounted for in a different manner from the other two censuses. In order to achieve a homogeneous series the two censuses of the Syndicate were selected. They provided the advantage of giving two measurements with the same age structure which provided a base to calculate the rest of the years. For the first census corrections made by Romero (1969) were taken into consideration. Seasonal areas of age groups for plants between 7 and 14 years old and greater than 14 years old were calculated for the five main varieties using a method described in Appendix A-1.

Farmers sell most of their production for fresh consumption but the percentage varies with different varieties. After middlemen have performed the necessary processes of grading and packing the oranges and mandarins, produce unsuitable for the fresh market goes into industrial uses. Prices for fresh consumption reach higher levels than the prices paid by industry. The Government has subsidized some of the crop going to the industry in recent years.

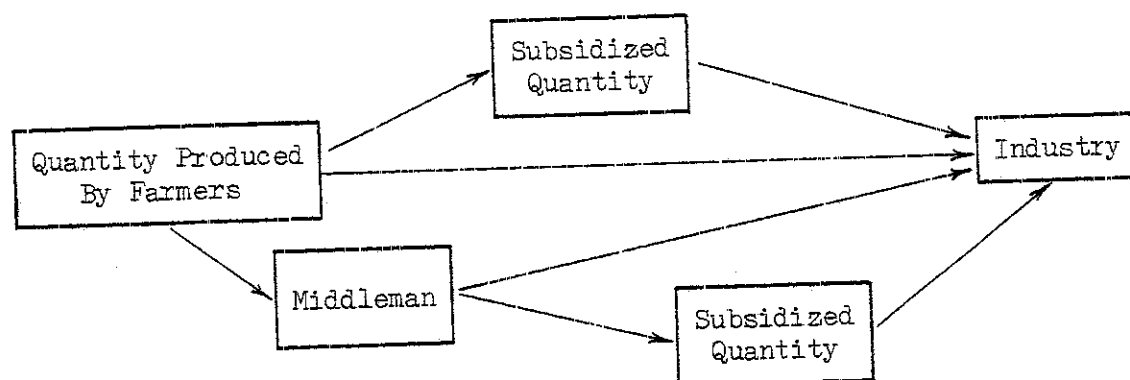
Figure 3.1 shows the different channels through which fruit reaches the industry and the steps at which subsidies are paid by the Government.

Seasonal prices for fresh consumption and for industrial use were calculated for the five main varieties. In order to determine

the effective price received by farmers, subsidies were taken into consideration whenever these were paid.

Table 3.1 shows seasonal farmers' average price for oranges and mandarins in pesetas (pts.) per kilogram and the average price for both crops. Annual orange and mandarin prices reported in the Agricultural Statistical Yearbook were taken as the average price for each respective crop and they represented seasons ending in those reported years, in each case.

Figure 3.1 SPAIN: Marketing Channels for Produce Going to Industrial Use



If these prices are deflated by the wholesale food index price in Table 3.2 then the prices in real (1955) terms of Table 3.3 are derived. The annual index price was taken for seasons ending that year.

The "real" orange and mandarin average price is grouped in Figure 3.2. It demonstrates both a general downtrend and cyclical movements. The following adjustment was taken in order to separate both types of fluctuation; it was assumed that in every season real prices diminished by 1 pts/ton. This accounts for the fall in price of between 2.5 and 5 percent throughout the period. This would be the price effect that farmers face from the spread of more efficient agriculture. They need

Table 3.1 SPAIN: Orange and Mandarin Prices, 1959/60 - 1976/77

Variety	Pesetas per Kg.																	
	59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77
Oranges	4.49	6.24	4.87	4.44	4.05	4.96	4.87	4.90	5.63	6.32	4.55	5.01	4.49	4.22	4.59	6.37	8.20	9.22
Mandarins	5.96	5.69	5.59	6.51	6.15	6.17	8.00	7.81	8.32	8.24	6.31	7.12	5.69	5.77	6.99	9.93	12.75	13.88
Average	5.23	5.97	5.23	5.48	5.10	5.57	6.44	6.36	6.98	7.28	5.43	6.07	5.09	5.00	5.79	8.15	10.48	11.55

Source: Spain. Ministry of Agriculture. Secretaria General Técnica. Anuario de Estadística Agraria. Madrid.

Table 3.2 SPAIN: Wholesale Food Price Index, 1960 - 1977

	1955 = 100																	
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Spain																		
Wholesale Food Price Index	148.9	154.3	166.7	177.1	180.8	209.2	215.6	216.3	222.9	228.3	228.6	244.9	265.7	293.4	331.1	377.1	433.6	501.9

Source: Spain, Ministry of Agriculture, Secretaría General Técnica. Anuario de Estadística Agraria, Madrid.

Table 3.3 SPAIN: Real Orange and Mandarin Average Price (1955 Prices), 1959/60 - 1976/77

	Pesetas per Ton																	
Spain	59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77
Orange and Mandarin Price	35.1	38.7	31.4	31.0	28.2	26.6	29.9	29.4	31.3	31.9	23.8	24.8	19.2	17.0	17.5	21.6	24.2	23.0

Source: Derived as explained in text from Tables 3.1 and 3.2

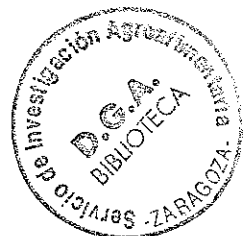
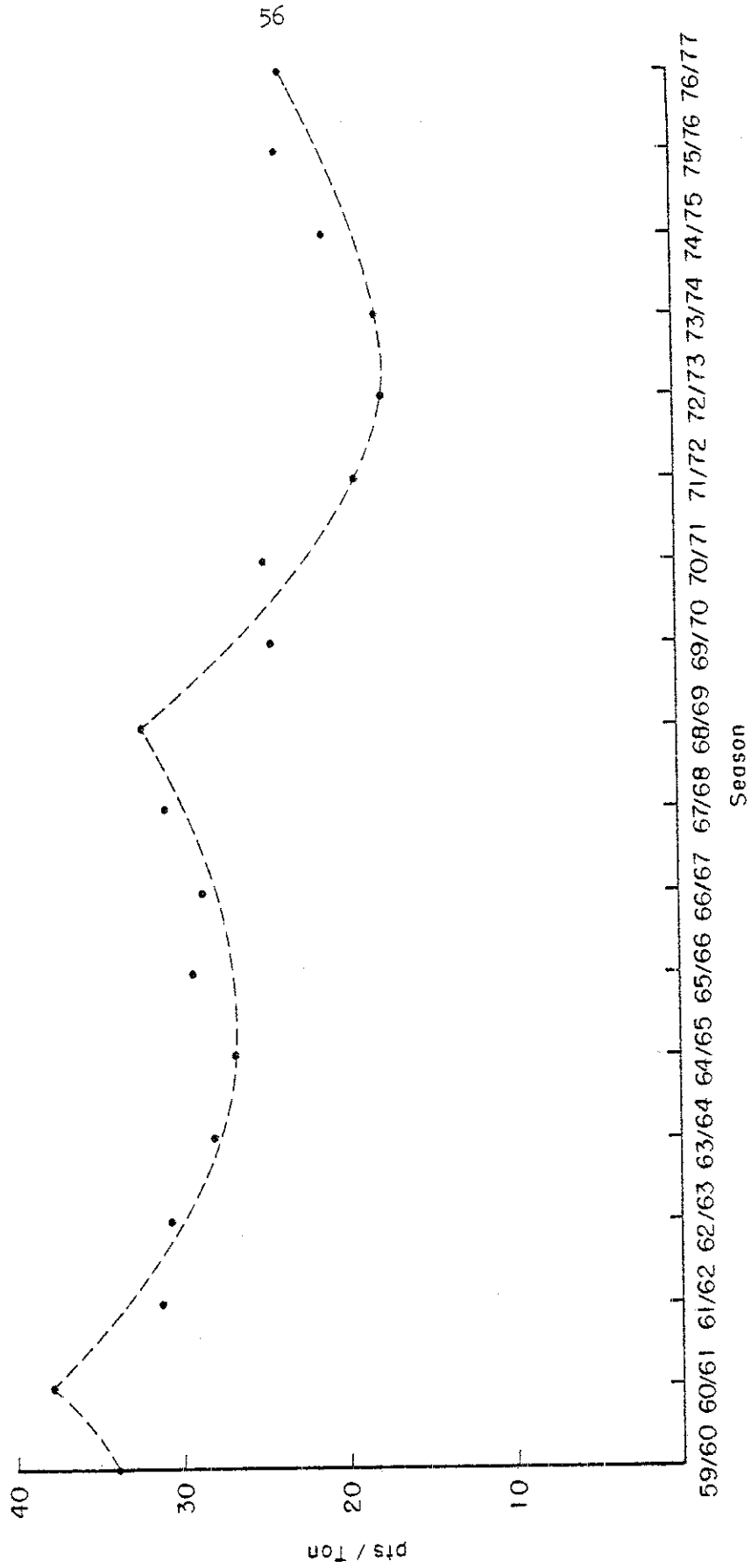


FIGURE 3.2. REAL ORANGE AND MANDARIN AVERAGE PRICE IN SPAIN (1955 PRICES)
 1959/60 - 1976/77 (pts / Ton)



to compensate for it through higher yields from improved varieties or from the managerial and cultural elements under their control.

If this were actually achieved, 1 pts/ton could be added to those years after 1950/60 to see what kind of behavior prices have had after taking into account their secular decline. The adjusted figures are given in Table 3.4 and graphed in Figure 3.3. Two cycles are clearly apparent each with an 8 year duration and a difference of roughly 30 percent between trough and peak prices. Such behavior might be inherent in the investment process for oranges and mandarins because of the gap between planting and bearing but it would be reinforced by investment attitudes and farmer perceptions of future prospects. Knowledge of both the linear and cyclical trends could help investment planning at a macrolevel by improving predictions of prices and consequently returns for the entire marketing life of the trees. The capacity utilization theory which explains the investment process under cyclical behavior or trends might thus have another application in the case of perennial plants.

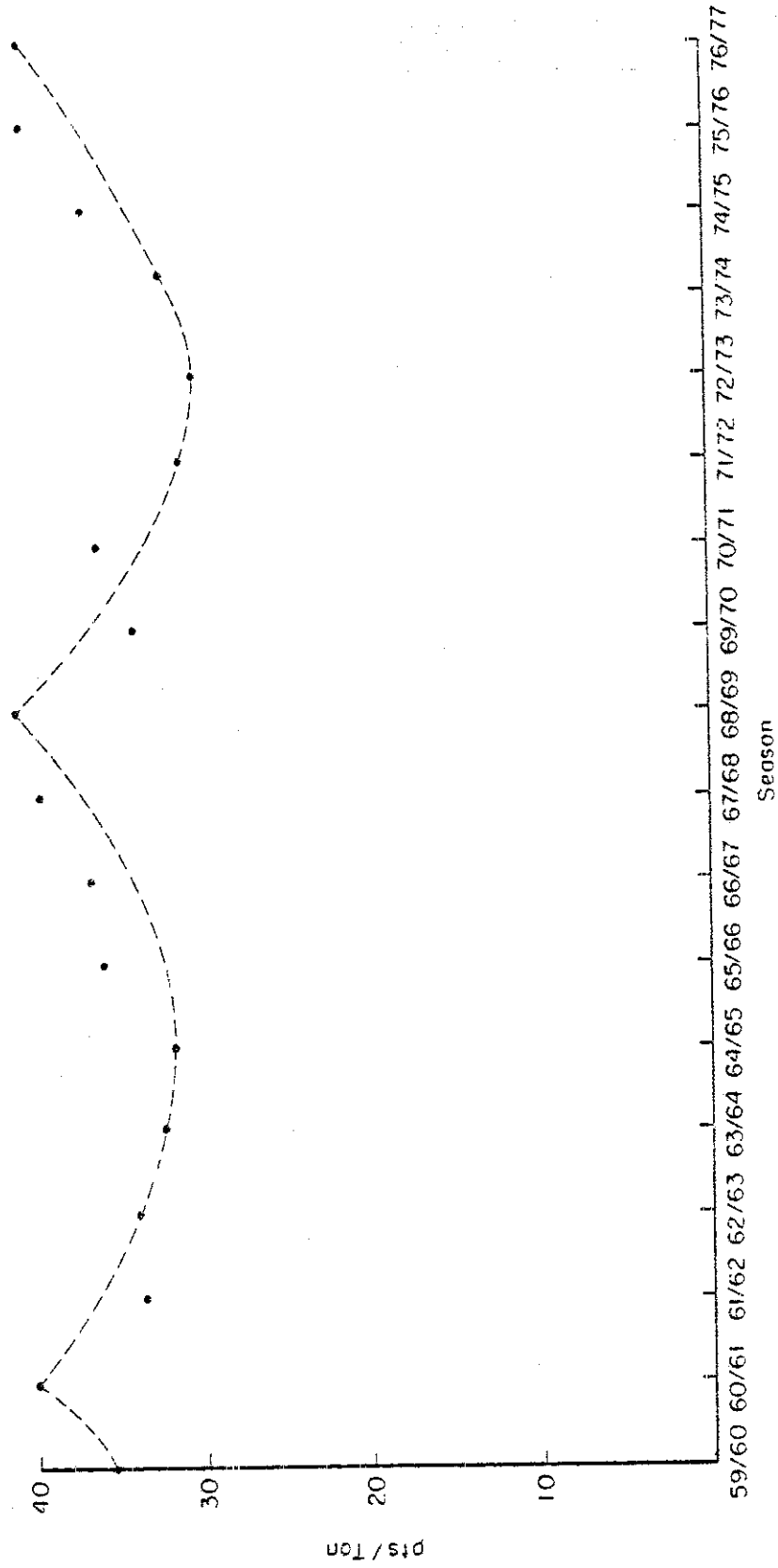
Formula (2.13) was applied to explain changes of total area in two consecutive seasons for the 5 main varieties. Both prices and area by age group were taken with a lag of one period. Consequently all the weight of response was assumed to depend on the most recent events. In Spain trees are generally considered to be bearing from about 5 years old. Area of trees 7 years and older was adopted as a reasonable proxy to represent this group. Trees greater than 14 years old was the breaking point used to represent old trees. Although an age of 14 years might seem too young to provide an indicator of "old" trees in a physical sense, this may not be the case in the marketing sense.

Table 3.4 SPAIN: Adjusted Real Orange and Mandarin Average Price (1955 Prices), 1959/60 - 1976/77

	Pesetas per Ton																	
Spain	59/60	60/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77
Orange and Mandarin Price	35.1	39.7	33.4	34.0	32.2	31.6	35.9	36.4	39.5	40.9	33.8	35.8	31.2	30.0	31.5	36.6	40.2	40.0

Source: Derived as explained in text from Table 3.3

FIGURE 3.3. ADJUSTED REAL ORANGE AND MANDARIN AVERAGE PRICE IN SPAIN (1955 PRICES)
1959/60 - 1976 / 77 (pts / Ton)



Formula (2.13) for estimation purposes is

$$\Delta A_{i,t} = A_{i,t} - A_{i,t-1} = \alpha_{i,t} + \alpha_{i,2} \frac{A_{i,t-1}^{>7}}{A_{i,t-1}} + \alpha_{i,3} \frac{A_{i,t-1}^{>14}}{A_{i,t-1}} + \alpha_{i,4} \frac{P_{i,t-1}}{\bar{P}_{t-1}},$$

where $\alpha_{i,2} > 0$, $\alpha_{i,3} > 0$, $\alpha_{i,4} < 0$,

and $i = 1, \dots, 5$.

The definition of variables and units are:

$\Delta A_i = A_{i,t} - A_{i,t-1}$ = change in total area for variety i in two consecutive seasons (thousand hectares),

$A_i^{>7}$ = area equal or greater than 7 years old for variety i (thousand hectares),

$A_i^{>14}$ = area greater than 14 years old for variety i (thousand hectares),

P_i = real farmer price for variety i (pts/ton), and

\bar{P} = average price of all oranges and mandarines (pts/ton).

Most of the findings from the census undertaken by the Ministry of Agriculture were incorporated in the Agricultural Statistical Yearbook in season 1973/74. This adjustment resulted in notable differences with respect to the previous season for some varieties. Two dummy variables were introduced to account for discontinuities; one relates to the season 1973/74 and the second to seasons 1973/74 to 1975/76. Those dummy variables are represented by the following symbols

$D73$ = dummy variable for season 1973/74 ($D=1$), and

$DG73$ = dummy variable for seasons 1973/74, 1974/75 and 1975/76 ($D=1$).

Results for the 5 main varieties are reported in Table 3.5. The dependent variable in all cases is the change of total area in consecutive seasons. All the signs of the coefficients are as expected except for $\frac{A_{t-1}^{>14}}{A_{t-1}}$ in the case of Clementine which also has a very small value. This can be explained by the small impact that this variable would have for the youngest variety with a very small stock of aging trees and removals during the study period. The coefficients in general are large with respect to their standard errors and all equations show acceptable statistical fit. Except for Blood Orange the Durbin-Watson statistics have values in the inconclusive region and we could not reject the null hypothesis of serial correlation. Dummies for the discontinuity discussed above improve the explanatory power for four varieties. Only one season was necessary to explain the corrections for Satsuma and Clementine and three seasons for Navel and Late Oranges.

Relative price elasticities with respect to total area were calculated as follows

$$\xi \frac{P_i}{\bar{P}}, t = \frac{d(A_{i,t})}{d\left(\frac{P_{i,t-1}}{\bar{P}_{t-1}}\right)} \cdot \frac{\left(\frac{P_{i,t-1}}{\bar{P}_{t-1}}\right)}{\bar{A}_{i,t}} = a_{i,4} \frac{\left(\frac{P_{i,t-1}}{\bar{P}_{t-1}}\right)}{\bar{A}_{i,t}} .$$

Results for elasticities indicate that relative values among them are in accordance to a priori expectations but with a low value for late oranges.

Table 3.5 SPAIN: Estimated Change of Total Area for the 5 Main Varieties, 1964/65 - 1975/76

Variety	Independent Variables					Mean Values			Elasticity of Relative Prices with Respect to Total Area		
	Constant Term	$\frac{\Delta A_{t-1}^{\geq 7}}{A_{t-1}}$	$\frac{\Delta A_{t-1}^{\geq 14}}{A_{t-1}}$	$\frac{P_{t-1}}{\bar{P}_{t-1}}$	D73	D73	R ²	a		A _t	$\frac{P_{t-1}}{\bar{P}_{t-1}}$
Satsuma	-7.13	.18 (.07)	-.20 (.12)	3.20 (1.91)	8.0 (1.02)		.94	2.17	14.96	1.18	.25
Clementine	-15.43	.11 (.04)	.07 (.07)	4.37 (1.19)	2.75 (1.17)		.91	2.43	14.59	1.69	.51
Navel	-17.53	2.26 (.43)	-2.73 (.68)	21.15 (7.41)	11.23 (2.97)		.84	3.49	63.21	.84	.28
Blood Orange	-23.14	.4 (.11)	-.23 (.09)	4.46 (2.02)			.79	2.01	18.57	.75	.18
Late Orange	-2.31	.67 (.15)	-.92 (.22)	.68 (.52)	-.87 (.49)		.80	2.47	16.62	1.14	.05

General Note

R² denotes the coefficient of multiple determination, a denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: area in thousand hectares
 Independent: $\frac{\Delta A_{t-1}^{\geq 7}}{A_{t-1}}$ = area equal or greater than 7 years old lagged one year (thousand hectares), $\frac{\Delta A_{t-1}^{\geq 14}}{A_{t-1}}$ = area greater than 14 years old lagged one year (thousand hectares), $\frac{P_{t-1}}{\bar{P}_{t-1}}$ = real farmers' price lagged one year (pts/ton), \bar{P}_{t-1} = average price of all oranges and mandarins lagged one year (pts/ton), D73 = dummy variable (D73 = 1 in 1973/74, D073 = dummy variable (D073 = 1 in 1973/74, 1974/75 and 1975/76.)

For the rest of the varieties only Common Mandarin had information about total area from 1964/65 to 1975/76 but not for prices. The other varieties had partial information from 1969/70 to 1975/76, and these varieties were thus aggregated into a group called "Other Oranges" from 1964/65 to 1968/69. Time trends were specified for these varieties and periods to explain the change in total area because of the lack of appropriate information or sufficient number of years for further analysis. Dummy variables were introduced to take account of discontinuities in the data sources in seasons 1969/70 and 1973/74. For the group "Other Oranges" a dummy was introduced for 1966/67 to reflect an abnormal area change. The additional independent variables are therefore

- T = time trend (1964/65 has the value 1),
- D69 = dummy variable for season 1969/70 (D=1), and
- D66 = dummy variable for season 1966/67 (D=1).

Table 3.6 summarizes results for the residual varieties. The dependent variable in all these equations is total area. All equations show a high fit, and a time trend with a positive or negative trend is able to explain changes in total area with high accuracy. Dummies explain existing discontinuities. The D-W values do not allow us to reject the null hypothesis of serial correlation.

3.1.2 Israel

No information was available on age structure in Israel. The formulations developed in Chapter II were therefore inapplicable. Consequently a totally different approach was undertaken.

Table 3.6 SPAIN: Estimated Total Area for the Rest of the Varieties

Variety	Independent Variables					R ²	d	Period Analyzed
	Constant Term	T	D66	D69	1973			
Common Mandarins	7.44	-.46 (.04)		-1.97 (.5)		.94	1.82	1964/65 - 1975/76
Other Oranges	29.85	.12 (.01)	.31 (.06)			.96	2.54	1964/65 - 1968/69
Navelina	-12.43	3.12 (.46)		6.08 (2.67)		.93	1.16	1969/70 - 1975/76
Common White Oranges	26.92	-1.7 (.21)		-5.72 (1.22)	-2.7 (.99)	.96	2.23	1969/70 - 1975/76
Salustiana	3.02	.52 (.04)			.43 (.28)	.96	1.46	1969/70 - 1975/76
Other Select White	9.75	-.32 (.06)		.95 (.37)		.94	2.28	1969/70 - 1975/76

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: area in thousand hectares.

Independent: T = time (T=1 in 1964/65), D66 = dummy variable (D66=1 in 1966/67), D69 = dummy variable (D69=1 in 1969/70), 1973 = dummy variable (1973=1 in 1973/74).



Shamouti and Late Oranges accounted for 92.5 percent of the total orange and mandarin production in 1975/76. The rest was made up of other orange varieties and a small quantity of mandarins. For this group, called "Other Oranges and Mandarins" only data for production were available and this will be analyzed in Section 3.3. An extensive description of the data is contained in Appendix A-2.

In this country only bearing area was available in statistical sources. Bearing area for the Shamouti increased slightly and for Late Oranges remained fairly constant from 1966/67 to 1975/76 (see Table A-2.1). This area is the result of past plantings and removals. Plantings are determined by profit expectations which are linked to past prices. It is therefore concluded that relative prices among alternative varieties is a suitable proxy variable for profit expectations, the same as in Chapter II. Shamouti, Late Oranges and Grapefruit are the three alternative perennial crops, Grapefruit is included because its production is significant in comparison to oranges.

The relationship between plantings and removals due to age structure was assumed to be captured by a time trend. The results of past decisions and circumstances are assumed to be reflected by bearing area lagged one period. For the late orange group a dummy variable was introduced for 1970/71 to account for an abnormal increase in bearing area. The final formulation for empirical analysis is

$$A_{i,t}^b = a_{i,1} + a_{i,2} A_{i,t-1}^b + a_{i,3} \frac{P_{i,t-k}}{\bar{P}_{t-k}} + a_{i,4} T,$$

where the definition of variables and units employed is

- A^b = bearing area (thousand hectares),
 P_i = farmers' price for variety i (£/ton),
 \bar{P} = average farmers price for Shamonti, Late Orange and Grapefruit,
 T = time trend,
 $D70$ = dummy variable for season 1970/71 ($D=1$),
 k = 3 and 4, and
 i = variety (1,2).

Time lag specified for prices, to measure the impact of new plantings on the bearing area, were 3 and 4 years for Shamouti and Late Oranges respectively.

Relative price elasticities with respect to bearing area was calculated according to the following formula

$$\xi \frac{P_{i,t}}{\bar{P}} = \frac{d(A_{i,t}^b)}{d\left(\frac{P_{i,t-k}}{\bar{P}_{t-k}}\right)} \cdot \frac{\left(\frac{P_{i,t-k}}{\bar{P}_{t-k}}\right)}{A_{i,t}^b} = a_{i,3} \cdot \frac{\left(\frac{P_{i,t-k}}{\bar{P}_{t-k}}\right)}{A_{i,t}^b}$$

Results are shown in Table 3.7. Signs are as expected. The dependent variable is bearing area in both cases. The relative price influence had a clearer effect for Shamouti than for Late Oranges. The coefficients of the lagged variable for bearing area have plausible magnitudes in both cases. The time variable indicates a strong downward trend for Shamouti but no trend for Late Oranges. The fit of the equations is high and the elasticities are in the range found for Spanish varieties with a similar low value for Late Oranges in both countries.

Table 3.7 ISRAEL: Estimated Bearing Area by Variety, 1966/67 - 1975/76

Variety	Mean Values									
	Predetermined Variables					Elasticity of Relative Prices with Respect to Bearing Area				
	Constant Term	A_{t-1}^b	$\frac{F_{t-3}}{F_{t-2}}$	$\frac{P_{t-4}}{\bar{P}_{t-4}}$	T	D70	R^2	h	A ^b	$\frac{P_{t-k}}{P_{t-k}}$
Shamouti	3.26	.74 (.26)	3.46 (2.01)		-.18 (.05)		.90	-2.30	21.25	.97
Late Orange	3.33	.49 (.19)		.31 (.41)	.01 (.03)	.54 (.17)	.85	-1.54	7.52	1.07

General Note

R^2 denotes the coefficient of multiple determination, h is the Durbin "h" statistic and values in parenthesis are standard errors of the estimate.

Variables

Dependent: area is given in thousand hectares.
 Independent: A_{t-1}^b = bearing area lagged 1 year (thousand hectares), P_{t-4} and \bar{P}_{t-4} are farmers' prices lagged 3 and 4 years (1\$/ton), $\frac{F_{t-3}}{F_{t-2}}$ and $\frac{P_{t-4}}{\bar{P}_{t-4}}$ are average farmers' price for Shamouti, Late orange and Grapesfruit varieties lagged 3 and 4 years, T = time (T=1 in 1966/67), D70 = dummy variable (D70=1 in 1970/71).

The Durbin-Watson d statistic was replaced in these equations by the Durbin h statistic used when the lagged dependent variable enters the equation as a predetermined variable (Durbin, 1970). It was calculated from the following formula

$$h = \left(1 - \frac{1}{2} d\right) \sqrt{\frac{N}{1 - N \cdot \hat{v}(\hat{a}_{1,2})}}$$

where d is the Durbin-Watson statistic, N is the sample size and $\hat{v}(\hat{a}_{1,2})$ is the estimate of the variance of $\hat{a}_{1,2}$ or the coefficient of the estimated lagged dependent variable.

According to the h values found, at a 95 percent level of confidence for Shamouti, the null hypothesis that the errors are serially independent can be rejected. This is not true for Late Oranges.

3.1.3 Morocco

Little information was available for this country. Many assumptions and transformations were made to try to build an historical series for many of the variables in order to be able to analyze supply under a reasonable degree of disaggregation. These are described thoroughly in Appendix A-3.

The main aim was to try to analyze oranges and mandarins separately according to the analytical framework developed in Chapter II to the extent possible with the information available. As can be seen in Table A-3.1, total area for oranges and mandarins has increased about 50 percent between 1966/67 and 1975/76. Prices received by farmers were not available and instead international prices were used. The formation of these prices is explained in Chapter V. Only bearing

area for the age group structure was calculated since there was no information about the stock of old trees. This variable was replaced by trend (T). Formula 2.13 was transformed in the following manner

$$A_{i,t} - A_{i,t-1} = \alpha_{i,1} + \alpha_{i,2} \frac{P_{i,t}^I}{\bar{P}_t^I} + \alpha_{i,3} \frac{A_{i,t-k}^b}{A_{i,t-k}} + \alpha_{i,4} T,$$

where the definition of the variables and units are,

A = total area (thousand hectares),

A^b = bearing area (thousand hectares),

P^I = international orange or mandarin price (\$/ton),

\bar{P}^I = average international orange and mandarin price (\$/ton), and

T = time trend.

The international orange and mandarin price corresponds to P^{OR} and P^{ME}, respectively, developed in Chapter V.

This formula was applied to oranges and mandarins with a one year lag on both area and price. The statistical sources did not specify the age of the bearing area. Results are shown in Table 3.8. The dependent variable in both equations is the difference of total area for consecutive seasons.

All signs are correct except for relative prices in the orange equation. This could imply either that farmer prices determined by the Marketing Board have not followed international prices closely and the latter are not appropriate for the analyses of area response or it could be argued that inadequate information was available to construct reasonable historical series for some variables. The rest of the statistical indicators are acceptable, although the standard errors of the price are relatively large.

Table 3.8 MOROCCO: Estimated Change of Total Area of Oranges and Mandarins, 1966/67 - 1975/76

Variety	Constant Term	Independent Variables			R ²	d	Mean Values		Elasticity of Relative Prices with Respect to Total Area
		$\frac{A_{t-1}}{A_t}$	$\frac{P_{t-1}}{P_t}$	T			$\frac{P_t}{P_{t-1}}$	$\frac{A_t}{A_{t-1}}$	
Oranges	-18.38	.27 (.09)	-3.75 (3.27)	-.22 (.04)	.84	2.26	46.97	.45	.03
Mandarins	-12.88	.13 (.04)	1.72 (1.62)	-.12 (.02)	.85	2.21	22.57	1.56	.11

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: area is given in thousand hectares.
 Independent: A_{t-1} = bearing area lagged 1 year (thousand hectares), A_t = total area lagged 1 year (thousand hectares), P_{t-1} = international orange and mandarin price lagged one year (\$/ton), P_t = average international price for oranges and mandarins lagged 1 year (\$/ton), T = time (T=1 in 1966/67).

Elasticities were calculated according to Formula 3.2 and the value found for oranges are unusually low in comparison to the values found on the average for Spain and Israel. This might be another indication that the equation does not adequately reflect reality or the Marketing Board influence.

3.2 Yield response analyses

3.2.1 Spain

Among the factors mentioned in Section 2.2.1.3 two are believed to be the most influential on yields: age structure and the weather. The first one has a strong influence over the long-run but its marginal impact is smooth from season to season. The weather has a more immediate influence with a positive or negative effect mainly in the same or the following season.

An accurate measurement of the average age of all the trees or a detail breakdown of different age groups season by season would have been necessary to capture the precise influence of the age structure by yields. This kind of information was not available and a time trend variable was used instead. Although a time trend might include other effects due to managerial and cultural practices as well, it is believed that the age structure is by far the most important.

Several hypothesis were tested to measure the weather influence. It was thought that normally the most important element was the amount of rain during the blooming period and in the fall. The maximum and an average of maximum temperatures in May and June were included to study the effect of the "June drop." A basic rule to indicate or exclude a variable for weather was that the variable had a consistent effect

for all varieties for the same harvesting circumstances. Two kinds of frosts can be differentiated, those occurring in the spring which affect yields in the next season and frosts occurring during or just before the harvesting period. The latter ones are more common and are more damaging. Dummy variables were employed to capture frost effects.

Precipitation in the fall was found to consistently exert a beneficial influence. September was the most important month for early varieties and September and October for the rest of the varieties. Two kinds of dummy variables have been included. The first reflect weather effects and the other correct for computational defects in data. Dummy D7071 accounts for frost that happened in December 1970 and January 1971 which had a damaging effect on yields in that season, and frosts in March 1971 that affected blooming and consequently yields in the next season. Dummies for seasons 1966/67, 1969/70 and 1973/74 account for abrupt changes in the area reported for some varieties in these seasons and their effects on yields.

For a description of how rain was computed for the entire country and other data necessary to estimate yield equations, see Appendix A-1.

The final specification adopted was as follows:

$$Y_i = a_{i,1} + a_{i,2} T + a_{i,3} (RS, RSO) \\ + a_{i,4} (D66, D69, D7071, D73),$$

where symbols in brackets are alternative variables incorporated in different equations. The meaning of each symbol and the units employed are

- Y = yield (tons/ha),
 RS = rain in September (cm),
 RSO = rain in September and October (cm),
 T = time trend,
 D66, D69, D73 = dummy variables for seasons 1966/67, 1969/70 and 1973/74, respectively (D=1), and
 D7071 = dummy variable for seasons 1970/71 and 1971/72 (D=1).

Results are shown in Table 3.9. The dependent variable for all varieties was yield. Signs of the coefficient for variable T are generally consistent with a priori expectations except for Navelina for which a positive sign was expected since this is a new and growing variety. Its negative sign might be the result of the way yields were computed, which was by dividing production by total area because accurate data for bearing area were lacking. If the amount of non-bearing area has been increasing during the estimation period, which is a real possibility for Navelina, then apparent yields can decrease.

All the coefficients for precipitation are correct and consistent, with early and the rest of the varieties having a clear distinctive critical rainy period. Standard errors of the estimated coefficients are in general not large in comparison to their respective estimate coefficients. The R^2 values can be considered high for yield equations. The Durbin-Watson statistic does not indicate evidence of autocorrelated errors.

3.2.2 Israel

The same approach was adopted in this country as for Spain to test critical weather periods. It was found that rain during the blooming period, March and April, was the critical weather factor.



Table 3.9 SPAIN: Estimated Yield by Variety

Variety	Constant Term	Independent Variables										R ²	d	Period Analyzed
		T	LOGT	RS	R50	D66	D69	D7071	D73					
Salema	4.99		3.68 (.65)	.2 (.19)								.82	1.94	1964/65 - 1975/76
Clementine	6.87	.14 (.04)		.27 (.07)		2.51 (.6)						.80	2.40	1964/65 1975/76
Navel	9.69	.53 (.09)			.07 (.03)					-1.56 (.489)		.80	1.84	1964/65 - 1975/76
Blood Orange	18.6	.4 (.13)			.15 (.04)					-3.75 (1.22)		.80	1.27	1964/65 - 1975/76
Lata Orange	13.13	-.06 (.08)			.09 (.02)					-2.94 (.74)		.77	1.93	1964/65 - 1975/76
Common Mandarin	11.18	-.22 (.14)			.56 (.2)					7.4 (1.71)		.80	1.56	1964/65 - 1975/76
Navelina	13.86	-.5 (.16)			.41 (.12)							.92	1.61	1969/70 - 1975/76
Common White	24.71	-1.12 (.38)			.03 (.06)					-6.43 (1.33)		.91	2.71	1969/70 - 1975/76
Salustiana	15.67	-.25 (.10)			.01 (.01)					-2.4 (.36)		.94	1.60	1969/70 - 1975/76
Other Select White	17.63	-.78 (.96)			.23 (.12)					-6.47 (4.88)		.86	2.72	1969/70 - 1975/76
Other Oranges	12.82	-.37 (.11)								1.16 (.39)		.97	2.55	1964/65 - 1968/69

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parentheses are standard errors of the estimates.

Variables

Dependent: yield is given in tons per hectare.

Independent: T = time (T = 1 in 1964/65), LOGT = natural logarithm of T, RS = September rain (cm), D66 = dummy variable (D66 = 1 in 1966/67, D69 = dummy variable (D69 = 1 in 1969/70), D7071 = dummy variable (D7071 = 1 in 1970/71 and 1971/72), D73 = dummy variable (D73 = 1 in 1973/74).

A dummy variable was included in season 1972/73 to account for the negative effect of a frost. For details about data, see Appendix A-2.

Formula 3.2 was transformed into

$$Y = a_{i,1} + a_{i,2} T + a_{i,3} RMA + a_{i,4} D72,$$

where the meaning of the new variables and the units employed are,

RMA = rain in March and April (cm), and

D72 = dummy variable for season 1972/73 (D=1).

Results are reported in Table 3.10. The dependent variable in both equations was yield. There was no information on the age structure, therefore nothing can be said about the signs of the T coefficients. There is a clear evidence of the rain effect during the blooming period.

3.2.3 Morocco

The same kind of analyses were adopted as in Spain and Israel. The critical period found here was rain in the fall, September and October, as was previously found for Spain. Dummy variables for seasons 1966/67 and 1974/75 in the case of oranges and for seasons 1966/67, 1974/75 and 1975/76 for mandarins picked up the effect of unfavorable high temperatures during summer. For details about data used in this section, see Appendix A-3.

Results are given in Table 3.11. The dependent variable in both cases was yield. Signs for the T coefficient seem to be correct according to previous knowledge. Rain in the fall has a clear positive influence on yields.

Table 3.10 ISRAEL: Estimated Yield by Variety, 1966/67 - 1975/76

Variety	Independent Variables					R ²	d
	Constant Term	T	RMA	D72			
Shamouti	22.43	.68 (.25)	.65 (.21)	-3.9 (3.24)		.78	1.91
Late Orange	13.43	2.23 (.56)	.56 (.36)			.75	2.39

76

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: yield is given in tons per hectare.

Independent: T = time (T=1 in 1966/67), RMA = March and April rain (cm.), D72 = dummy variable (D72=1 in 1972/73).

Table 3.11 MOROCCO: Estimated Yield by Variety, 1966/67 - 1975/76

Variety	Independent Variables					R ²	d
	Constant Term	T	RFM	D6674	D667475		
Oranges	17.10	-.5 (.12)	.23 (.10)	-2.41 (.84)		.85	1.19
Mandarins	4.86	.18 (.08)	.09 (.07)	-2.14 (.51)		.75	2.30

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: yield is given in tons per hectare.

Independent: T = time (T=1 in 1966/67), RFM = September and October rain (cm.), D6674 = dummy variable (D6674=1 in 1966/67 and 1974/75), D6674=1 in 1966/67 and 1974/75), D6674=1 in 1966/67, 1974/75 and 1975/76).

3.3 Supply analyses

In this section supply that could not be separated into area and yield components will be dealt with. This was the case for small quantity of oranges and mandarins in Israel, and supply of oranges and mandarins in the rest of the Mediterranean area. See Appendix A-2 and A-4 for data on each group, respectively.

For each case a simple regression line with the quantity supplied as the dependent variable and T as the independent variable was used and the results are given in Table 3.12.

Table 3.12 ESTIMATED SUPPLY IN ISREAL, AND THE REST OF THE MEDITERRANEAN AREA BY VARIETY, 1966/67 -
1975/76

Geographical Area	Variety	Constant Term	Independent Variable		R ²	d
			T	t		
Israel	Other Oranges and Mandarins	39.26	3.09 (.39)		.88	1.91
Rest of Mediterranean Area	Oranges	2708.13	165.97 (21.81)		.93	1.43
Rest of Mediterranean Area	Mandarins	283.89	44.78 (4.26)		.93	1.31

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: supply is given in thousand tons.
Independent: T-time (T=1 in 1966/67).

CHAPTER IV

ORANGE AND MANDARIN EXPORTS FROM MEDITERRANEAN COUNTRIES

Preamble

All orange varieties are aggregated into one group and mandarin varieties into another. The need to derive an international trade model of a reasonable size and the lack of data at the varietal level make such aggregation necessary.

Most of the orange and mandarin exports go to West and East European markets. Quantities going to other geographical areas have also been analyzed because of their potential significance in the future. If excess supply in traditional markets exists, exporters need to know the quantity of exports that can be diverted to non-European countries and the significance of these quantities in comparison with previous trends.

In this chapter, the seasons between 1966/67 and 1977/78 were used to study trends. When the recent seasons are referred to this denotes the last four seasons.

Exports begin each season in October and continue all year, but from July to September they usually account for less than 5 percent of total Mediterranean exports. Therefore, the season effectively runs from October to June and for traders it is generally divided into three quarters: October to December, January to March, and April to June. These quarters are clearly distinct with respect to market conditions and availability of different exporting varieties. All figures on exports used to explain trends in each individual country are derived from C.L.A.M. (Comité de Liaison de l'Agriculture Méditerranéenne).

4.1 Orange and Mandarin Exports to Europe

4.1.1 Spain

Exporting oranges has been a traditional activity in Spain since the second part of the 19th century. Exports from the agricultural sector on the average during 1974 and 1975 represented 23 percent of the value of all national exports (Spain, I.N.E.). Oranges and mandarins are the two major agricultural export commodities. In 1976 and 1977 they accounted for over 15 percent of total agricultural exports (Spain, Ministry of Agriculture, Anuario de Estadística Agraria).

A great proliferation of exporters which have sometimes had divergent export marketing policies has been a common feature in Spain. Many traders exported small quantities and on an irregular basis. However, exporting is becoming increasingly regulated.

The Government, through the Spanish Fruit Syndicate, used to regulate export quality standards and some marketing practices. In December 1965, the Spanish Government created the Interministerial and Syndicate Commission for the Regulation of Export Supplies of Citrus Fruit and Horticultural Products and became increasingly involved in market and export policies primarily to counterbalance the effect of the European Community's import policies. Its regulatory powers broadened to include the limitation of exports, under certain conditions, to the European Community.

Achievements were not as great as expected and in 1972 a new institution called the Management Committee (Comité de Gestión) was established with greater powers of intervention. New rules stated that it was compulsory for exporters to reach a minimum trade quantity to



remain in business. Promotion in foreign countries was undertaken by the Committee and procedures for all the participants in the sector were implemented to achieve greater policy coordination and agreements among exporters, producers and the administration.

Exporting remains the main objective for cultivating oranges and mandarins in Spain because of the large price differential that exists between international and national markets. Consequently, the best quality fruit goes to external markets and it is only if international prices are depressed that high quality fruit reaches the national market. Orange and mandarin exports have typically represented around 55 and 75 percent of total orange and mandarin production, respectively. The proportion diverted to industrial use has been relatively constant at around 10 percent of total orange and mandarin production. The remainder goes for national consumption.

Spain has benefitted from its proximity to the largest European markets, France and Germany, and these countries have imported around 65 percent of the Spanish orange and mandarin exports in recent seasons. The enlarged European Community imports 90 percent of its consumption for both commodities. Almost all exports to European markets are now carried by truck or train and both modes of transportation have a roughly equal share of the quantity delivered.

Almost all mandarin exports occur during the first two quarters with the first accounting for more than 75 percent of total mandarin exports. For oranges, the first and second quarters usually account for around 40 and 45 percent of total exports, respectively.

4.1.2 Israel

Orange exports have a long tradition in the area with shipments starting in the second half of the 19th century. Exports from the agricultural sector accounted on the average for 13 percent of total national exports by value in 1976 and 1977 (Israel, Statistical Abstract). In these years, orange and mandarin exports represented an average of 39 percent of the total value of agricultural exports (Israel, Statistical Abstract). Exporting from the country has been undertaken by marketing boards for many years. In 1940 a Citrus Control Board was created, and the Citrus Ordinance of 1947 and 1948 led to the current Citrus Marketing Board (Melamed, 1979). This monopoly export marketing board has total control over the national and international marketing practices by deciding what types, how and where oranges are to be sold each season. The Board provides marketing services like promotion, establishment of marketing channels and contract arrangements relating to exports. The main aim of the Board is to maximize grower revenues each season although it has other short and long term objectives, such as diversifying market risks each season and achieving stable and reliable marketing services over a long-run time horizon.

Exports of fresh produce dominate but industry has taken between 25 and 45 percent of total supplies. Low quality fruit is dedicated to industrial use and its price is determined by the Citrus Marketing Board and the industry with the Ministry of Commerce acting as a mediator. Although national per capita consumption of oranges is very high, the total quantity of oranges dedicated to fresh domestic use is less than 10 percent because of the size of the population.

Due to its geographical location, exports are carried by boat to the European Markets. England had strong historical, political and commercial links with Israel and these still prevail. England is therefore Israel's main customer with Germany a close second. Collectively, these two countries account for 40 to 50 percent of its exports. The Scandinavian countries of Norway and Sweden are becoming an important third outlet, taking almost 20 percent of total exports in recent years. The enlarged European Community accounts for around 55 percent of Israel's total orange exports. The East European countries are slowly increasing their share, with almost 15 percent of total exports in recent seasons.

The second and third quarters amount for 60 and 25 percent, respectively, of orange exports as a consequence of concentration on two varieties, Shamonti and Valencia, which are harvested at this time.

4.1.3 Morocco

Exports of oranges from Morocco began to be significant in the 1920's with the arrival of Europeans (mainly from France) who became involved in cultivating the crop. In 1976, agricultural exports accounted for 26 percent of total exports. Orange and mandarin exports accounted for 33 percent of the total value of agricultural exports and are by far the two most important agricultural export commodities (Morocco, *Annuaire Statistique*, 1976). In the season 1965/66 the Marketing and Export Office (Office de Commercialisation et d'Exportation - O.C.E.) was established as a monopoly export marketing board, assuming and expanding the duties previously performed by the Control and Exports Office (Office de Controle et d'Exportation) (Institut National de la Recherche Agronomique, 1968).

The bulk and best quality of Moroccan oranges and mandarins are exported as fresh produce. Quantities going to the domestic market and for industrial use are a residual, varying each season with the general export situation and the overall quality of the crop. Generally, between 70 to 75 percent of total supply goes for export and 10 to 15 percent for industrial use. The rest remains in the domestic market.

Morocco has maintained close commercial ties with France, its former colonizer, but the share of total orange and mandarin exports going to that country has diminished from around 40 to 45 in the 60s to around half that figure in recent years. France is still its biggest single customer and Germany is second. The enlarged European Community and the East European countries import 95 percent of Morocco's total orange exports with very similar quantities going to both economic blocs. However, the enlarged European Community has recently been importing between 75 to 80 percent of its total mandarin exports. All exports to European markets are by ship.

During recent years, from 40 to 45 percent of total orange exports have been delivered in the second and third quarters, respectively. The first quarter has accounted for around 75 percent of total mandarin exports during recent seasons.

4.1.4 The Rest of the Mediterranean Area

Exporting systems and markets vary from country to country. The three most important exporting countries in the group (Greece, Egypt, and Italy) are selected for discussion.

In Greece, the Government makes export arrangements with East European countries and through the government-financed Greek Council

for the Promotion of Exports carries on promotional activities in West European countries (FAO, CI 74/3, 1974). East European countries account for 70 to 75 percent of total orange exports. Almost all the remainder of exports go to Germany and Switzerland-Austria in about equal parts. In 1977/78, 73 percent of total exports were shipped during the first quarter.

Since 1968 orange export marketing activities in Egypt have been handled by a government organization. Between 60 to 65 and around 30 percent of its total exports were sold in East European and non-European countries, respectively, during recent years. In 1977/78 almost half of its exports were in each of the first two quarters.

All the complex European Community regulations operate for Italy because it is a member of the Community. Marketing services are carried out by private firms. Germany and Switzerland-Austria are the major customers with roughly similar importance. They collectively account for 50 to 70 percent of total exports. Italy exports only around 50 percent of its total orange and mandarine exports to the enlarged European Community despite tariff and geographical advantages.

4.1.5 Empirical Approach and Results

As explained above exporting is the main objective for cultivating oranges and mandarins for Spain, Israel and Morocco. In general, the same holds for the rest of the Mediterranean area. It is not merely that exports account for the greatest share of the total quantity supplied but also take the best quality. Quality standards are quite homogeneous in Europe and most markets impose

minimum standards. Exports from a particular country are closely related to quantity supplied in that country and minimum international quality standards. This implies that for a particular season supplies can be very high but if there were some climatological or other adverse influence on quality, then exports could decrease in comparison to another season with lower total supplies.

For oranges, it is assumed that the quantity exported from a particular country is not affected by supplies in other competing countries. Orange supplies are shown in Table 4.1. The supply from Israel is separated into quantities for industrial use and the rest. It is hypothesized that the quantity going for industrial use is primarily a function of industrial capacity. Industrial capacity is the result of past investments and long-run planning. Once factories are built, all necessary measures are taken to utilize their capacity or at least not to have them operating at a low level. Consequently, the quantity going for industrial use is separated from total supplies and estimated independently. Time trend is used as a proxy independent variable for industrial capacity. In seasons 1974/75 and 1975/76 heavy imports of concentrated orange juice from Brazil which was blended with local produce had an influence on the domestic quantity diverted to industrial use. These effects are captured by two dummy variables. The specification used is,

where Q^I = quantity going for industrial use in Israel (thousand tons),
 T = time trend, and
 $D74, D75$ = dummy variables for seasons 1974/75 and 1975/76, respectively ($D=1$).

Table 4.1 MEDITERRANEAN AREA: Orange Supply by Country, 1966/67 - 1975/76

Country	Thousand Tons									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Spain (a)	1972.229	1798.885	1599.745	1942.571	1596.713	1815.399	2238.077	2059.516	1888.541	1991.000
Israel (b)										
Industrial Use	203.285	305.265	240.600	234.000	397.100	454.900	471.500	571.400	289.000	241.100
Non-Industrial Use	608.765	652.375	637.300	703.800	708.700	723.700	780.900	694.600	762.500	778.500
Total	812.05	957.64	877.90	937.80	1105.80	1178.60	1252.40	1266.00	1051.50	1019.60
Morocco (c)	589	678	618	727	666	688	763	626	478	523
Rest Mediterranean Area (d)	3015	3437	3567	3555	3894	4310	4323	4626	4327	4475

Sources: (a) Spain, Ministry of Agriculture, Secretaría General Técnica. Anuario de Estadística Agraria. Madrid.
 (b) Israel, Central Bureau of Statistics, Statistical Abstract of Israel. Tel Aviv.
 (c) Morocco, Premier Ministre, Secrétariat d'Etat au Plan et au Développement Regional Direction de la Statistique. Annuaire Statistique du Maroc. Rabat.
 (d) Commonwealth Secretariat, Fruit A Review of Production and Trade Fruit, Fruit Juices and Wine. London and FAO, Production Yearbook. Rome.

Results are shown in Table 4.2. The dependent variable is quantity going for industrial use. All the independent variables have the expected signs and explain variation in the dependent variable reasonably well. The rest of the statistical indicators show that the specification is acceptable.

It is assumed that in any particular season exports to Europe in all countries are a function of the quantity produced. In the case of Israel quantity going for industrial use was subtracted from total supply and this remainder was assumed to be the relevant quantity influencing exports. Some dummy variables were introduced into the equations. Thus, for Spain two dummy variables are used; one for season 1967/68 to account for the negative effect that strong winds had on orange quality and consequently on exported quantity, and a second dummy for season 1975/76 to account for the new way of reporting crop production with wastes and cullings incorporated into the final figure. This practice led to an inflated value with respect to previous seasons and thus a discontinuity exists in the relationship between production and exports. For Israel a dummy was used in season 1972/73 to account for the negative effect that frost had upon quality and exports. In the case of the rest of the Mediterranean Area, one dummy was incorporated in season 1968/69 to pick up the positive effect of an unusual increase of exports which was not so related to the magnitude of the increase of supplies in that season. Exports going to Europe are shown in Table 4.3 and they refer to quantities exported from October to June.

Table 4.2 ISRAEL: Estimated Quantity Going for Industrial Use, 1966/67 - 1975/76

Country	Constant Term	Independent Variables			R ²	d
		T	D74	D75		
Israel	33.67	50.16 (8.79)	-296.5 (72.25)	-394.57 (77.42)	.86	1.89

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: Quantity is given in thousand tons.

Independent: T = time (T=1 in 1966/67), D74 = dummy variable (D74=1 in 1974/75), D75 = dummy variable (D75=1 in 1975/76).

Table 4.3 MEDITERRANEAN AREA: Orange Exports by Country and Destination, 1966/67 - 1975/76

Destinations	Thousand Tons									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
<u>To European Markets</u>										
Spain	1085	856	904	1155	847	966	1290	1044	1016	947
Israel	536	590	554	622	666	671	596	638	691	686
Morocco	438	507	435	490	458	485	527	446	390	373
Rest Mediterranean Area	517	536	633	640	727	730	807	807	781	779
<u>To Non-European Markets</u>										
Total Mediterranean Area	121	138	134	131	174	145	198	254	230	120

Source: CIAM, Commission des Etudes Economiques, Les Exportations d'Agrumes du Bassin Méditerranéen. Statistiques Évaluations Répartitions.



The specification used for each country or region is

$$E_i^0 = a_{i,1} + a_{i,2}S_i^0 + a_{i,3} \quad (D67, D68, D72, D75),$$

where, the array of dummy variables incorporated in the equation in parentheses refer to the dummies included in different equations,

$$\begin{aligned} E_i^0 &= \text{orange exports (thousand tons),} \\ S_i^0 &= \text{orange supply (thousand tons),} \\ D67, D68, D72, D75 &= \text{dummy variables in seasons 1967/68,} \\ &\quad \text{1968/69, 1972/73, and 1975/76 respec-} \\ &\quad \text{tively (D=1), and} \\ i &= 1, 2, 3, 4. \end{aligned}$$

Results are shown in Table 4.4. The dependent variable in all equations is the quantity of orange exports. The signs of the coefficients are in accordance with expectations and the magnitude of the supply coefficients are plausible for different countries or regions. The rest of the statistical indicators have reasonable magnitudes.

A similar kind of analysis was performed for exports of mandarins. For Spain and Morocco it is assumed that exports of mandarins are determined by the supply of mandarins in each country. In the case of Morocco, a dummy variable was included for season 1972/73 to account for discrepancies in primary data sources that indicated exports in excess of total supply.

For the rest of the Mediterranean Area, a different approach was taken. Although this group of countries has been constantly increasing its supply of mandarins, exports have been decreasing. It is believed that the main exporters, Spain and Morocco, by cultivating more appropriate varieties and through a more aggressive marketing are slowly displacing competitors. Consequently, the total

Table 4.4 MEDITERRANEAN AREA: Estimated Orange Exports by Country, 1966/67 - 1975/76

Country	Constant Term	S ⁰	<u>Independent Variables</u>					R ²	d
			D67	D68	D72	D75			
Spain	-83.35	.59 (.1)	-128.8 (63.93)			-151.88 (64.11)	.87	2.11	
Israel	-52.94	.97 (.1)			-114.55 (20.34)		.92	1.55	
Morocco	119.62	.53 (.07)					.87	2.03	
Rest Mediterranean Area	.15	.17 (.03)		139.75 (54.82)			.81	1.82	

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: orange exports are given in thousand tons.

Independent: S⁰ = orange supply in each country (thousand tons), D67 = dummy variable (D67=1 in 1967/68), D68 = dummy variable (D68=1 in 1968/69), D72 = dummy variable (D72=1 in 1972/73), D75 = dummy variable (D75=1 in 1975/76).

supply of mandarins from Spain and Morocco was used as the independent variable to reflect this situation. Two dummy variables were included for this group; one in season 1966/67 which picked up an unusually high export figure due to a great increase in exports from Italy and a second dummy variable used for season 1967/68 which had an unusual low exports figure in comparison to other years. This was because Turkey, one of the biggest exporters in that group, was not included in original statistical sources.

Supply and export data for mandarins are shown in Tables 4.5 and 4.6. The specification used for each country or region is

$$E_i^m = a_{i,1} + a_{i,2}S_i^m + a_{i,3} (D66, D67, D73),$$

where, dummy variables included in parentheses are used for different equations,

$$\begin{aligned} E_i^m &= \text{mandarin exports (thousand tons),} \\ S_i^m &= \text{mandarin supply (thousand tons),} \\ D66, D67, D73 &= \text{dummy variables in seasons 1966/67, 1967/68,} \\ &\quad \text{and 1973/74 respectively (D=1), and} \\ i &= 1, 2, 3. \end{aligned}$$

Results are shown in Table 4.7. The dependent variable in all equations is the quantity of exported mandarins. The signs of the coefficients are as expected and the statistical indicators are acceptable.

4.2 Orange and Mandarin Exports to Non-European Countries

Orange and mandarin exports to non-European countries are shown in Tables 4.3 and 4.6, respectively. These exports are believed to be closely related to the overall supply situation in the

Table 4.5 MEDITERRANEAN AREA: Mandarin Supply by Country, 1966/67 - 1975/76

Country	Thousand Tons									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Spain (a)	218.448	210.025	193.995	275.332	350.958	372.764	578.119	599.531	590.830	651.700
Morocco (b)	95	120	111	149	154	150	162	188	106	118
Rest Mediterranean Area (c)	415	499	525	551	587	568	642	776	803	832

Source: (a) Spain. Ministry of Agriculture. Secretaria General Tecnica. Anuario de Estadistica Agraria.
 (b) Morocco. Premier Ministre. Secretariat d'Etat au Plan et au Developpement Regional Direction de la Statistique. Annuaire Statistique du Maroc. Rabat.
 (c) Commonwealth Secretariat. Fruit. A Review of Production and Trade Fruit, Fruit Juices and Wine. London, and FAO. Production Yearbook. Rome.

Table 4.6 MEDITERRANEAN AREA: Mandarin Exports by Country and Destination, 1966/67 - 1975/76

Destination	Thousand Tons									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
<u>To European Markets</u>										
Spain	154	162	184	272	296	312	465	441	454	493
Morocco	74.7	91.7	93.7	121.6	120.6	115.7	183.9	131.4	83.8	84.3
Rest Mediterranean Area	121	76	105	88	86	98	75	61	79	70
<u>To Non-European Markets</u>										
Total Mediterranean Area	.2	.7	3.7	3.9	6	4.9	7.8	7.4	9.1	3.7

Source: CIAM, Commission des Etudes Economiques. Les Exportations d'Agrumes du Bassin Méditerranéen. Statistiques, Evaluations, Répartitions.

Table 4.7 MEDITERRANEAN AREA: Estimated Mandarin Exports by Country, 1966/67 - 1975/76

Country	Constant Term	Independent Variables					R ²	d
		S ^m	D66	D67	D72	D72		
Spain	35.58	.71 (.04)					.97	1.08
Morocco	15.20	.66 (.06)			61.59 (6.32)		.97	1.14
Rest Mediterranean Area	126.62	-.07 (.01)	17.53 (7.74)	-26.24 (7.64)			.91	2.29

97

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: Mandarin exports are given in thousand tons.

Independent: S^m = mandarin supply in each country (thousand tons), D66 = dummy variable (D66=1 in 1966/67), D67 = dummy variable (D67=1 in 1967/68), D72 = dummy variable (D72=1 in 1972/73).

Mediterranean Area for both oranges and mandarins. Exceptional exports may occur in this small and sometimes unstable market as the result of abrupt decisions made by some of the exporting countries.

The quantity of oranges for industrial use in Israel was assumed to be diverted as the result of decisions unrelated to the seasonal supply situation in the Mediterranean area. This was subtracted from the total supply of oranges in the Mediterranean Area. The remainder is used as the representative figure for potential supplies affecting exports in the non-European markets. In the case of mandarins total supply from all the Mediterranean area is employed.

A dummy variable was used in season 1975/76 in both orange and the mandarine equation, to account for the lack of data on exports to non-European countries by Lebanon. This had a considerable negative impact on the overall figure that season. For oranges, a further dummy variable was included for seasons 1973/74 and 1974/75 to account for an unusual increase in exports from Egypt and Israel which was not related to previous trends. The specification used for both oranges and mandarines is

$$ENE = a_1 + a_2 TS + a_3 (D7374, D75),$$

where ENE = exports of oranges (mandarins) from the Mediterranean Area to non-European countries (thousand tons),

TS = total orange (mandarin) supply in the Mediterranean Area (thousand tons),

D7374 = dummy variables for seasons 1973/74 and 1974/75 (D=1), and

D75 = dummy variable for season 1975/76 (D=1).

Results are shown in Table 4.8. The dependent variable is the quantity exported to non-European countries. The statistical indicators tend to support the specification.

Table 4.8 MEDITERRANEAN AREA: Estimated Quantity Exported to Non-European Markets by Variety, 1966/67-1975/76

Variety	Constant Term	Independent Variables			R ²	d
		TS	D7374	D75		
Oranges	-66.53	.31 (.13)	80.57 (17.36)	-57.05 (25.14)	.87	2.86
Mandarines	-5.43	.009 (.001)		-5.71 (1.49)	.85	2.08

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimate.

Variables

Dependent: quantity is given in thousand tons.

Independent: TS = total orange or mandarin supply in the Mediterranean Area (thousand tons), D7374 = dummy variable (D7374 = 1 in 1973/74 and 1974/75), D75 = dummy variable (D75 = 1 in 1975/76).

CHAPTER V
FORMATION OF INTERNATIONAL PRICES AND THEIR
RELATIONSHIP TO NATIONAL PRICES

Preamble

As explained in Chapter IV, oranges and mandarins are primarily grown in the Mediterranean Area for export to European markets. Prices in those markets determine farmers' prices in exporting countries and subsequently, have an impact on future plantings. The linkage between international and national prices is therefore important. Data used in this section are described in Appendix B.

The enlarged European Community, as an economic bloc with the same market and trade policies, is by far the largest consumer in Europe, accounting for an average of 82 and 56 percent of the total mandarin and orange exports from the Mediterranean Area during 1976/77 and 1977/78 (CLAM). Its trade policy has a major impact on the rest of the European markets. Consequently, price formation for the European Community was studied separately from the rest of Europe.

5.1 Formation of International Price

5.1.1 European Community Trade Policies

In this section, reference is made to the six original European Community members and analysis is concentrated on the period 1966/67 to 1975/76.

The European Community approved Regulation number 23 related to fruits and vegetables on the 4th of April, 1962. It was the first attempt to set common policies for the six original members: Belgium, France, Germany, Italy, Luxembourg and the Netherlands. A group of norms were created to



regulate quality standards, internal market policies within the Community and external trade policies.

Quality standards applied to fruits and vegetables traded among Community members as well as those imported from other countries. Regulation 159/66 approved on the 25th of October, 1966, further defined internal market policies. However, in this study, external trade policies are the only ones to be analyzed because of their implications for Mediterranean exports of oranges and mandarins.

Stabilizing internal consumer market prices and protecting producers from low import prices have been the two main objectives of the Community's external trade policy. Regulation number 23 established a common external tariff (CET) for oranges and mandarins coming from outside the Community and was fully operational by the 1st of January, 1967. Its rate remained the same between 1966/67 and 1975/76 with two different values for oranges and one for mandarins during their respective export seasons.

All the Mediterranean exporting countries have profited from some kind of preferential arrangement with the European Community. Each arrangement is between the European Community and a single exporting country, and allows for reductions of the external tariff on a variety or group of varieties if exports reach a minimum market price in the Community, the so-called "preference price."

These are provisions set by the Community to transform market prices into entry or customs level prices calculated every two weeks during the exporting season for each variety or group of varieties coming from a particular exporting country. These are called "forfaitaire prices." They are calculated by taking prices in representative Community markets,

deducting custom duties, other import charges, transport within the Community, a fixed profit margin between entry and wholesale level and a fixed amount for handling and other marketing services (European Communities, 1970). Customs duties, on a daily basis, are applied to these "forfaitaire prices." This translates literally into "contractual price" but is more appropriately an offer price - the price at which exporters offer the product for sale at point of entry to the Community.

Reference prices are provided every season by the Community for different varietal groups. There are three groups for oranges and one for mandarins and do not necessarily correspond to imported groups. Each orange group has a reference price applied for different months during the season and this has the same value each season. The mandarin group had different reference prices during the season in 1966/67 and 1967/68 but since then this has remained constant during each season. Each group includes several varieties cultivated in the European Community, mainly Italy. Every season the Community provides coefficients to effect the necessary transformations to apply reference prices to different varieties from exporting countries.

If the market price of an imported variety or group of varieties per 100 kg. multiplied by the varietal correction coefficient minus import charges (excluding tariffs) and internal transport costs is equal to or greater than the reference price plus duty (CET multiplied by the reference price) plus 1.2 units of account then preferential arrangements operate (European Communities, 1969). This condition can be expressed through the following inequality

$$(P^m \times C) - K \geq P^r + (P^r \times CET) + 1.2 \text{ u.a.},$$

where P^m = market price at the wholesale level (u.a./100 kg.),

C = varietal correction coefficient,

K = EC estimated import charges (excluding tariffs) plus internal transport costs,

P^r = reference price (u.a./100 kg.), and

CET = common external tariff.

Market price (P^m) can be decomposed into the following components: the price at which the product enters the EC (entry price), duties paid, and a fixed amount to account for actual costs and margins between entry and wholesale level. On the assumption that (5.1) applies

$$P^m = P^e + (P^f \times T^D) + K^1, \quad (5.2)$$

where P^e = entry price (u.a./100 kg.),

P^f = "forfaitaire price" (u.a./100 kg.),

T^D = preferential tariff, and

K^1 = actual costs and margins between entry and wholesale level.

Substituting (5.2) into (5.1)

$$(P^e + P^f \times T^D + K^1)C - K \geq P^r + (P^r \times CET) + 1.2. \quad (5.3)$$

Assuming that $P^f = P^e$ and $K^1 \times C = K$ (5.3) becomes

$$(P^e + P^e \times T^D)C \geq P^r + (P^r \times CET) + 1.2. \quad (5.4)$$

Converting (5.4) into an equality and solving for P^e , which can be redefined as P^D

$$P^D = \frac{P^r(1+CET)+1.2}{C(1+T^D)}, \quad (5.5)$$

where P^D is the "preference price" or minimum entry price under which an exporting country continues to benefit from its preferential agreement with the Community

The entry price (P^e) by variety or group of varieties for each exporter is evaluated by the Community on a daily basis. If entry price falls below P^D for several days then the preferential tariff is suspended and the CET is applied. The Community also calculates a second entry price ($P^{e'}$) following other rules which result in a value lower than P^e . If $P^{e'}$ falls below the reference price (P^I) then "countervailing duties" equal to the difference between estimated entry price ($P^{e'}$) and the reference price are imposed, in addition to the CET.

The European Community's trade policy for oranges and mandarins is complex. However, as a generalization the preference price is the most important determinant of the effective size of the tariff barrier facing Mediterranean exporters. Formula (5.5) demonstrates that a number of factors influence the level of the preference price. The European Community has been using the reference price and the varietal correction coefficient for short-run (single season) policy changes and the CET and the preferential tariff for its long-run (several years) policy shifts.

5.1.2 Other Western European Countries' Trade Policies

The rest of the Western European countries have generally had small tariff rates on oranges and mandarins from the Mediterranean Area because they do not produce these commodities. Comments are provided for a few countries, for which information is available.

England, Ireland and Denmark joined the European Community in 1973. There was an agreement with the six original European Community members to adjust their tariffs to the Common External Tariff with a 20 percent annual adjustment rate between January 1974 and January 1978. However,

their tariffs were at a standstill status, at least until 1975/76, which meant that since the European Community was negotiating with the Mediterranean countries for new preferential agreements, the three new members were able to convince the Community to maintain their existing tariffs until the new agreements came into effect on the 1st of January 1978.

Apart from the old members of the European Community, England is the largest importer among West European countries. A free entry duty was granted to Commonwealth countries. Two different tariffs during the season applied for the rest of the Mediterranean exporting countries. Table 5.1 shows tariffs at different points in time during study period according to available information (FAO, CI 69/3, CI 72/5 and CI/CONS/74/3). The change between 1968 and 1972 occurred as a result of the 1967 Geneva Protocol of the Kennedy Round negotiations under the Geneva Agreement on Tariffs and Trade which provided for a reduction of tariffs between January 1968 and 1972 in equal amounts each year. Tariffs in 1975/76 were the same as in 1972.

As a result of the Kennedy Round, Denmark and Norway abolished their tariffs for oranges and mandarins. Finland reduced its ad valorem tariff from 30 to 15 percent for the bulk of the orange season. Sweden and Ireland did not have a tariff before the negotiations.

5.1.3 Eastern European Countries' Trade Policies

Russia, East Germany, Romania and Poland have exercised direct control over quantity imported but without charging any import duties. Hungary, Czechoslovakia, Yugoslavia and Bulgaria have had both import quotas and import tariffs.

Table 5.1 ENGLAND: Tariff Barriers for Oranges and Mandarin from Non-Commonwealth Countries

Period	Tariff	
	1965	1972
1 Oct. - 30 Nov.	£.175 per cwt.	£.175 per cwt.
1 Dec. - 31 Mar.	10% ad valorem	10% ad valorem
1 Apr. - 30 Jun.	£.175 per cwt.	£.175 per cwt.

Source: FAO. Committee on Commodity Problems. Intergovernmental Group on Citrus Fruit. Developments in National and International Citrus Policies. Fifth and Sixth Session.

Table 5.2 SPAIN: Number of Days Without Tariff Preferences in the European Community for Oranges and Mandarin 1969/70 - 1975/76

Variety	Days					
	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75
Oranges	35	0	87	89	8	43
Mandarin	0	34	23	40	0	0

Source: Spain. Ministry of Agriculture. Dirección General de la Producción Agraria. Servicio de Inspección Fitopatológica. Citricos. Informe Resumen de la Campaña de Exportación.

5.1.4 Implications of the European Community's Trade Policy

The European Community's trade policy has had a clear influence in the Mediterranean Area. Exporting countries have tried to improve their marketing skills to comply with the European Community's quality standards and trade policies. A crucial consideration has been to reach the minimum entry price in order to benefit from preferential agreements. If any particular exporting country has to pay the full Common External Tariff, its competitive standing diminishes to a degree that it usually prefers to decrease or stop exports for a few days until market price rises above the preference price.

As a result of the European Community's trade policy, Spain was forced to make its export decisions through a more centralized organization (Comité de Gestión) which began operating in 1973/74. The underlying reason for the change was the large number of days during which the country lost its preferential tariffs. Spain is selected as an example to show the effects that the European Community trade policy has had on exporting countries with regard to the loss of tariff preferences. Table 5.2 demonstrates that since 1969/70, the first season that the European Community penalized exporting countries, oranges have been exposed more frequently to loss of tariff reductions than mandarins with totals of 262 and 97 days, respectively. All orange groups in the European Community's classification for reference prices have been aggregated to calculate the number of days for oranges.

Oranges and mandarins face the same Common Trade Policy in the European Community. What basically differentiates them is that they need to achieve different levels for their entry prices to incur reduced tariffs, or to avoid countervailing charges.

The European Community concludes preferential agreements on a country by country basis and applies these at the variety or group of varieties level. The overall effect for each country is the same in all cases. It is useful to analyze a situation in which a country has a single export curve either for oranges or mandarins.

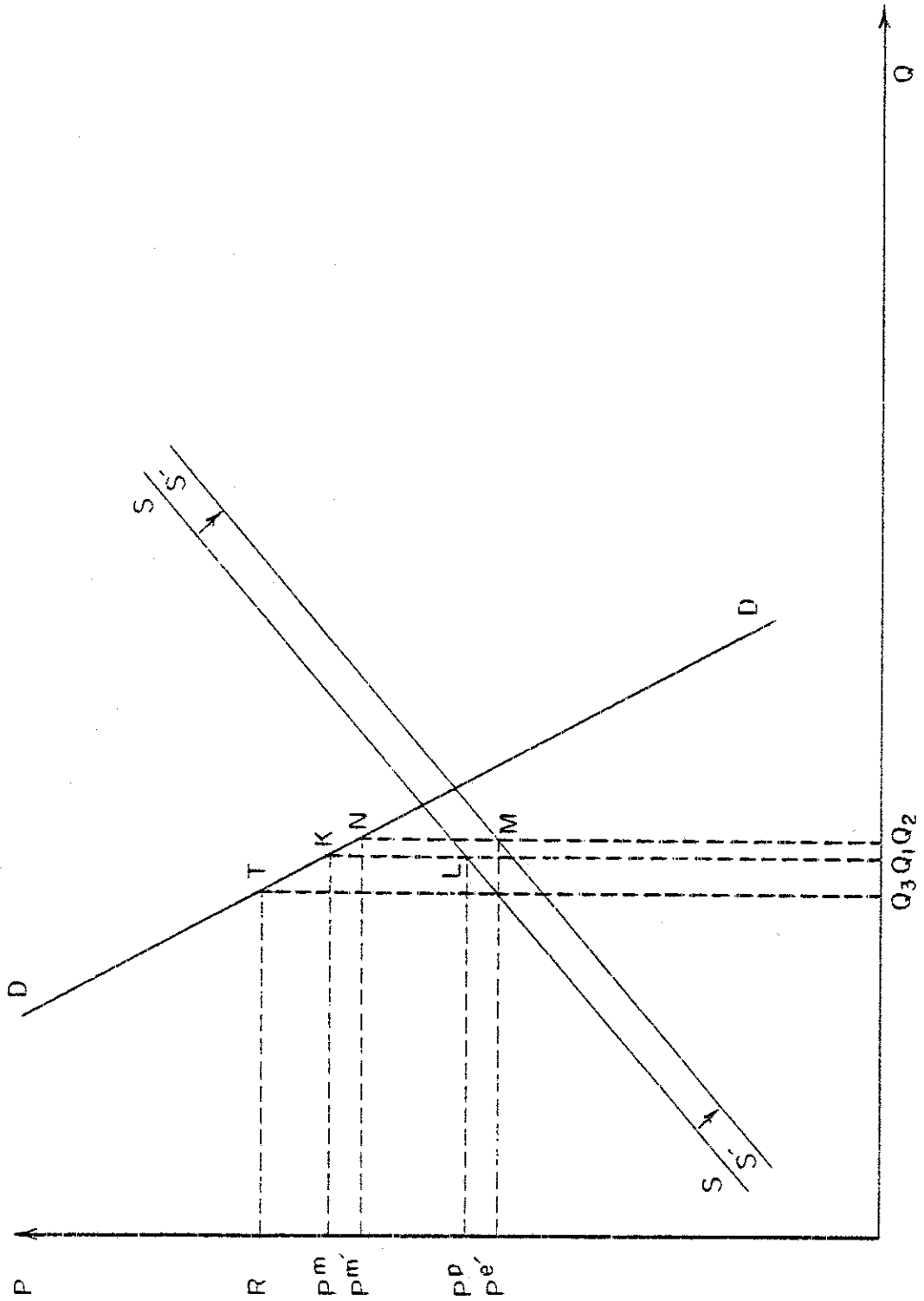
In figure 5.1 SS is the export curve for oranges or mandarins to the European Community from a Mediterranean country. We assume that between entry and market prices all charges besides tariffs are constant, therefore it is possible to focus entirely on the tariffs. P^m is the minimum market price that the exporter face to be able to benefit from its preferential agreements with the European Community.

Suppose that the market price is P^m which after subtracting tariffs (KL) (or the common external tariff with preferences) reaches P^D (minimum entry price in formula 5.5) which implies exports of OQ_1 . If there is a shift in exports due to excess supply in that particular country, it will be willing to export a greater quantity (OQ_2 for example) and the market price will be $P^{m'}$ which after subtracting tariffs (NM) implies a $P^{e'}$ entry price¹. $P^{e'}$ is smaller than the minimum entry price (P^D) and as a result, exports are penalized through loss of tariff reduction. For example, they will now pay extra tariffs ($P^{m'R}$), and ($P^{e'R}$) will represent all the tariffs paid (or the Common External Tariff without reductions).

At that particular price consumers will be willing to consume OQ_3 which is less than OQ_2 or quantity that the country was willing to ex-

¹Tariffs are applied on ad valorem basis in the Community but for the sake of graphical simplicity specific tariffs are considered in figure 5.1. The implications drawn from the analysis are not affected by this simplification.

FIGURE 5.1. EFFECTS OF THE LOSS OF EUROPEAN COMMUNITY PREFERENTIAL TARIFF REDUCTIONS FOR A MEDITERRANEAN EXPORTER



port when the preferential tariff was operating. Assuming we are on the elastic portion of the demand curve for exports coming from a particular country, this will be willing to export more in order to increase its total revenue. The Community tariff mechanism places a high penalty on the exporter if it attempts to export more than OQ_1 and it finds that the optimum point under those circumstances is K where exports are OQ_1 . This implies a shift back of the supply curve from S'S' to SS. The excess supply need to be diverted to other markets with a negative impact on market prices in those outlets. If exporters face demand curves of similar elasticity in other markets, they will prefer to divert the excess supply to other outlets until they reach the original situation (SS), because the drop in market price in other outlets will be smaller than the tariff penalty imposed by the European Community.

5.1.5 Orange and Mandarin Price Formation in the European Community Empirical Analysis

It is hypothesized that three factors influence orange market prices in the European Community: total orange exports from the Mediterranean Area, offered quantities of a fruit substitute (pears) in the European Community and the orange preference price. However, only the first two factors are believed to influence mandarin market prices: total mandarin exports from the Mediterranean Area and offered quantities of a fruit substitute (pears). Mandarin preference prices have been set at levels far below market prices and consequently they should not have a seasonal impact.



The specifications of the orange and mandarin market price equations are the following

$$P^{OE} = a_1 + a_2 E^0 + a_3 Q^{PJ} + a_4 P^{OP}, \text{ and} \quad (5.6)$$

$$P^{ME} = b_1 + b_2 E^m + b_3 Q^{PM} + b_4 P^{MP}, \quad (5.7)$$

where P^{OE} = orange market price (\$/ton),

P^{ME} = mandarin market price (\$/ton),

E^0 = total orange exports from the Mediterranean Area (thousand tons),

E^m = total mandarin exports from the Mediterranean Area (thousand tons),

P^{PJ} = quantity of pears offered in the European Community from October to June (thousand tons),

Q^{PM} = quantity of pears offered in the European Community from October to March (thousand tons),

P^{OP} = orange preference price (\$/ton),

P^{MP} = mandarin preference price (\$/ton),

and where expectations are that

$$a_2 < 0, a_3 < 0, a_4 > 0, b_2 < 0, b_3 < 0, \text{ and } b_4 = 0.$$

Rotterdam was selected as the most appropriate geographical location in the European Community to examine orange and mandarin market prices. The selection was made based on the following reasons: 1) it is located close to the most important consumer markets in the Community, 2) it can be reached by truck, train and boat, the means of transportation used by the main exporters, and 3) market information is more readily available than in other locations because price quotations are the result of public auctions at a wholesale level.

Auctions are carried out several times every week. Price information from each auction was available for Spanish varieties. Four orange

and two mandarin groups were selected corresponding to the varieties Navel, Select White, Blood Orange and Verna for oranges and Satsuma and Clementine for mandarins. Monthly averages were calculated for each group and these were weighted by monthly Spanish exports to all destinations to calculate orange and mandarin seasonal prices. Prices were reported in florins. Florins were converted into dollars by first deflating by the consumer price index in Holland (base 1976) and then using the exchange rate in 1976 to convert to dollars.

To calculate an orange seasonal "preference price" accounting for all exporters, varietal groups and different periods during the season when it is in force, formula 5.5 was applied in the following manner

$$P^D = \frac{\sum_{i=1}^4 \sum_{j=1}^2 \sum_{k=1}^3 \frac{P_{ijk}^r (1 + CET_{ijk}) + 1.2}{C_{ijk} (1 + T_{ijk}^D)} Q_{ijk}}{\sum_{i=1}^4 \sum_{j=1}^2 \sum_{k=1}^3 Q_{ijk}}, \quad (5.8)$$

where i = country (Spain, Israel, Morocco, Rest of Mediterranean Area),

j = varietal group (II, III, defined by the European Community's classification in Appendix B)

k = time (December, January to March, April), and

Q = exports to the European Community.

For mandarins, the final formulation was

$$P^D = \frac{\sum_{i=1}^3 \sum_{j=1}^2 \sum_{k=1}^2 \frac{(P_{ijk}^r (1 + CET_{ijk}) + 1.2)}{C_{ijk} (1 + T_{ijk}^D)} Q_{ijk}}{\sum_{i=1}^3 \sum_{j=1}^2 \sum_{k=1}^2 Q_{ijk}}, \quad (5.9)$$

where i = country (Spain, Morocco, Rest of Mediterranean Area),

j = varietal group (A and B defined by the European Community's classification in Appendix B),

k = time (November, December to February), and

Q = exports to the European Community, .

Results are reported in Table 5.3. The dependent variable in all equations is market price. Although the second equation was believed to be the correct specification for mandarin market price, the third equation was estimated to examine the effect that the inclusion of mandarin preference price had in the equation. In the first two equations all coefficients have correct signs, relatively small standard errors, high R^2 and a d -value in the inconclusive region for oranges. The null hypothesis for mandarins cannot be rejected. It demonstrates that in the case of oranges the preference price has exerted a statistically discernible impact on EC price. Expressed in terms of an elasticity at the mean of the observations, the results suggest that a 1% increase in the season average preference price would increase EC orange prices by .45%. In the third equation, the mandarin preference price shows a negligible value and a large standard error, supporting a priori expectation about the lack of relevance of the variable

5.1.6 Orange and Mandarin Price Formation in the Rest of the European Markets

Since the Community is a major importer of oranges and mandarins its trade policy has important implications for the rest of the European prices. The nature of the effect can be demonstrated algebraically through a four equation linear model of the market for oranges. The model is composed of a Mediterranean supply equation, an EC demand

Table 5.3 European Community: Estimated Market Prices by Variety, 1966/67 - 1975/76.

Variety	Constant Term	Independent Variables						R ²	d
		E ^O	E ^m	Q ^{Pj}	Q ^{pm}	P ^{OP}	P ^{MP}		
Oranges	1268	-.28 (.03)		-.46 (.17)		.73 (.33)		.91	1.38
Mandarin	1947		-1.5 (.19)		-.93 (.45)			.90	2.09
Mandarin	1954		-1.49 (.21)		-.85 (.62)		-.09 (.49)	.90	2.05

General Note

R² denotes the coefficient of multiple determination, and d denotes the value of the Durbin-Watson "d" statistic.

Variables

Dependent: price is given in \$ (1976) per ton.
 Independent: E^O = total orange exports from the Mediterranean Area (thousand tons), E^m = total mandarin exports from the Mediterranean Area (thousand tons), Q^{Pj} = quantity of pears offered in the European Community from October to June (thousand tons), Q^{pm} = quantity of pears offered in the European Community from October to March (thousand tons), P^{OP} = orange preference price (\$/ton) (1976 \$)
 P^{MP} = mandarin preference price (\$/ton) (1976 \$).

equation, a Rest of Europe demand equation and a market-clearing condition. For the sake of simplicity, the EC is assumed to use a specific import tariff.

$$S^M = a + b P^{OR} \quad \text{Mediterranean orange supply} \quad (5.10)$$

$$D^{EC} = c - d (P^{OR} + t) \quad \text{EC orange demand} \quad (5.11)$$

$$D^{RE} = a - f P^{OR} \quad \text{Rest of Europe orange demand} \quad (5.12)$$

$$S^M = D^{EC} + D^{RE} \quad \text{Market-clearing condition} \quad (5.13)$$

where S^M = Mediterranean orange supply,

P^{OR} = Rest of Europe orange price,

D^{EC} = EC orange demand,

t = EC tariff for orange,

D^{RE} = Rest of Europe demand,

$a \dots f$ = structural coefficients, and

$$P^{OE} = P^{OR} + t, \quad (5.14)$$

where P^{OE} = EC price.

Substituting (5.10) to (5.12) in (5.13) and solving for P^{OR}

$$P^{OR} = \frac{c - a + e - dt}{b + d + f} \quad (5.15)$$

$$\text{or } P^{OR} = S_0 - S_1 t, \quad (5.16)$$

where $S_0 = \frac{c - a + e}{b + d + f}$ and $S_1 = \frac{d}{b + d + f}$.

Differentiating (5.15) with respect to the EC tariff

$$\frac{d(P^{OR})}{d(t)} = \frac{-d}{b+d+f} \quad (5.17)$$

Thus, increases in the EC's tariff on oranges depresses European prices and vice versa. For any given set of structural supply/demand coefficients, (5.17) will be a constant factor.

The preference price exerts the same effect as the imposition of a tariff because violation of the minimum entry price carries a tariff penalty. But it should only have a noticeable impact when the preference price level interferes with the free trade price. Therefore, it would have an impact on orange prices but not on mandarin prices.

It is reasonable to argue that mandarin market prices in the Community have been the same as in the Rest of the European Area (disregarding transportation costs). If quantity of pears consumed in the Community follows similar fluctuations as in the Rest of Europe, the real orange market price in the Rest of Europe can be derived by correcting for the effect of the preference price. This proxy price is called P^{OR} and is calculated from (5.6) in the following manner

$$P^{OR} = P^{OE} - a_4 P^{OP}, \quad (5.18)$$

where P^{OR} = Rest of European orange price,

P^{OE} = EC orange price, and

P^{OP} = preference orange price.

In the remainder of this study P^{OR} , derived in 5.18, and P^{ME} , from 5.7, are referred as the orange and mandarin international prices, respectively. Consequently, it is assumed that P^{OP} exerts a constant negative effect on P^{OR} as it was shown in (5.17).

5.2 Relationship between International and National Prices

It is necessary to establish the linkage between international and national or farmers' prices to evaluate the impact that external markets have on plantings by variety. Relating an aggregate price (international) to disaggregate prices (national) was the main issue to deal with to study the linkage. Only two countries, Spain and Israel, had supply

analyzed with farmers' prices in each country. Consequently, these two countries are analyzed here.

5.2.1 Spain

First, overall orange and mandarin prices were calculated. In each case prices of each variety were weighted by their seasonal exports. This was done to establish a parallel with the way international prices were calculated.

When relating the international orange and the overall orange farmers' price it was hypothesized that this commodity, as a whole, is in a declining phase of its marketing life. Consumers are slowly changing to other commodities or products like juices. In order to maintain pre-established marketing channels and because of the spread of the supermarket chains and their contractual relationships, traders are willing to pay a premium to farmers in seasons when Spanish export shares with respect to exports from the rest of its competitors is likely to decrease and vice versa. A dummy variable was introduced for seasons 1974/75 and 1975/76 to capture unexplained high prices for farmers without a correspondence in international markets.

Mandarins are in a different stage of their marketing life. This is already a well-accepted commodity and its consumption is increasing. In the initial stage, when traders needed to open new channels and promote the product heavily, a great part of this high market premium was used to compensate for increasing marketing costs. It is believed that traders are paying higher prices to farmers in order to generate new incentives for a further increase in production. Marketing channels are established and the marketing costs are not so high as before. A

time trend was included to try to capture this effect. For mandarins a dummy variable was introduced in 1970/71 because international prices were extremely low in relation to farmers' price. The final specifications for oranges and mandarins were

$$P^{SO} = a_1 + a_2 P^{OR} + a_3 S^O + a_4 D7475, \text{ and}$$

$$P^{SM} = b_1 + b_2 P^{ME} + b_3 T + b_4 D70,$$

where P^{SO} = Spanish orange farmers' price (\$/ton),

P^{SM} = Spanish mandarin farmers' price (\$/ton),

P^{OR} = international orange price (\$/ton),

P^{ME} = international mandarin price (\$/ton),

S^O = ratio of Spanish orange exports with respect to the Rest of the Mediterranean orange exports,

T = time trend,

$D70$ = dummy variable in 1970/71 ($D=1$),

$D7475$ = dummy variable in 1974/75 and 1975/76 ($D=1$).

Results are shown in Table 5.4. The dependent variable is farmers' price. All coefficients have the expected sign and the statistical performance of the equations is reasonable.

The next step was to try to find out how different varieties are related to overall farmers' price for each commodity, oranges and mandarins. A time trend was used as an independent variable in addition to the overall orange (mandarin) farmers' price. For Late Oranges a dummy was used in 1974/75 to take account of an outlier observation. The general specification used was

$$P_i^O = a_1 + a_2 P^{SO} + a_3 T + a_4 D74, \text{ and}$$

$$P_i^M = b_1 + b_2 P^{SM} + b_3 T,$$

Table 5.4 SPAIN: Estimated Overall Farmers' Price, 1966/67 - 1975/76

Variety	Constant Term	Independent Variables							R ²	d
		P ^{OR}	P ^{ME}	S ^O	T	D70	D7475			
Oranges	101.62	.27 (.08)		-114.04 (34.89)				33.66 (7.51)	.92	2.2
Mandarins	45.99		.12 (.05)		2.67 (1.48)	-31.93 (12.37)			.72	2.36

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: Price is given in \$ per ton.

Independent: P^{OR} = international orange price (\$/ton), P^{ME} = international mandarin price (\$/ton), S^O = ratio of Spanish orange exports with respect to the Rest of the Mediterranean orange exports, T = time (T=1 in 1966/67), D70 = dummy variable (D70=1 in 1970/71), D7475 = dummy variable (D7475=1 in 1974/75 and 1975/76).

where the new variables are

P_i^O = farmers' orange price for variety i (\$/ton),

P_i^M = farmers' mandarin price for variety i (\$/ton), and

$D74$ = dummy variable in 1974/75 ($D=1$).

Results are shown in Table 5.5. The dependent variable in all equations is the farmers' price for a particular variety. In general the trend variable reflects quite accurately what is happening in the market among varieties. In 1974/75 it is noticeable that prices in the third quarter reached abnormally high values (Late Orange). The fit of these equations indicates that this method might be appropriate for closing the overall model through its price equations.

5.2.2 Israel

The procedure applied in Spain was carried out in Israel. A dummy was introduced for seasons 1974/75 and 1975/76 to take account of the same effect that happened in the Spanish equation. Table 5.6 shows results for the estimated overall orange farmers' price. Except for the 1974/75 and 1975/76 seasons there is a close correspondence between national and international prices.

Table 5.7 shows results for the relationship between each variety and the overall orange farmers' price. P^{IO} refers to the overall orange farmers' price. Late orange had a dummy variable for 1974/75 with the same effect as found in Spain.

Table 5.5 SPAIN: Estimated Farmers' Price by Variety, 1966/67 - 1975/76

Variety	Constant Term	Independent Variables					R ²	d
		P ^{SO}	P SM	T	D74	D74		
Satsuma	37.72		.76 (.13)	-4.34 (.82)			.87	1.5
Clementine	-35.16		1.2 (.17)	5.47 (1.04)			.92	1.65
Navel	17.7	.95 (.06)		-1.84 (.59)			.96	1.89
Late Orange	-20.53	1.41 (.16)		64.63 (13.6)	1.58 (1.45)		.96	1.58
Blood Orange	-19.02	1.01 (.06)		1.3 (.51)			.97	2.44

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimate.

Variables

Dependent: Price is given in \$ per ton.
 Independent: P^{SO} = Spanish orange farmers' price (\$/ton), PSM = Spanish mandarin farmers' price (\$/ton), T=time (T=1 in 1966/67), D74=dummy variable (D74=1 in 1974/75).



Table 5.6 ISRAEL: Estimated Overall Orange Farmers' Price, 1966/67 - 1975/76

Variety	Independent Variables			
	Constant Term	P ^{OR}	D74/75	R ² d
Oranges	36.58	.1 (.03)	45.05 (3.4)	.97 2.95

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: Price is given in \$ per ton.

Independent: P^{OR} = international orange price (\$/ton), D74/75 = dummy variable (D74/75=1 in 1974/75 and 1975/76).

Table 5.7 ISRAEL: Estimated Orange Farmers' Price by Variety, 1966/67 - 1975/76

Variety	Independent Variables			
	Constant Term	P ^{IO}	D74	R ² d
Shamouti	10.2	.79 (.06)		.94 2.39
Late Orange	-9.49	1.18 (.14)	27.64 (10.01)	.95 1.94

General Note

R² denotes the coefficient of multiple determination, d denotes the value of the Durbin-Watson "d" statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: Price is given in \$ per ton.

Independent: P^{IO} = Israel overall orange farmers' price (\$/ton), D74 = dummy variable (D74=1 in 1974/75).

CHAPTER VI

ORANGE AND MANDARIN EUROPEAN IMPORTS

Preamble

More than 95 percent of orange and mandarin exports from the Mediterranean Area go to European markets (Table 4.3). The analysis of imports by Western and Eastern European countries has been carried out using different approaches to reflect their trade policies. Although the chapter deals with import demand since most of the importing do not produce oranges and mandarins imports are generally equal to consumption.

The Western European countries have been divided in 4 groups: 1) the original members of the European Community (France, Germany, Netherlands, Belgium and Luxembourg) excluding Italy because it does not import in order to protect its own industry, 2) the new members of the European Community (England, Ireland and Denmark), 3) the Scandinavian countries (Norway, Sweden and Finland) and 4) Switzerland and Austria. The European Community was divided in two groups because they had different import policies during the period analyzed, 1966/67 to 1975/76. The third and fourth group were selected based on their geographical proximity. The USSR, Hungary, Poland, Czechoslovakia, and Yugoslavia were included in the Eastern European country group.

Orange and mandarin imports by Western European countries from non-Mediterranean areas were analyzed to complement information about market import shares for Mediterranean export countries in those countries.

The import season was defined as October to June for oranges and October to March for mandarins. Estimation was carried out between 1966/67 and 1975/76 seasons.

6.1 Orange and mandarin imports in Western European countries

Tables 6.1 and 6.2 show quantities of oranges and mandarins imported by different country groups. Monthly information for orange and mandarin imports and exports was available for all countries in the original EC countries and England from national trade statistics. Monthly net trade import figures were calculated and aggregated from October to June for oranges and from October to March for mandarins. For the rest of the countries data given by CLAM for orange and mandarin exports from the Mediterranean countries were used as total import figures.

Table 6.3 presents information on population in each group and in individual countries. Imports per capita were calculated as the dependent variable for all equations. The specification of the import equations included similar variables for all groups. It was hypothesized that imports are influenced by the price of the commodity (oranges or mandarins), the price of a substitute (pears) and trend (T) that captures changes in consumers tastes and long-run substitution effects. An income variable was not included because changes in consumer preferences was considered to be the more relevant factor. Attempts to include consumption of several fruit juices as an explanatory variable for possible substitution effects failed to show any consistent statistical relationship.

Table 6.1. ORANGE CONSUMPTION, 1966/67 - 1975/76

Country	Thousand Tons									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Original EC Countries (a)	1572.23	1477.35	1526.64	1783.94	1507.52	1558.16	1797.95	1537.43	1489.76	1456.15
New EC Countries (b and c)	368.03	336.98	338.24	403.67	346.34	364.02	394.69	324.08	315.27	322.23
Norway, Sweden										
Finland (c)	173.7	163.72	174.71	175.0	166.	164.	177.	168.	170/	168.
Switzerland & Austria (c)	144.	132.	149.	161.	133.	137.	136.	136.	132.	137.
Eastern European Countries (c)	393.	391.	428.	442.	477.	613.	686.	676.	698.	729.

SOURCE: Derived as explained in text from

- a) Belgium. Institut National de Statistique. Statistique du Commerce. Bruxelles.
 France. Ministère de l'Agriculture. Bulletin de Statistique Agricole. Paris.
 Germany. Statistische Bundesamt. Foreign Trade Statistics. Berlin.
 Netherlands. Netherlands Central Bureau of Statistics. Foreign Trade Statistics. The Hague.
 b) England. Commonwealth Economic Committee. Fruit Intelligence. London.
 c) CLAM. Commission des Etudes Economiques. Les exportations d'agrumes du bassin Méditerranéen. Statistiques. Evaluations, Répartitions.

Table 6.2 MANDARIN CONSUMPTION, 1966/67 - 1975/76

Country	Thousand Tons										
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	
Original EC Countries (a)	266.3	257.6	297.6	371.	383.8	397.1	530.9	467.8	442.6	481.4	
New EC countries (b and c)	24.2	22.7	28.2	41.7	46.2	42.4	70.3	60.8	59.6	61.4	
Norway, Sweden											
Finland (c)	15.5	14.5	15.6	22.0	28.2	28.1	41.6	40.2	40.2	39.2	
Switzerland & Austria (c)	24.4	17.4	30.7	36.8	31.9	42.2	39.6	26.1	34.7	34.3	
Eastern European Countries (c)	5.3	2.5	7.7	7.2	8.2	11.8	31.5	31.7	32.6	29.7	

SOURCE: Derived as explained in text from

- a) Belgium. Institut National de Statistique. Statistique du Commerce. Bruxelles
 France. Ministère de l'Agriculture. Bulletin de Statistique Agricole. Paris.
 Germany. Statistische Bundesamt. Foreign Trade Statistics. Berlin.
 Netherlands. Netherlands Central Bureau of Statistics. Foreign Trade Statistics. The Hague.
 b) England. Commonwealth Economic Committee. Fruit Intelligence. London.
 c) CIAM. Commission des Etudes Economiques. Les exportations d'agrumes du bassin Méditerranéen. Statistiques, Evaluations, Répartitions.

Table 6.3 EC COUNTRIES: Population, 1966/67 -1975/76

Country	Thousands										
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	
Germany	59887	60192	60453	60700	60941	61168	61375	61549	61682	61532	
France	49164	49548	49914	50315	50770	51249	51703	52131	52510	52915	
Netherlands	12597	12725	12873	13032	13194	13330	13438	13540	13635	13770	
Belgium	9508	9543	9574	9604	9638	9673	9711	9742	9803	9846	
Luxembourg	336	337	338	339	340	341	341	342	342	343	
Total	131422	136345	133152	133990	134883	135761	136560	137972	137304	138406	
England	54997	55164	55318	55480	55712	55882	56021	56221	56427	56074	
Ireland	2910	2927	2945	2954	2980	3014	3029	3094	3131	3166	
Denmark	4039	4867	4891	4929	4963	4992	5022	5050	5070	5073	
Total	62746	62950	63154	63363	63655	63888	64072	64370	64628	64313	
Norway	3786	3819	3851	3877	3903	3933	3961	3990	4015	4027	
Sweden	7868	7912	7968	8043	8098	8122	8137	8160	8209	8219	
Finland	1606	1627	1624	1606	1616	1634	1657	1680	1689	1730	
Total	16260	16358	16443	16526	16617	16689	16755	16830	16913	16976	
Switzerland	5990	6070	6140	6190	6230	6385	6431	6489	6535	6346	
Austria	7323	7349	7373	7391	7456	7487	7525	7528	7538	7514	
Total	13313	13419	13513	13581	13686	13872	13956	14017	14073	13860	

SOURCE: FAO. Production Yearbook, Rome.

Orange prices, P^{OE} and P^{OR} developed in Chapter V, were used in the original EC members equation and the rest of the world equations, respectively. P^{ME} , developed in Chapter V, was used as the mandarin price in all equations. Prices for pears were taken from two different sources. For the original EC countries prices were taken from France by averaging monthly quotations at Strasbourg. For the rest of the country groups prices were taken from England; it was assumed that they represented international prices and could be applied to other countries. In both cases two prices were calculated, one represented the October to March season and the second from October to June. Results are shown in Tables 6.4 and 6.5. Both prices were deflated by the consumer price index with base in 1976 and then they were converted into dollars by applying the average exchange rate for that year.

The specification for orange imports was

$$Q^O = a_1 + a_2 P^{OE} (P^{OR}) + a_3 P^{PEJ} (P^{PRJ}) + a_4 T + a_5 (D677071, D7071),$$

where the array of dummy variables incorporated in the equation in parenthesis refer to the dummies included in different equations,

Q^O = orange imports (grams per capita),

P^{OE} = EC orange price (\$ 1976) (dollars/ton),

P^{OR} = international orange price (\$ 1976) (dollars/ton),

T = time,

$D677071$ = dummy variable in seasons 1967/68, 1970/71 and 1971/72 ($D=1$),

$D7071$ = dummy variable in seasons 1970/71 and 1971/72 ($D=1$),

P^{PEJ} = EC pear price (October-June) (\$ 1976) (dollars/ton), and

P^{PRJ} = international pear price (October-June) (\$ 1976) (dollars/ton).

Table 6.4 FRANCE: Pear prices, 1966/67 -1975/76

Period	Dollars (1976) per Ton									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
October-March	375.3	389.3	369.3	394.	374.7	365.3	502.	355.3	394.7	464.7
October-June	422.	434.6	674.	382.	434.6	368.	506.7	352.	420.7	464.7

SOURCE: Derived from, France. Service Central des Enquetes et Etudes Statistiques. Bulletin Statistique Agricole. Paris., as explained in text.

Table 6.5 UNITED KINGDOM: Pear prices, 1966/67 -1975/76

Period	Dollars (1976) per Ton									
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
October-March	485.3	497.3	296.7	324.	328.	342.	532.3	436.	356.7	431.3
October-June	510.7	518.	339.3	363.3	374.	336.	524.7	475.3	382.	413.3

SOURCE: Derived from, England. Commonwealth Economic Committee. Fruit Intelligence. London, as explained in text.

Results are shown in Table 6.6. A dummy variable was included for 1967/68, 1970/71 and 1971/72 seasons for which Norway, Sweden and Finland orange consumption was estimated. The reason for the existence of such behavior is the irregular supply of Israel, the main exporter in that area. For Switzerland and Austria a dummy was included for seasons 1970/71 and 1971/72. Irregular export allocation by Italy, the leading exporter to that area created large differences in some seasons. Both cases could be explained as marginal markets in Europe with particular export countries having a dominant role. Whenever the leading export countries are not able to provide normal supplies, the rest of the exporters do not fill the gap because of the insignificant quantities involved and the rigidities of the distribution system.

Results indicate that all signs for orange prices are correct with low standard errors of the estimates. The sign of the coefficient of the pear price is correct except for the last equation. But the precision of the estimators is low except for the original EC countries. The variable T has a negative sign in all equations with low standard errors in all cases, stressing the downward trend that consumption of fresh oranges had had in European markets. Finally, the coefficient of determination is high in all cases and the Durbin-Watson statistic do not indicate autocorrelation.

The specification for mandarin imports was similar to the orange imports function

$$Q^m = a_1 + a_2 P^{ME} + a_3 P^{PEM} (P^{PRM}) + a_4 T + a_5 D73,$$

Table 6.6 WESTERN EUROPE: Estimated orange imports, 1966/67 - 1975/76

Countries	Independent variables										R ²	d
	Const. Term	P ^{OE}	P ^{OR}	P ^{PEJ}	P ^{PRJ}	T	D677072	D7072	R ²	d		
Original EC Countries	22634	-22.76 (4.63)		6.24 (3.38)		-579.91 (108.72)			.83	1.99		
New EC Countries	8282		-7.5 (1.88)		1.18 (1.27)	-209.9 (45.66)			.78	2.28		
Norway, Sweden Finland	11681		-1.82 (.98)		.01 (.67)	-118.63 (24.58)	-555.72 (107.46)		.89	3.25		
Switzerland & Austria	16990		-5.73 (3.61)		-7.2 (2.59)	-304.09 (86.97)		-1271.93 (488.32)	.80	1.85		

General Note

R² denotes the coefficient of multiple determination, d denotes the Durbin-Watson "d" statistics and values in parentheses are the standard errors of the estimate.

Variables

Dependent: imports are given in grams per capita.

Independent: P^{OE} = EC orange price (\$/1976) (dollars/ton), P^{OR} = international orange price (\$ 1976) (dollars/ton), T = time (T = 1 in 1966/67), P^{PEJ} = EC pear price (October-June) (\$ 1976) (dollars/ton), P^{PRJ} = international pear prices (October-June) (\$ 1976) (dollars/ton),

D677071 = dummy variable (D677071 = 1 in seasons 1967/68, 1970/71 and 1971/72), D7071 = dummy variable (D7071 = 1 in seasons 1970/71 and 1971/72).

where Q^{In} = mandarin imports (grams per capita),

P^{ME} = international mandarin price (\$ 1976) (dollars/ton),

P^{PEM} = EC pear price (October-March) (\$ 1976) (dollars/ton),

P^{PRM} = international pear price (October-March) (\$ 1976) (dollars/ton),

$D73$ = dummy variable in season 1973/74 ($D=1$), and

T = time.

Results are shown in Table 6.7. The signs for mandarin prices are correct with low values for the standard errors of the estimates. Price of pears shows the same performance as for the orange equations. Signs are correct in all equations except for Switzerland and Austria's mandarin imports. But only in the original EC countries shows high precision. The trend is positive in 3 equations but the estimates have low precision. A dummy variable was included for the 1973/74 season to account for a discontinuity of mandarins supplied to Switzerland and Austria by its leading exporter, Turkey. This discontinuity could be due to similar factors that have affected orange imports explained above.

The R^2 is high in all cases and the Durbin-Watson statistic is in the indetermined region.

6.2 Orange and mandarin imports in Eastern European countries

Tables 6.1 and 6.2 show orange and mandarin imports by Eastern European countries from 1966/67 to 1975/76. Table 6.8 shows the population for each individual country and totals. Imported orange and mandarin quantities from the Mediterranean Area were taken as total consumed quantities. Although this might not be the case, imports from other places like Cuba have a lower quality and are not direct substitutes.

Table 6.7 WESTERN EUROPE: Estimated mandarin imports, 1966/67 - 1975/76

Countries	Independent variables						
	Const. Term	pME	pPEM	pPRM	T	D73	R ² d
Original EC Countries	2707	-2.08 (.67)	4.08 (1.52)		18.8 (52.69)		.93 1.62
New EC Countries	932	-.92 (.29)		.94 (.33)	14.83 (21.6)		.94 3.29
Norway, Sweden Finland	1201	-1.47 (.65)		2.16 (.75)	102.18 (48.72)		.95 2.62
Switzerland & Austria	6112	-3.34 (1.1)		-.46 (1.28)	-126.6 (81.24)	-838.39 (327.74)	.82 2.76

General Note

R² denotes the coefficient of multiple determination, d denotes the Durbin-Watson "d" statistics, and values in parentheses are the standard errors of the estimates.

Variables

Dependent: imports are given in grams per capita.

Independent: P ME = international mandarin price (\$ 1976) (dollars/ton), P PEM = EC pear prices (October-March) (\$ 1976) (dollars/ton), P PRM = international pear price (October-March) (\$ 1976) (dollars/ton)

T = time (T = 1 in 1966/67), D73 = dummy variable (D73 = 1 in 1973/74).



Table 6.8 EASTERN EUROPEAN COUNTRIES: Population, 1966/67-1975/76

Country	Thousands										
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	
USSR	2 35990	2 38320	2 40550	2 42768	2 45080	2 47460	2 49750	2 52061	2 54390	2 56674	
Hungary	10220	10260	10300	10338	10370	10400	10410	10430	10510	10600	
Poland	31911	32305	32555	32473	33057	33308	33560	33810	34022	34362	
Czechoslovakia	14305	14362	14418	14338	14500	14544	14585	14630	14757	14846	
Yugoslavia	19840	20030	20210	20371	20570	20770	20960	21150	21352	21520	
Total	312299	315277	318033	320289	323577	326482	329265	332081	335061	338002	

SOURCE: FAO, Production Yearbook, Rome

It was hypothesized that the volume of trade permitted by governmental agencies was based on two elements, 1) the amount of foreign currency available and 2) near term import prices. Total value of imported fruits and vegetables was used as a proxy for the amount of foreign currency available for imports. Data are shown in Table 6.9. It was deflated by the United States consumer price index with base in 1976 and then divided by population. International orange and mandarins lagged one year were used as proxy variables to reflect the impact of prices on short run planning decisions. The specification was

$$I_t^o (I_b^m) = a_1 + a_2 P_{t-1}^{OR} (P_{t-1}^{ME}) + a_3 IFV_t,$$

where I^o = orange imports (grams per capita),

I^m = mandarin imports (grams per capita),

P^{OR} = international orange price (1976 \$) (\$/ton),

P^{ME} = international mandarin price (1976 \$) (\$/ton), and

IFV = imported fruits and vegetables (1976 \$)(\$/100 people).

Results are shown in Table 6.10. The statistical performance of both equations is acceptable. Signs are correct, coefficients have low standard errors and the R^2 is high.

6.3 Western European orange imports from non-Mediterranean countries

Table 6.11 shows the quantity of oranges imported by Western European countries from non-Mediterranean countries. Monthly information was available for England and France from their national trade statistics. The French information was used to extrapolate for the rest of the original EC countries. The same approach was used for the new EC countries using the English information. An average of both

Table 6.9 EASTERN EUROPEAN COUNTRIES: Fruit and Vegetable Imports, 1966/67 - 1975/76.

Country	Thousand Dollars										
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	
USSR	266789	283496	326970	347417	362746	472760	490347	567604	768902	965356	
Hungary	20447	20184	21893	25548	23101	30993	44225	59594	53365	59822	
Poland	29739	35063	43510	34013	40775	64189	80458	72746	97519	109416	
Czechoslovakia	75841	73141	72830	99385	85860	115941	145252	141523	183515	208289	
Yugoslavia	26673	26588	28841	40338	44181	44702	64730	92624	83461	97315	
Total	419489	438472	513027	546701	55663	728585	825012	1759103	1186762	1440198	

SOURCE: FAO, Trade Yearbook, Rome.

Table 6.10 EASTERN EUROPEAN COUNTRIES: Estimated orange and mandarin imports, 1966/67 -1975/76

Variety	Const. Term	Independent variable				R ²	d
		P _{t-1}	OR _{t-1}	ME _{t-1}	IFV _t		
Oranges	1104	-1.92 (.67)			35.65 (7.86)	.92	1.62
Mandarins	36			-.07 (.04)	2.65 (1.61)	.81	1.5

General Note

R² denotes the coefficient of multiple determination, d denotes the "d" Durbin-Watson statistic and values in parenthesis are standard errors of the estimates.

Variables

Dependent: imports are given in grams per capita

Independent: P_{OR} = international orange price (1976 \$) (\$/ton), P^{ME} = international mandarin price (1976 \$) (\$/ton), IFV = imported fruits and vegetables (1976 \$) (\$/100 people)

Table 6.11 WEST EUROPE: Orange imports from non-Mediterranean Countries, 1966/67 - 1975/76

Country	Tons										
	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	
Primitive EC Countries (a)	127234	116354	115642	141936	75525	92160	101949	88435	126760	93155	
New EC Countries (b)	51731	48705	42945	44668	27340	34022	37694	30084	36274	41235	
Other Western European Countries (a and b)	34988	32382	32570	32595	18536	22336	22830	20503	31400	32292	

SOURCE: Derived as explained in text from

- a) France. Ministère de l'Agriculture. Bulletin de Statistique Agricole. Paris.
 b) England. Commonwealth Economic Committee. Fruit Intelligence. London.

sources was calculated and applied for the rest of the Western European countries.

The purpose was to examine trends and if discontinuities occurred these were dealt with through dummy variables. The specification was

$$I^o = a_1 + a_2 T + a_3 (D70, D6974, D75, D7475),$$

where the array of dummy variables incorporated in the equation in parenthesis refer to the dummies included in different equations,

I^o = orange imports (thousand tons),

T = time,

D70 = dummy variable for season 1970/71 (D=1),

D6974 = dummy variable for seasons 1969/70 and 1974/75 (D=1),

D75 = dummy variable for season 1975/76 (D=1), and

D7475 = dummy variable for seasons 1974/75 and 1975/76 (D=1).

Results are shown in Table 6.12. There is a clear negative trend in all groups.

Table 6.12 WEST EUROPE: Estimated orange imports from non-Mediterranean countries, 1966/67 - 1975/76

Country	Const.	Term	T	Independent variables				R ²	d
				D70	D6974	D75	D7475		
Original EC Countries	133		-3.87 (.7)	-30.57 (6.73)	34.06 (5.11)		.93	2.29	
New EC Countries	56		-2.31 (.44)	-13.42 (3.65)		12.03 (4.27)	.87	2.95	
Other Western European Countries	42		-2.17 (.31)	-8.53 (2.22)		14.53 (2.32)	.92	1.82	

General Note

R² denotes the coefficient of multiple determination, d denotes the Durbin-Watson "d" statistics and values in parenthesis are standard errors of the estimates.

Variables

Dependent: imports are given in thousand tons.

Independent: T = time (T = 1 in 1966/67), D70 = dummy variable (D70 = 1 in 1970/71), D6974 = dummy variable (D6974 = 1 in 1969/70 and 1974/75), D75 = dummy variable (D75 = 1 in 1975/76), D7475 = dummy variable (D7475 = 1 in 1974/75 and 1975/76)

CHAPTER VII

SUMMARY AND CONCLUSIONS

7.1 Summary

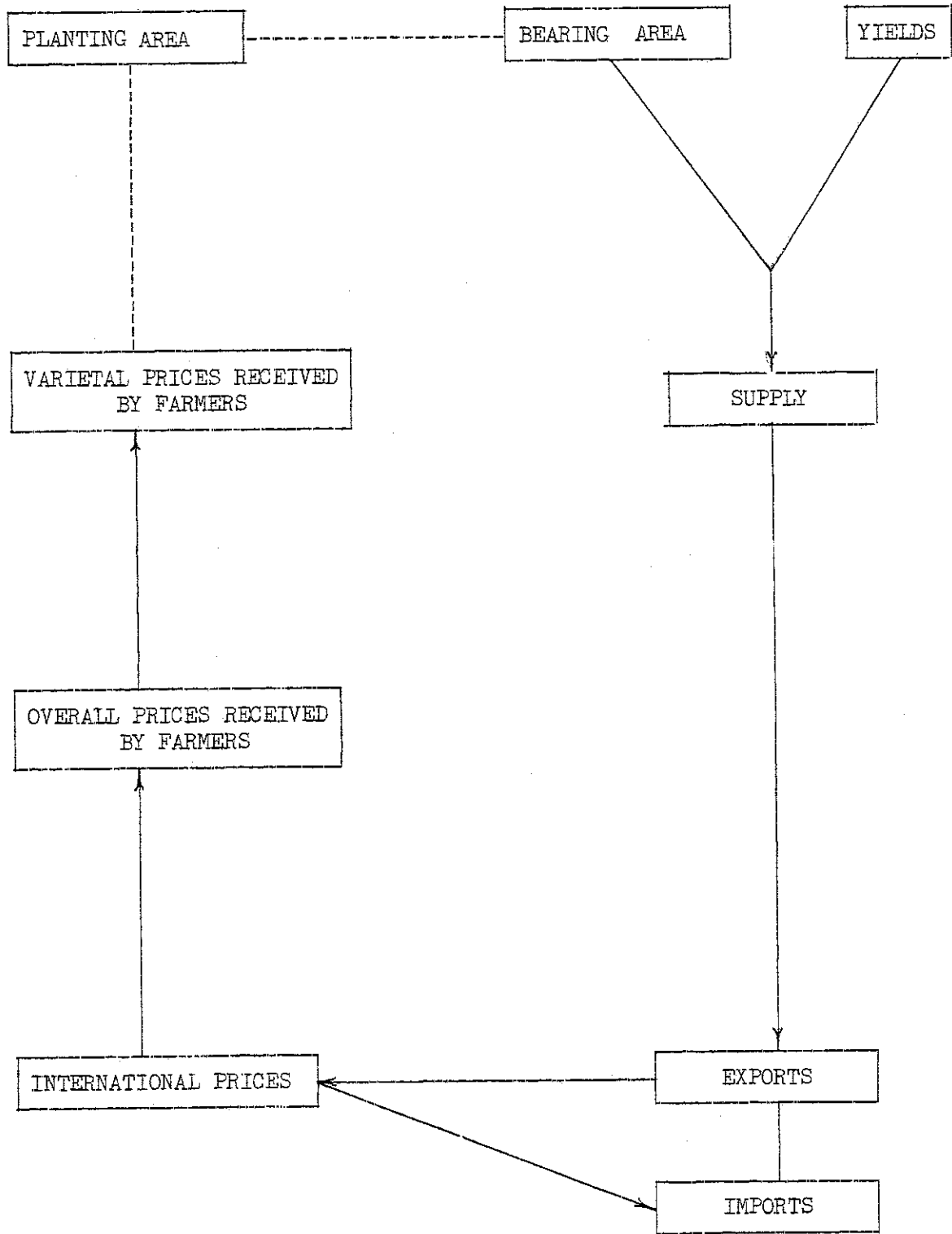
Figure 7.1 provides a summary of the linkages between supplies, exports, imports, international prices and farmers' prices at national levels for oranges and mandarins in the Mediterranean Area. An econometric approach is used to estimate the relationships between dependent and explanatory variables representing economic or other factors for each of the components of figure 7.1. It is assumed that this system is recursive and that each block of relationships can be estimated using ordinary least squares. The same overall approach was used for oranges and mandarins.

In figure 7.1 full arrows represent relationships for a particular year and the direction of causality. Broken arrows are used when there is a time lag of one season or more in response between two blocks. A continuous line without arrow means that a relationship exists between two blocks.

In a simple season the area of bearing fruit and yields are the main factors determining supply or total production. In countries such as those in the Mediterranean for which orange and mandarin exports are the main reason for the cultivation of these crops, exports are mainly determined by supplies. European countries, with the exception of Italy, do not grow these fruits and their imports correspond closely to what the Mediterranean Area is able to supply.

Exports vary quite dramatically between seasons, mainly because of changes in supplies due to weather conditions. These fluctuations have

Figure 7.1 MARKET RELATIONSHIPS FOR ORANGES AND MANDARINS



an influence on international market price fluctuations. International prices determine farmers' prices in each exporting country. Prices received by farmers influence farmers' planting decisions because they base their expectations on past prices. Once new trees are planted, after some years, they start bearing fruit and increase the stock of bearing area.

Figure 7.2 shows the geographical area analyzed in the Mediterranean Area. Tables 7.1 and 7.2 show the number of equations in each block of market relationships for oranges and mandarins by country, geographical or economic area.

The supply sector has the largest number of equations because greater disaggregation has been used. Thus the supply of oranges and mandarins in each country has been examined by variety or group of varieties, whereas oranges and mandarins have been aggregated into two different groups to estimate exports, imports and international prices. The linkage between the aggregated and disaggregated parts is achieved by relating overall orange (mandarin) prices received by farmers with the varietal orange (mandarin) prices received by farmers.

The equations estimated in the different blocks are summarized below with the exogenous and endogenous variables used. Dummy variables are not included in this summary. If subscripts are not specified it means that all variables relate to the same season. In the following description whenever a coefficient is attached to more than one variable it means that these variables have been used alternatively in different estimations.

FIGURE 7.2. THE MEDITERRANEAN STUDY AREA

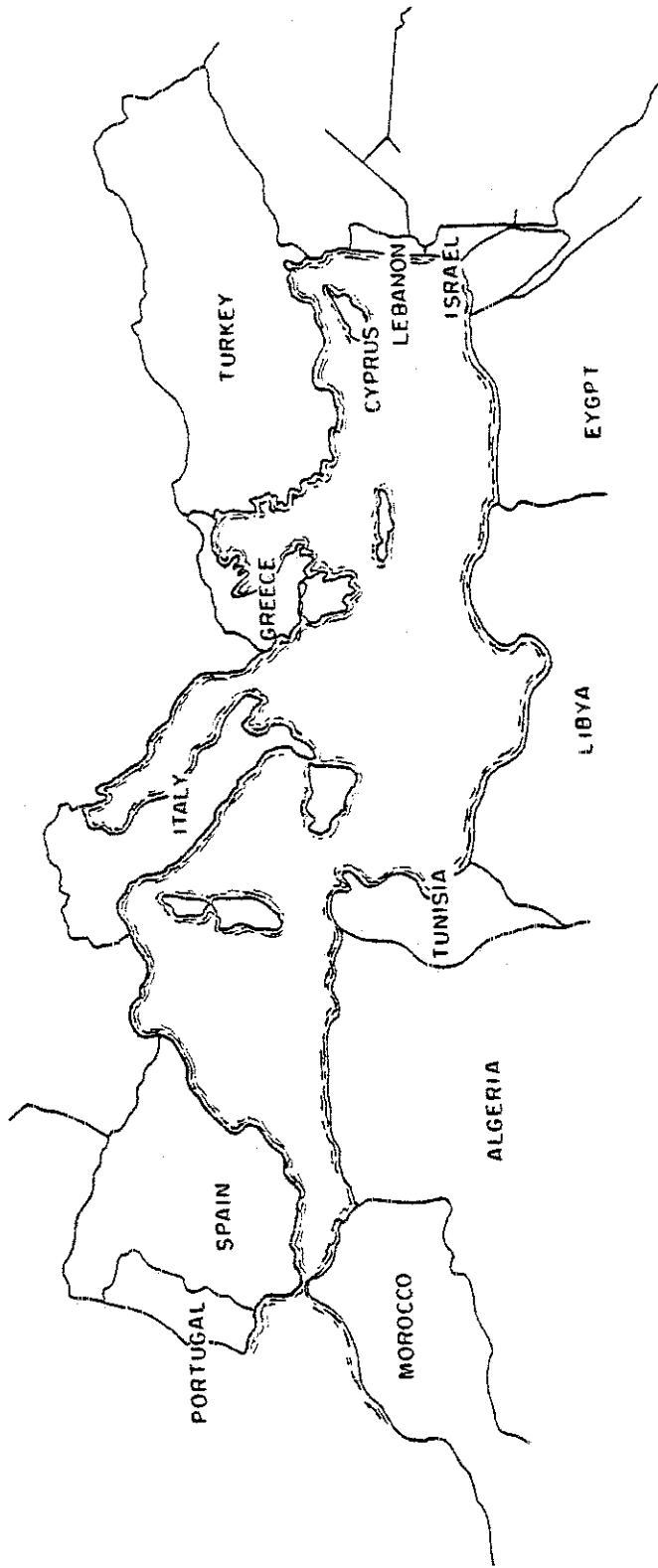


Table 7.1 EQUATIONS SPECIFIED IN THE DIFFERENT BLOCS FOR THE ORANGE MARKET RELATIONSHIPS

	Country, geographical or economic Area	Number of Equations
<u>Supply</u>		
	Spain	16
	Israel	5
	Morocco	2
	Rest of Mediterranean Area	1
<u>Exports</u>		
<u>To European Countries</u>		
	Spain	1
	Israel	2
	Morocco	1
	Rest of Mediterranean Area	1
<u>To Non-European Countries</u>		
	Total Mediterranean Area	1
<u>International Prices</u>		
	European Markets	1
<u>Imports</u>		
<u>From Mediterranean Area</u>		
	Original 6 EC members	1
	New 3 EC members	1
	Scandinavia less Denmark	1
	Switzerland and Austria	1
	Non-European countries	1
	East European countries	1
<u>From Non-Mediterranean Area</u>		
	Original 6 EC members	1
	New 3 EC members	1
	Other Western European c countries	1
<u>Overall Prices Received by</u>		
<u>Farmers</u>		
	Spain	1
	Israel	1
<u>Varietal Prices Received by</u>		
<u>Farmers</u>		
	Spain	3
	Israel	2
	Total	47

Table 7.2 EQUATIONS SPECIFIED IN THE DIFFERENT BLOCS FOR THE MANDARIN MARKET RELATIONSHIPS.

	Country, geographical or economic Area	Number of Equations
<u>Supply</u>		
	Spain	6
	Morocco	2
	Rest of Mediterranean Area	1
<u>Exports</u>		
<u>To European Countries</u>		
	Spain	1
	Morocco	1
	Rest of Mediterranean Area	1
<u>To Non-European Countries</u>		
	Total Mediterranean Area	1
<u>International Prices</u>		
	European Markets	1
<u>Imports</u>		
	Original 6 EC members	1
	New 3 EC members	1
	Scandinavia less Denmark	1
	Switzerland and Austria	1
	Non-European countries	1
	East European countries	1
<u>Overall Prices Received by Farmers</u>		
	Spain	1
<u>Varietal Prices Received by Farmers</u>		
	Spain	2
	Total	23

7.1.1 Supply

A theoretical framework was developed in chapter II and the empirical results are gathered in chapter III. Supplies were analyzed individually for Spain, Israel and Morocco. The Rest of the Mediterranean Area was aggregated.

7.1.1.1 Spain

Area

The theoretical model developed in chapter II was applied to 5 varietal groups, two mandarin varieties: Satsuma and Clementine and three orange varieties: Navel, Blood orange and Late orange. The final specification was

$$A_t - A_{t-1} = a + b \frac{A_{t-1}^{\geq 7}}{A_{t-1}} + c \frac{A_{t-1}^{>14}}{A_{t-1}} + d \frac{P_{t-1}}{\bar{P}_{t-1}}$$

where

- A = total area,
- $A^{\geq 7}$ = area equal or greater than 7 years old,
- $A^{>14}$ = area greater than 14 years old,
- P = farmers' price, and
- \bar{P} = average orange and mandarin price.

The empirical results obtained were given in Table 3.5

The rest of the varietal groups; one for mandarins: Common mandarins, and 5 oranges: Other oranges, Navelina, Common White oranges, Salustiana and Other Select White, were specified as follows:

$$A = a + bT,$$

where

- A = total area, and
- T = time.

Results were presented in Table 3.6

Yield

Similar specification was used for all 11 varieties, 8 oranges and 3 mandarins

$$Y = a + bT(\text{Log}T) + c \text{RSS}(\text{RSO}),$$

where Y = yield,

T = time,

$\log T$ = logarithm of time,

RSS = Spanish rain in September, and

RSO = Spanish rain in September and October.

Results were given in Table 3.9

7.1.1.2 Israeli

Area

Two orange varieties, Shamouti and Late orange, were analyzed with the following specification

$$A_t^b = a + b A_{t-1}^b + c \left(\frac{P_{t-3}}{\bar{P}_{t-3}} \right) \left(\frac{P_{t-4}}{\bar{P}_{t-4}} \right) + d T$$

where A^b = bearing area,

P = farmers' price,

\bar{P} = average farmers' price for Shamouti, Late orange and Grapefruit, and

T = time.

Results were presented in Table 3.7

Yield

The same orange varieties, Shamouti and Late oranges, were analyzed

using the following specification

$$Y = a + b \text{ RMA} + cT,$$

where Y = yield,

RMA = Israel rain in March and April, and

T = time

Results were given in Table 3.10

Supply

The rest of the orange and mandarin production was specified in the following manner

$$S = a + bT,$$

where S = supply, and

T = time.

Results were presented in Table 3.12

7.1.1.3 Morocco

Area

All oranges and mandarins were specified in the following manner

$$A_t - A_{t-1} = a + b \frac{P_t^I}{\bar{P}_t^I} + c \frac{A_{t-1}^b}{A_{t-1}} + dT,$$

where A = total area,

P^I = international orange price,

\bar{P} = average orange and mandarin international prices,

A^b = bearing area, and

T = time.

Results were given in Table 3.8

Yield

All oranges and mandarins were specified in the following manner

$$Y = a + bR_{FM} + cT,$$

where Y = yield

R_{FM} = Morocco rain in September and October, and

T = time.

Results were presented in Table 3.11

7.1.1.4 Rest of Mediterranean Area

Both oranges and mandarins were specified by the following manner

$$S = a + bT,$$

where S = supply, and

T = time.

Results were given in Table 3.12

7.1.2 Exports

Chapter IV includes the analysis for exports

7.1.2.1 To European Countries

Oranges and mandarins exported from Spain, Israel, Morocco and the Rest of the Mediterranean Area had the same specification

$$E^O(E^M) = a + bS(S^M),$$

Where E^O = orange exports,

E^M = mandarin exports,

S^O = orange supply, and

S^M = mandarin supply.

Results were given in Tables 4.4 and 4.7

In the case of Israel, orange supply was computed as total supply minus quantity used for industrial purposes and this was specified as



$$Q^I = a + bT,$$

where Q^I = quantity used for industrial purposes in Israel, and
 T = time.

Results were presented in Table 4.2

7.1.2.2 To non-European Countries

Oranges and mandarins were specified as

$$ENE = a + bTS,$$

where ENE = exports of oranges (mandarins) from the Mediterranean Area to non-European countries, and
 TS = total orange (mandarin) supply in the Mediterranean Area

Results were given in Table 4.8

7.1.3 International prices

Chapter V includes the analysis of this section. The final specification was

$$P^{OE} (P^{ME}) = a + bE^O (E^m) + cQ^{pj} (Q^{pm}) + dP^{OP},$$

where P^{OE} = EC orange market price,
 P^{ME} = EC or international market price,
 E^O = total orange exports from the mediterranean Area,
 E^m = total mandarin exports from the Mediterranean Area,
 Q^{pj} = quantity of pears offered in the European Community from October to June,
 Q^{pm} = quantity of pears offered in the European Community from October to March, and
 P^{OP} = orange preference price.

Results were given in Table 5.3

International orange prices were deduced

$$\text{from } P^{OR} = P^{OE} - dP^{OP}$$

where P^{OR} = international orange price.

7.1.4 Imports

Chapter VI includes the analysis for imports.

The specification used for orange imports in the Western European countries was

$$Q^O = a + bP^{OE} (P^{OR}) + cP^{PEJ} (P^{PRJ}) + dT,$$

where Q^O = orange imports,

P^{OE} = EC orange price,

P^{OR} = international orange price,

P^{PEJ} = EC pear price (October - June),

P^{PRJ} = international pear price (October-June), and

T = time.

Results were presented in Table 6.6

The specification for mandarin imports in the Western European

was

$$Q^m = a + bP^{ME} + cP^{PEM} (P^{PRM}) + dT,$$

where Q^m = mandarin imports,

P^{ME} = international mandarin price,

P^{PEM} = EC pear price (October-March),

P^{PRM} = international pear price (October-March), and

T = time.

Results were given in Table 6.7

Orange and mandarin imports in the Eastern European countries were specified in the following manner

$$I_t^O(I_t^m) = a + bP_{t-1}^{OR} (P_{t-1}^{ME}) + cIFV_t,$$

where I^O = orange imports,

I^m = mandarin imports,

P^{OR} = international orange price,

P^{ME} = international mandarin price, and

IFV = imported fruit and vegetables.

Results were given in Table 6.10

Imports of oranges by Western European countries from non-Mediterranean countries was specified by the following manner

$$I^o = a + bT,$$

where I^o = orange imports, and

T = time

Results were given in Table 6.12

7.1.5 Overall prices received by farmers

This section was analyzed in Chapter V.

The specification used for Spanish oranges was

$$P^{SO} = a + bP^{OR} + cS^o,$$

where P^{SO} = Spanish orange farmers' price,

P^{OR} = international orange price, and

S^o = ratio of Spanish orange exports with respect to the Rest of the Mediterranean orange exports.

Results were presented in Table 5.4

The specification used for Spanish mandarins was

$$P^{sm} = a + bP^{ME} + cT,$$

where P^{sm} = Spanish mandarin farmers' price,

P^{ME} = international mandarin price, and

T = time.

Results were given in Table 5.4

The specification used for Israeli oranges

$$P^{IO} = a + bP^{OR}$$

where P^{IO} = Israeli orange farmers' price, and

P^{OR} = international orange price.

Results were given in Table 5.6

7.1.6 Varietal prices received by farmers

Chapter V includes the analysis of this section

The specification used for Spanish oranges and mandarins was

$$P_i^O(P_i^m) = a + bP^{SO} (P^{sm}) + cT,$$

where P_i^O = Spanish farmers' orange price for variety i,

P_i^m = Spanish farmers' mandarin price for variety i, and

P^{SO} = Spanish orange farmers' price,

P^{sm} = Spanish mandarin farmers' price, and

T = time.

The specification used for Israeli oranges was

$$P_i^O = a + bP^{IO},$$

where P_i^O = Israeli farmers' orange price for variety i, and

P^{IO} = Israeli orange farmers' price.

Results were given in Table 5.7

7.2 Conclusions

The overall conclusion of this study is the evidence that the causality of market relationships for oranges and mandarins from the Mediterranean Area can be analyzed with a fully recursive econometric framework.

The main findings from the different sections of this study are:



- 1) The possibility of applying capital and investment behavior to analyze plantings and removals response for perennial plants. A combination of the capacity utilization and expected profits theories were applied to oranges and mandarins.
- 2) There is empirical evidence that farmers select their plantings from several varieties and they diversify their investment among them.
- 3) The proportion of bearing and old stock of plants with respect to total planted are determining factors in their investment behavior.
- 4) Rain in the fall is a critical factor for yields in Spain and Morocco whereas rain in the spring is the limiting element for yields in Israel.
- 5) There is a close correspondence between supply and export fluctuations in the Mediterranean Area that confirms the basic export nature of the orange and mandarin industries in the Mediterranean Area.
- 6) The European Community import policy has played an important role in determining internal market prices as well as prices in other European markets. The level of the "preference" price has been the main policy tool.
- 7) Orange imports per capita in the Western European countries has had a declining trend which might indicate possible long-run substitution effects.
- 8) From October to June season the Western European countries have been decreasing their orange imports per capita from non-Medi-

terranean countries.

9) The relationship between international and farmers' prices in Spain and Israel indicates results which portray different marketing strategies.

10) The relationships developed in this study provide for an overall model of production, trade and prices for Mediterranean oranges and mandarins. Such a model could be used to provide forecasts of future prices and to analyze the implications of alternative policies.

BIBLIOGRAPHY

- Bateman, Merrill J. "Aggregate and Regional Supply Functions for Ghanaian Cocoa, 1946-62." Journal of Farm Economics 47 (May 1965): 384-401.
- Bateman, Merrill. "Supply Relations for Perennial Crops." In Subsistence Agriculture and Economic Development, pp. 243-253. Edited by C. R. Wharton, Jr. Chicago: Aldine Press, 1969.
- Belgium. Institut National de Statistiques, Statistique du Commerce. Bruxelles.
- CLAM. Commission des Etudes Economiques. Les exportations d'agrumes du bassin Meditteraneen. Statistique, Evaluations, Repartitions.
- Commonwelath Economic Committee. Fruit Intelligence. London.
- Commonwealth Secretariat. Fruit. A Review of Production and Trade Fruit, Fruit Juices and Wine. London.
- Durbin, J. "Testing for Serial Correlation in Least-Squares Regression When Some of the Regression Are Lagged Dependent Variables." Econometrica. 38 (May 1970): 410-421.
- Elliott, J. W. "Theories of Corporate Investment Behavior Revisited." American Economic Review. Volumen LXIII, no. 1 (March 1973): 195-207.
- European Community. Official Journal of the European Communities. Regulations of the Commission, 1570/70. Brussels.
- European Communities. Official Journal of the European Communities. Regulations of the Council, 1467/69, 1541/69, 1542/69. Brussels.
- FAO. Committee on Commodity Problems. Intergovernmental Group on Citrus Fruit. Developments in National and International Citrus Policies. Fourth Session. CCP:CI 69/3. Rome.
- FAO. Committee on Commodity Problems. Intergovernmental Group on Citrus Fruit. Developments in National and International Citrus Policies. Fifth Session. CCP:CI 72/5. Rome.
- FAO. Committee on Commodity Problems. Intergovernmental Group on Citrus Fruit. Problems of Market Access and Possibilities for Trade Liberalization Measures for Citrus Fruit. Special Session. CCP:CI/CONS/74/3. Rome.
- FAO. Committee on Commodity Problems. Intergovernmental Group on Citrus Fruit. Developments in National and Regional Policies. Sixth Session. CCP:CI 74/3. Rome.

- FAO. Production Yearbook. Rome.
- FAO. Trade Yearbook. Rome.
- Feldstein, M. S. and M. Rothschild. "Towards an Economic Theory of Replacement Investment." Econometrica 42 (May 1974): 393-423.
- France. Ministère de l'Agriculture. Bulletin de Statistique Agricole. Paris.
- France. Service Central des Enquêtes et Études Statistiques. Bulletin Statistique Agricoles. Paris.
- French, B. C. and J. L. Matthews. "A Supply Response Model for Perennial Crops." American Journal of Agricultural Economics. 53 (August 1971): 478-490.
- Germany. Statistische Bundesamt. Foreign Trade Statistics. Berlin.
- Gonzalez Sicilia de Juan, E. El Cultivo de los Agrinos. Madrid: Instituto Nacional de Investigaciones Agrarias, 1960.
- Hickman, G. "Capacity, Capacity Utilization and the Acceleration Principle." In Problems of Capital Formation Studies in Income and Wealth, vol. 19 Princeton: Princeton University Press, 1957.
- Hicks, J. R. Value and Capital. Second ed. Oxford, 1946.
- Institut National de la Recherche Agronomique. Las Agrumes au Maroc. Rabat: Ministère de l'Agriculture et de la Réforme Agraire, 1968.
- Israel. Central Bureau of Statistics. Statistical Abstract of Israel. Tel Aviv.
- Jones, W. W. and C. B. Cree. "Environmental Factors Related to Fruiting of Washington Navel Oranges Over a 38 Year Period." Proceedings of American Society of Horticultural Science. 85: 267-271. 1964.
- Koo, Robert C. J. "Evapotranspiration and Soil Moisture Determination as Guides to Citrus Irrigation." Proceedings of the First International Citrus Symposium. 3: 1725-1730. 1969.
- Kuznets, G. M. "Weather Effects on Oranges." California Agriculture. vol. 6 no. 4 (1950), p. 2.
- Kuznets, G. M. and R. F. Jennings. "Effect of Weather on Average Size and Yield of Oranges." California Citrograph. vol. 35, no. 9 (July 1950).
- Maass, A. and R. L. Anderson. And the Desert Shall Rejoice: Conflict, Growth and Justice in Arid Environments. MIT, 1978.

- Maddala, G. S. Econometrics. New York: McGraw-Hill Book Co., 1977
- Melamed, A. "The Citrus Marketing of Israel." In Agricultural Marketing Boards. An International Perspective. pp. 179-208. Edited by Sidney Hoos. Cambridge, Massachusetts: Ballinger, 1979.
- Morocco. Premier Ministre. Secretariat d'Etat au Plan et au Develop-
ment Regional. Direction de la Statistique. Annuaire Statistique
du Maroc Rabat.
- Nerlove, M. The Dynamics of Supply: Estimation of Farmers' Response to
Price. Baltimore: John Hopkins Press, 1958.
- Netherlands. Netherlands Central Bureau of Statistique. Foreign Trade
Statistics. The Hague.
- Parvin, D. W. "Effects of Weather on Orange Supplies." Ph.D. disserta-
tion. The University of Florida, 1970.
- Rausser, G. "Dynamic Econometric Model of the California - Arizona Orange
Industry." Ph.D. dissertation, University of California, 1971.
- Romero, R. "Estudio sobre la evolucion de la produccion de naranjas y
mandarinas en los principales paises exportadores de la Cuenca Medi-
terranea." Ph.D. dissertation, I. T. S. I. A. of Valencia, 1969.
- Spain. INE. Anuario Estadistico. Madrid.
- Spain. Ministry of Agriculture. Secretaria General Tecnica. Anuario
de Estadistica Agraria. Madrid.
- Wallace, T. D. "Pretest Estimation in Regression: A Survey." American
Journal of Agricultural Economics. 59 (August 1977): 431-433.
- Wickens, M. R. and J. N. Greenfield. "The Econometrics of Agricultural
Supply: An Application to the World Coffee Market." Review of Econo-
mics and Statistics. 55 (November 1973): 433-440.
- Winston, G. C. "Capacity: An Integrated Micro and Macro Analysis." Papers and Proceedings of the Eighty-Ninth Annual Meeting of the
American Economic Association. The American Economic Review.
(February 1977): 418-422.