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Equilibrium Contracts in the Israeli Citrus Industry

by

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EQUILIBRIUM CONTRACTS IN THE ISRAELI CITRUS INDUSTRY

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Abstract

The Israeli citrus industry, made of several thousands growers, is served by an oligopoly of several exporters. The export sector is highly concentrated; the market share of the 3 largest firms is above 95% and the HHI level is 2,620. Exporters offer growers contracts, generally on a "take it or leave it" basis. Growers are supplying their fruit to exporters of their choice. In contrast to the typical result of textbook contract theory that predicts profit sharing, the most common contracts in the industry are of the consignment kind and they provide little price information. In this paper we develop a model to explain this phenomenon in terms of strategic behavior of exporters who offer consignment contracts in order to conceal price information and reduce price competition. This explanation is examined in an econometric study of the industry.

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1 Introduction

The Israeli citrus industry was reformed in 1991. The governmental export monopoly, the Citrus Marketing Board (CMBI) was dismantled and the industry, made of a few thousands growers, is now served by an oligopoly of several exporters. The export sector is highly concentrated. Exporters offer growers contracts, generally on a "take it or leave it" basis. Growers are supplying their fruit to exporters of their choice. The prevailing contracts are differentiated by the degree of information provided about the final payment a grower will receive per ton of fruit. Seldom will exporters buy fruit at the "orchard gate". Sometimes exporters offer contracts, providing partial price information, such as a guaranteed minimum price agreement. However, in contrast to the typical result of textbook contract theory that predicts contracts with profit sharing, the most common contracts in the industry are of the consignment kind and they provide little price information. This settling of the industry on seemingly inefficient contracts is puzzling.

In the paper, we try to resolve this puzzle by explaining the contractual arrangements between growers and exporters. The choice of contract influences incentives of exporters and growers, the division of risk between growers and exporters and the nature of competition between exporters. The analysis presented in the paper focuses, mainly, on the influence of contract choice on price competition. Our main hypothesis is that exporters offer consignment contracts in order to conceal price information and reduce price competition. We develop a simple model that supports this hypothesis with theoretical arguments and examine it empirically in an econometric study of the Israeli citrus industry.

Our theory is based on the work of Perloff and Salop (1986) on markets with imperfect price information. In that model, consumers choose among firms based on imperfect firm-specific price estimates. The authors obtain a single-price equilibrium between competitive and monopoly prices, depending on the degree of imperfect information. While in the Perloff and Salop model the degree of information imperfection is exogenous, it is endogenized in our model allowing us to examine the role of strategic considerations in contract design and concealment of information.

Strategic design of contracts in different contexts from ours is the subject of several studies. For example, Fershtman and Judd (1987) examine how incentive contracts may be chosen strategically to influence managers' behavior and oligopoly outcome. Additional examples are Zhang and Sexton (2001) and Xia and Sexton (2002) who study strategic choice of contracts in agricultural markets. Gerchak and Khmlnitsky (2003) study strategic considerations in the design of consignment system in the newspaper industry.

The citrus market for export services is modeled in this paper as a two-stage game. In the first stage, each of the exporters chooses, non-cooperatively, the type of contract offered to growers. In the second stage, given the contract types chosen in the stage I, exporters are engaged in a (Bertrand type) price competition. The analysis proceeds by characterizing the Nash subgame perfect equilibrium of the game. Assuming that both growers and exporters are risk neutral, we prove the existence (and uniqueness) of a symmetric perfect Nash equilibrium with the following characteristics: 1) All firms offer consignment contracts, 2) Price to growers falls short of the competitive price, 3) The price to growers is decreasing in the exogenous variance and increasing in the number of exporters.

The driving force leading to the above "consignment equilibrium" is the strategic effect. Suppose that a firm considers a shift in the contract structure toward consignment. The firm realizes that such a change will conceal its price from growers and facilitate price reduction by the competitors. This in turn, will increase the market share of the firm and its profit. The theoretical analysis is generalized to account for risk aversion on the part of both growers and exporters.

To assess the plausibility of the theoretical arguments, we examine several of the industry's stylized facts and estimate a multiplicative version of the theoretical model. The empirical results support our main hypothesis, that equilibrium contracts with imperfect price information reduce price competition among exporters. Moreover, we find substantial oligopolistic markup of more than 25%. A policy, promoted for a short period by the Israeli government, to encourage more informative contracts led to a sharp decline in the markup, to about 15%.

2 Institutional Background

This section presents a brief description of the export sector of the Israeli citrus industry. The review focuses on the following aspects: the development of the export-oriented industry, structure of the market for export services and the contractual arrangements. We begin with the former.

2.1 Development of the Industry and Export Markets

The citrus industry in Palestine was founded in the 19th century. The development of an export-oriented industry began after World War I under the British mandate administration (Melamed 1979). Citrus was mainly exported to European countries, especially to the U.K..

Table 1: Agricultural and Citrus Export

	Agricultural exports as % of total exports	Citrus exports as % of total exports	Citrus exports as % of ag-export
1950	48.4 %	47.7 %	98.6 %
1960	29.2 %	21.5 %	73.8 %
1970	16.6 %	11.1 %	66.4 %
1980	10.0 %	4.2 %	41.6 %
1990	5.4 %	1.5 %	27.5 %
1999	3.1 %	0.5 %	17.1 %
2000	2.2 %	0.3 %	13.2 %
2001	2.2 %	0.3 %	13.0 %

Data Source: CBS - Statistical Abstract of Israel, Chapter Foreign Trade, various years.

Citrus production expanded rapidly in the 1930's. World War II disrupted exports and the industry underwent a severe crisis. A short time after World War II the Israeli War of Independence (1947-1949) interrupted cultivation again. In the early 1950's the newly found state began building its economy. A period of strong economic growth followed which lasted till 1965. In its early early years citrus industry played a major role in the development of the economy and was the dominant export industry. In 1950 exports of fresh citrus fruit contributed nearly half of total exports from Israel (Table 1). Later the relative importance of citrus exports dropped due to the accelerated growth of the industrial sector. In 1970 exports of fresh citrus fruits still accounted for 11% of total exports and 66% of agricultural exports. In recent years the share of citrus exports of total exports is very small, less than one percent. In 2001 The share of fresh citrus exports in agricultural exports was 13%.

Oranges and grapefruit of different varieties constitute as much as 90% of Israeli citrus exports (CLAM). The CMBI invested a lot of money in advertising and promotion and successfully established a differentiated brand name for Israeli citrus-Jaffa (Fresh Produce Journal, 1995). During the 60's and 70's, Israel was one of the main suppliers of oranges and the main supplier of grapefruit to European markets. Market shares in Western Europe in the mid-70's were close to 30% for oranges and about 65% for grapefruits. Market shares of Israeli citrus have been falling substantially since then. In the mid-90's, the average market share of Israeli oranges in the main European markets was lower than 5%, while on European grapefruit markets Israel was still an important competitor with a market share of about 20%. In recent seasons, there has been an additional decline in exports. In some European markets, *e.g.* the Scandinavia (Table-2), Israeli citrus fruits still constitute a significant share of citrus consumption.

Table 2: Winter Citrus Export to Scandinavia (Average 1998-2002)

Country of origin	Orange (1000 mt)	Share	Easy-Peelers (1000 mt)	Share	Grapefruit (1000 mt)	Share
Israel	20	16 %	6.1	6 %	4.2	31 %
Spain	70.4	56%	63.3	67 %	0.4	3%
Morocco	16.2	13%	22.5	24%	-	-
U.S.	-	-	-	-	8.2	60 %

Data Source: C.L.A.M Reports, various years.

2.2 Industry Structure

There is only a small number of exporters of citrus fruit from Israel, the industry's structure is oligopolistic. There are four major firms exporting citrus fruit from Israel (Tnuport, Mehadrin, Agrexco and Pardess), offering export services to several thousands growers. The development of market shares in the main varieties is presented in figures 1 and 2. All concentration indexes of the industry are very high. In most seasons, the four-firm concentration ratio is above 90%. The 1991-2000 average of the Herfindahl-Hirshman (HHI) index equals 2620. Recently, concentration has increased. The 2001-shares of 3 largest exporters is 95%.

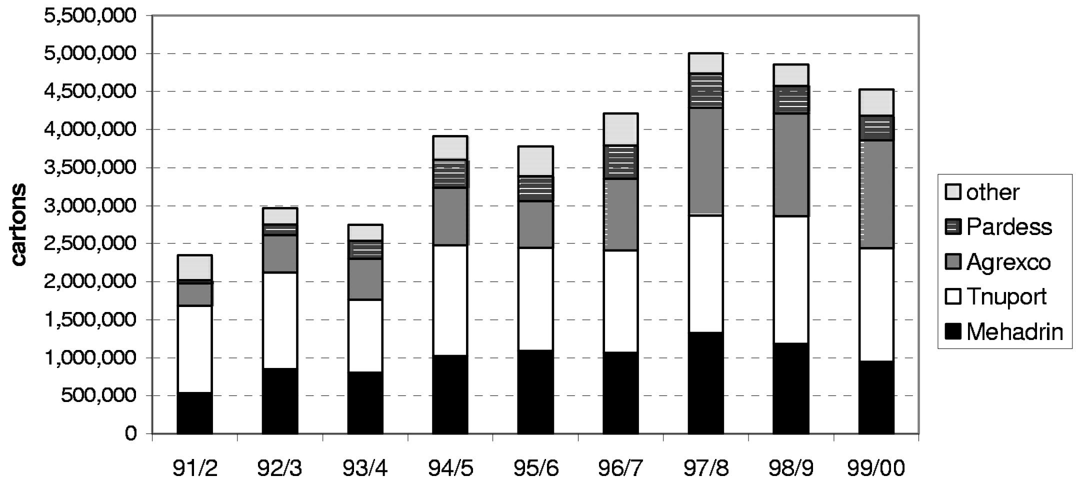

Figure 1: Sunrise Export

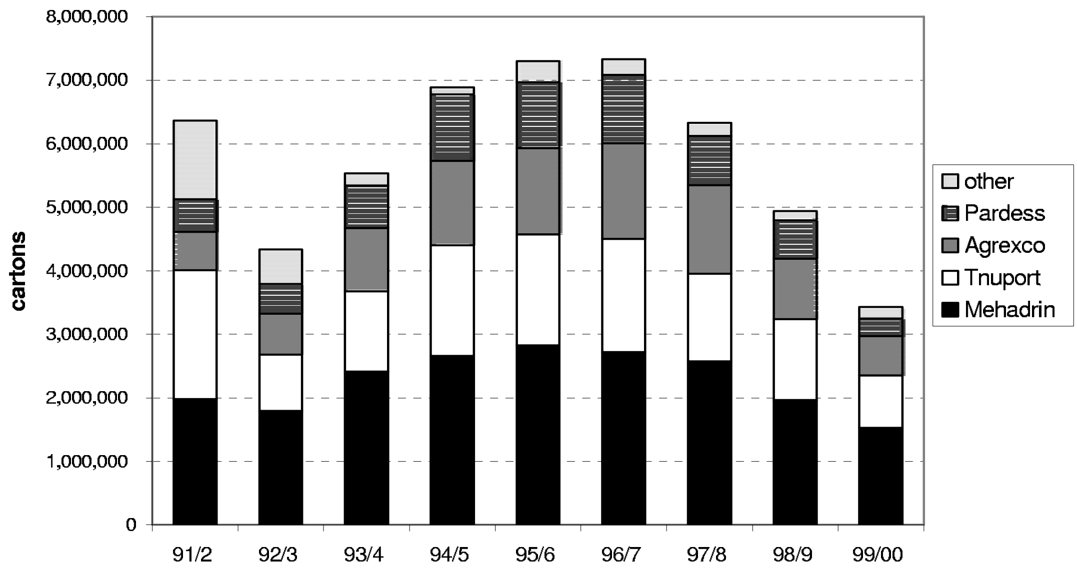

Figure 2: Shamouti Export

Starting from 2002 the two largest firms (Tnuport and Mehadrin) merged their marketing and export operations. Finally, it is worth noting, that as marketers of agricultural products the citrus exporters enjoy partial exemption from enforcement of anti-trust law.

2.3 Contractual Arrangements

Exporters offer growers contracts, generally as a "take it or leave it" offer. Large growers may have limited possibilities to bargain with exporters on contract conditions. The contract is usually oral. Some exporters are also growers of citrus fruit. Exporters are sorting and packing the fruit in their packinghouses. Part of the fruit is sold as fresh fruit in export markets and in the domestic market, while fruit not meeting the quality standards for fresh fruit marketing is supplied to the processing industry.

A grower's average revenue, t_i, for one ton of citrus fruit sent to an exporter i is:

$$t_i = \alpha_i(\sum_{s=1}^{S} p_{i,s}^E \beta_{i,s} - w_i^E) + (1 - \alpha_i)(p^I - w_i^I), \tag{1}$$

where α^i is the percentage of exports, p_s^E is the price for one ton of citrus for export of size s (net of marketing cost and transport cost abroad), β_s is the percentage of exported fruit with size s, p^I is the price per ton of fruit supplied to the processing industry, while w^E and w^I are the payments exporters charge for handling exported fruit and fruit supplied to the processing industry. Exporters normally don't pay growers a separate price for fruit sold in the domestic market. This fruit is included with the exported fruit or the fruit sent to the processing industry, depending on its quality.

The Israeli citrus industry is characterized by a variety of contracts, differing in the number of parameters in equation (1) known to the grower previous to supplying citrus fruit to an exporter. Frequently so called consignment is used: growers supply fruit to exporters without agreement on prices, the final price paid to growers is a function of selling prices minus costs occurred by the exporter. Here the grower is actually the principal of the fruit while the exporter, as agent, performs a service for him, but the possibility of the grower to influence the contract specifications or monitor the performance of the exporter is very limited. Sometimes exporters buy fruit paying a fixed price at the orchard gate. Other forms of contracts are also used, like guaranteeing a minimum price for each size exported.

The contracts differ in the degree of information about the final price that growers know previously to supplying their fruit to one of the exporters (Table 3). These differences influence growers' choice because of two main effects, a) risk-averse growers will prefer contracts providing less uncertainty on price, and b) growers' accuracy of price estimates depends on the information they know. The next section develops a model taking into account these two effects.

Table 3: Contract Types and Information

Contract Form	Information-Set	Unknown
Price per Gross ton	t^i	Non
Differentiation by export/processing	t_i^E, t_i^I	Export share: α_i
Differentiation by sizes	t_i^E, t_i^I, w_i^E, w_i^I	α_i and size distribution: $\beta_{i,s}$
Minimum Price	$min(p_{i,s}^E), p^I$, w_i^E, w_i^I	α_i, $\beta_{i,s}$ and actual $p_{i,s}^E$
Consignment, know Service Charge	p^I, w_i^E, w_i^I	α_i, $\beta_{i,s}$, $p_{i,s}^E$
Consignment	p^I	α_i, $\beta_{i,s}$ and actual $p_{i,s}^E$,w_i^E, w_i^I

3 Analysis

Consider an export duopoly, providing exporting and marketing services to L growers. Both exporters and growers are risk-neutral. Growers are supplying their fruit to exporters of their choice, attempting to maximize the revenue per ton of citrus supplied to the exporter, t_i, $i \in (1, 2)$. Growers cannot gather perfect price information by search. They have to estimate the price paid by the exporters, based on the limited information.

3.1 Price Estimates

Growers form price estimates for each exporter based on the available current information, such as visits of exporter representatives, and information from previous years. The many parameters determining growers' revenue per ton of citrus fruit make comparisons between exporters difficult even after publication of comparative price tables by the citrus growers association at the end of each growing season. To overcome this problem, some growers send fruit from the same orchard to more than one exporter in order to compare the percentages of exports. Price estimates vary among growers because of differences in information available to each grower. Since growers do not know the exact prices, an exporter may decrease his price without loosing all growers supplying him with citrus fruit, that is, the supply curve facing an exporter is not perfectly elastic. As growers become more informed, the supply curve facing an export firm becomes more elastic.

A schematic example (based on Carlton and Perloff, 2000) will demonstrate this phenomenon. There are two firms exporting citrus fruit. Each of the L growers supplies an identical quantity of fruit. Growers have imperfect information, so their price estimates are not always correct. Exporter 1 pays \$105 per ton citrus fruit. Initially, one-third of all growers estimate that exporter 1 will pay \$95, one-third \$105, and the remainder \$115. Exporter 2 pays \$100 while growers' estimates are \$90, \$100 and \$110 (one-third of the growers estimates each price). The estimates are unbiased and formed independently for each exporter. Table 4 presents the joint distribution of price estimates for the two exporters, among the growers' population. A 1 appearing in a cell indicates a realization of price estimates with higher estimate for exporter 1. A 2 in a cell indicates the opposite.

As can be seen in Table 4, two-thirds of the growers supply exporter 1 and one-third exporter 2, although the latter pays less than the former. If growers obtain better information on exporters' payments, their estimates become more accurate and supplies to exporter 2 decrease (second part of Table 4). The better growers' information, the higher the elasticity of supply facing each exporter. With perfect information, the elasticity of supply is infinite, and each firm has to pay a price as high as the other firms or lose all its market share.

Table 4: Price Estimates and Market Shares

A. Inial Estimates

		Estimates	of Price-	Exporter 2
		90\$	100\$	110\$
Estimate of	95\$	1	2	2
Price-	105\$	1	1	2
Exporter 1	115\$	1	1	1

B. More Accurate Estimates

		Estimates	of Price-	Exporter 2
		97\$	100\$	103\$
Estimate of	102\$	1	1	2
Price-	105\$	1	1	1
Exporter 1	108\$	1	1	1

Growers in the Israeli citrus industry do not exhibit an explicit information-gathering technology. We consider two alternative formulations of grower j's estimate for the price paid by the i^{th} exporter. 1) A linear formulation by which:

$$s_i^j = t_i + \lambda_i \theta_i^j, \quad \text{with} \quad 0 \leq \lambda_i \leq 1, \tag{2}$$

where $\theta_i^j \sim F_i^j(\theta)$, $\theta \in [-d, d]$, $E(\theta_i^j) = 0$, $Var(\theta_i^j) > 0$, and $F_i^j(\theta)$ is continuous and differentiable CDF with a density $f_i^j(\theta)$. Thus, estimates are taken to be unbiased (on average, growers estimate the correct price), and, if $\lambda_i > 0$, they are imperfect. Those growers who draw $\theta = 0$ have accurate estimates, while other growers are underestimating or overestimating revenue per ton, t_i. 2) A multiplicative formulation by which:

$$s_i^j = t_i(1 + \lambda_i \theta_i^j), \quad \text{with} \ \ 0 \le \lambda_i \le 1, \tag{3}$$

where now $|d| \le 1$.

Growers know that the expected value of the random variable $\theta = 0$[1], and they recognize the influence of the form of contract on the accuracy of their estimates. This influence is expressed by the parameter λ, which permits a range of information states corresponding to the degree of information provided by the contract. If $\lambda_i = 0$, information is perfect and growers know exactly the price exporter i will pay for a ton of citrus fruit. This case corresponds to a fixed price contract. The other extreme is $\lambda_i = 1$, corresponding to a consignment contract, providing the least information. We assume that $F_i^j(\theta) = F(\theta)$, thus, the degree of imperfect information is identical for all growers, and differences in the distribution of price estimates for firms depend only on differences in contract type.

3.2 Supply Functions

Exporters engage in a game with two stages. In the first stage they choose the form of contract offered to growers (choice of the degree of information) while in the second stage they compete in prices for citrus supplies. By setting the information parameters, the exporters affect the probability of a grower to supply either firm. For firm 1 the probability to be selected by grower j are (the superscript j is dropped for convenience) is

$$Pr_1 = P(s_1 \ge s_2) = \int F_2(\frac{t_1 - t_2}{\lambda_2} + \frac{\lambda_1}{\lambda_2}\theta_1) f_1(\theta_1) d\theta_1, \tag{4a}$$

for linear price estimates, and

$$Pr_1 = P(s_1 \ge s_2) = \int F_2(\frac{t_1 - t_2}{\lambda_2 t_2} + \frac{\lambda_1 t_1}{\lambda_2 t_2}\theta_1) f_1(\theta_1) d\theta_1, \tag{4b}$$

for multiplicative price estimates. In both cases, the probability of firm 2 to be selected is

$$Pr_2 = 1 - Pr_1. \tag{5}$$

[1] $E(t_i/s_i^j) = s_i^j - \lambda_i E(\theta_i^j) = t_i + \lambda_i[\theta_i^j - E(\theta_i^j)]$.

In deriving firm i's supply curve we assume that the individual supply curves of the growers are completely inelastic, and that each grower supplies an identical quantity of citrus fruit standardized to one. Then the supply curve of firm i is given by the probability to be selected multiplied by the number of growers:

$$q_1(t_1, t_2, \lambda_1, \lambda_2) = LPr_1, \quad q_2(t_2, t_1, \lambda_2, \lambda_1) = LPr_2. \tag{6}$$

Once the level of information in the first stage of the game is chosen, the firms compete in the second stage in prices and maximize expected profits, taking the price of the other firm as given:

$$\max_{t_i > 0} (p^i - t^i) q_i(t_i, t_j, \lambda_i, \lambda_j) \; i = 1, 2, \tag{7}$$

where p^i is the price for citrus fruit obtained by exporter i on export markets net of the cost of exporting citrus fruit. The first order condition for the second stage price game is

$$p^i - t^i = \frac{q_1(t_i, t_j, \lambda_i, \lambda_j)}{\partial q_i / \partial t_i}. \tag{8}$$

The right-hand side of equation (8) is positive, hence the price paid by exporters to growers will be lower than the competitive price. The difference, relative to the competitive price, depends on the slope of the supply curve facing firm i. As supply becomes completely elastic, the right-hand side approaches zero and the competitive price is paid.

3.3 Contractual Equilibrium

To further characterize the contractual equilibrium we presume a uniform distribution, that is, $F(\theta)$ is a continuously differentiable distribution function with density $f(\theta) = \frac{1}{2d}$ and $\theta \in [-d, d]$. It turns out that the above two-stage game has multiple Nash sub-game perfect equilibria. To choose among these equilibria, we employ Zelten's (1975) trembling-hand refinement.[2] Theorem 1 characterizes the (sub-game and trembling-hand) perfect contractual equilibrium.

[2] One of the implications of Zelten's perfection is the exclusion of equilibria containing weakly dominated strategies.

Theorem 1. *Consider an industry with L growers and an export duopoly. Assuming a uniform distribution and risk neutrality, there exists a unique symmetric perfect Nash equilibrium with the following characteristics:*

a. Both firms offer consignment contracts,

b. Price to growers falls short of the competitive price.

c. For additive formulation: $t_1 = t_2 = p - d$ *and exporters markup equals* d*.*

d. For multiplicative formulation: $t_1 = t_2 = \frac{p}{1+d}$ *and exporters markup equals* $\frac{p}{1+\frac{1}{d}}$*.*

d. Price to growers is decreasing in the exogenous variance and is increasing in exporters' net export revenue.

Proof: We provide a detailed proof for the linear formulation. Similar reasoning can be used to prove the multiplicative case. The probability that a grower would choose exporter 1 is:

$$Pr_1 = \frac{1}{4} + \frac{(t_1 - t_2)^2}{8\lambda_1\lambda_2 d^2} + \frac{(t_1 - t_2)}{4\lambda_1 d} + \frac{(t_1 - t_2)}{4\lambda_2 d} + \frac{\lambda_1}{8\lambda_2} + \frac{\lambda_2}{8\lambda_1}, \tag{9}$$

and, similarly, the probability that a grower would choose exporter 2 is:

$$Pr_2 = \frac{3}{4} - \frac{(t_1 - t_2)^2}{8\lambda_1\lambda_2 d^2} - \frac{(t_1 - t_2)}{4\lambda_1 d} - \frac{(t_1 - t_2)}{4\lambda_2 d} - \frac{\lambda_1}{8\lambda_2} - \frac{\lambda_2}{8\lambda_1}. \tag{10}$$

The Nash equilibrium prices of the second-stage game of price competition are

$$t_1^* = p - \frac{d}{8}(\lambda_1 + \lambda_2) - \frac{d}{8}(\lambda_1^2 + \lambda_2^2 + 34\lambda_1\lambda_2)^{\frac{1}{2}}, \tag{11}$$

and

$$t_2^* = p + \frac{5d}{8}(\lambda_1 + \lambda_2) - \frac{3d}{8}(\lambda_1^2 + \lambda_2^2 + 34\lambda_1\lambda_2)^{\frac{1}{2}}]. \tag{12}$$

Substituting equations (11) and (12) and evaluating the firms' expected profits yield the first stage profit functions

$$\pi_i(\lambda_i, \lambda_j) = [p - t_i^*(\lambda_i, \lambda_j]q_i(t_i^*, t_j^*, \lambda_i, \lambda_j) \; i, j \in (1, 2) \tag{13}$$

In the first-stage game each firm chooses an optimal λ_i to maximize profits in (13), taking the other firm's choice as given. Totaly differentiating the first stage profit function with respect to λ_i and employing the envelope theorem, one finds:

$$\frac{d\pi_i}{d\lambda_i} = \frac{\partial \pi_i}{\partial q_i}\left(\frac{\partial q_i}{\partial \lambda_i} + \frac{\partial q_i}{\partial t_j}\frac{\partial t_j}{\partial \lambda_i}\right). \tag{14}$$

The first term in the parenthesis is the (nonnegative) direct effect of attracting additional growers by offering a more informative contract. The second term is the (negative) strategic effect–offering a more informative contract induces tougher price competition by the opponent firm. Risk neutrality implies that the direct effect vanishes.

Incorporating the assumption of symmetric firms and evaluating (14) we find

$$\frac{d\pi_1}{d\lambda_1} = \frac{d\pi_2}{d\lambda_2} = (p - t)\frac{L}{4\lambda} > 0, \tag{15}$$

implying that both firms choose $\lambda = 1$. □

The above "consignment equilibrium" fits the situation commonly observed in the Israeli citrus industry where exporters offer consignment contracts with very limited differentiation of the amount of price information supplied to growers. The driving force leading to the "consignment equilibrium" is the strategic effect: firm 1 shifting toward consignment conceals its price and facilitates price reduction by the competitor (firm 2), which in turn increases firm's 1 market share.

4 Extensions

In this section we discuss several possible extensions of the basic model. The analysis relies on the linear specification of price estimates and its details are not presented. However, we discuss the main assumptions and conclusions,and offer directions for future research.

4.1 Risk Aversion

The first extension is the introduction of risk-aversion. Citrus export involves both price and technological risks. Thus, growers and exporters bear risk to which, it is reasonable to assume, they are averse.

To incorporate risk-aversion on the part of the growers, we assume that rather than maximizing profits, they maximize a mean-variance utility function, u_i^j, which (for simplicity) is presumed linear in the estimated price and the variance associated with the payment contract offered by exporters. That is, growers choose which exporter to hand their fruit based on the criterion:

$$u_i^j = t_i + \lambda_i \theta_i^j r^j \sigma_i^2(\lambda_i), \tag{16}$$

where σ_i^2 is the variance of the price signal and r^j is (1/2) the grower's measure of absolute risk aversion. To simplify the analysis we assume that the risk preferences are homogenous within the growers population as well as within the group of the exporters. However, there may be intergroup differences.

When paying growers a fixed price exporters are assuming risk, because export revenue is known only after the fruit has been exported. Therefore, other things being equal, risk-averse exporters will prefer a consignment contract over the obligation to pay growers a fixed price. To incorporate exporters' risk aversion in the model, a cost term $k(1-\lambda), \quad k \geq 0$, expressing the cost of offering a riskier contract, is subtracted from the exporters' profit. The cost is decreasing in λ.

The incorporation of growers risk aversion into the model modifies the equilibrium as can be seen in Table 6.[3] The table simulates the equilibrium contracts for a range of parameters. With risk neutral producers, as seen earlier, if a firm changes the terms of its contract it will yield a strategic effect, but will have no direct effect on supply or market share. With risk averse growers, a firm's shift of the contract towards consignment reduces supply and its market share, implying that consignment need not be the optimal strategy. Indeed, as shown in Table 6, the incorporation of growers' risk aversion yields intermediate contracts, which are between consignment and a fixed price contract. Moreover, one would expect that, *ceteris paribus*, the more the growers are risk averse, the more informative are the equilibrium contracts. Indeed, the first 4 rows of table 6 demonstrate this phenomenon. On the other hand, to offer more informative contracts, exporters must assume risk and the cost associated with risk aversion, hedging and diversification. The last 4 rows of Table 6 show that, *ceteris paribus*, the larger this cost (k), the less informative are the equilibrium contracts.

It is interesting to note that with risk aversion exporters offer differentiated contracts.

[3]The calculations in the Table are based on an equilibrium that presumes $\lambda_1 \leq \lambda_2$. The detailed derivation of this equilibrium is available from the authors upon request.

This can be seen in last column of Table 6, which presents the differences in the type of contracts. Thus, with growers' risk aversion, exporters offer more informative contract that potentially lead to tougher price competition. To avoid the competition and erosion of profits, exporters differentiate the contracts.

A fruitful avenue for further research might be an empirical assessment of the relative importance of risk aversion and strategic considerations in the determination of the actual contracts in the industry.

Table 6: Simulation of Equilibrium Contracts

r	d	k	λ_1	λ_2	Difference
0.4	10	10	0.38	1	0.62
0.6	10	10	0.25	0.70	0.45
0.8	10	10	0.19	0.52	0.33
1	10	10	0.15	0.42	0.27
1	5	10	0.60	1	0.40
1	7.5	10	0.27	0.62	0.35
1	10	10	0.15	0.42	0.27
1	15	10	0.07	0.25	0.18
1	10	0	0	0.30	0.30
1	10	5	0.08	0.36	0.28
1	10	10	0.15	0.42	0.27
1	10	20	0.30	0.55	0.25

4.2 Entry and Equilibrium

This section concerns the effect of entry of additional exporters on equilibrium prices and contracts. This is an interesting question both from theoretical and empirical perspectives. Theoretically, Preloff and Salop (1986) showed that in the context of entry their results are in "striking contrast" with search theory. In search models, entry does not reduce prices, while in Perloff and Salops' model, as the number of firms increases price approaches the competitive level. However, in Perloff and Salop's model the degree of information imperfection is exogenous. Our model allows to study whether their results concern entry survive the endogenizing of information imperfection. In addition, it allows to examine how entry effects the form of contract.

Empirically, in the last 3 years the number of exporters serving the Israeli citrus industry has decreased markedly. Now in 2003 the industry is served by an export duopoly (and a few very small exporters). Thus, it is interesting to comprehend how these changes effected prices and contracts. In addition, a comparison of the Israeli and Spanish citrus industries reveal striking differences in the form of the prevailing contracts and prices to growers (Hertzano and Kachel 1999). Since the two industries export to same markets and grow similar varieties, it is intriguing to examine whether these differences are due to the huge differences between the industries in the number of exporters (3 in Israel and a few hundreds in Spain).

At this stage of the research the entry question was examined only in the simple model, which assumes risk neutrality. For this model we proved the following generalization of Theorem 1.

Theorem 2. *Consider an industry with L growers and N-firm export oligopoly. Assuming a uniform distribution and risk neutrality, there exists a unique symmetric perfect Nash equilibrium with the following characteristics:*

a. All firms offer consignment contracts,

b. Price to growers falls short of the competitive price.

d. Price to growers is decreasing in the exogenous variance, and is increasing in N.

Proof: Available from the authors upon request.

Thus as in Perloff and Salops' model, as the number of firms increases, prices approach the competitive level. Note, however, that entry does not change the form of the contract–it remains consignment.

The reasons is that risk neutrality implies that if a firm changes the form of its contract it will experience no direct effect on supply. The only effect of shifting towards consignment is the strategic effect which, for any number of firms, is positive. However, one would expect that with risk aversion, entry will reduce the importance of the positive strategic effect relative to the negative supply effect leading to a shift of the equilibrium contract towards more informative contracts. This issue is left for future research.

5 Empirical Analysis

This section is devoted to an empirical analysis of the Israeli citrus industry. The theory presented above produces several testable hypothesis, which are examined in this section. In particular, we estimate the equilibrium price strategies, Eq (11) and Eq (12) and the supply functions (Eq (6)).

5.1 The Relationship Between Export and Growers Prices

In a competitive market for export services exporters' charge for their services equals the marginal cost of sorting, packing and exporting the fruits to the target markets. As the variable cost of export is independent of the citrus prices in target markets[4], the payment to growers should be a linear function of the prices for Israeli citrus fruits in target markets. Moreover, the slop of this function is expected to be nearly 1 and fluctuations in prices in target market should be fully transformed to growers. However, the non-competitive conduct predicted by the multiplicative theoretical model implies a much flatter payment function and that fluctuations in target market prices translate only partially to fluctuations in growers prices.

To examine the prediction of the theoretical model, average seasonal prices are calculated to show the relationship between grower prices and export market prices. Grower prices are reported by the Citrus Growers Organization (Hadarim, various years) and reflect the price per "gross ton" of which 50% is designate for export and 50% for processing. As an indicator of export market prices for grapefruits (Sunrise) we use import prices for Israeli Sunrise in France (Pomona) and wholesale market prices for Israeli Sunrise in Germany (ZMP). For Israeli oranges (Shamouti) price reports from export markets are not available. As approximation Spanish orange wholesale market prices are used (ZMP, Rungis Hebdomadaire). Spain is the main supplier of oranges to European markets during the export season of Shamouti oranges. Market prices are translated to NIS (new Israeli Sheqel) and all prices are deflated with the Israeli monthly consumer price index (2000 = 100). To calculate the

[4] An exception is a commission for local marketers in target countries. However, as the usual commission is in the range $1\% - 5\%$ of sales, its quantitative effect is minimal.

average seasonal price, weekly prices are weighted with total weekly export quantities of the relevant variety. A lead of two weeks is used for export market prices.

The results are reported in Figures 4 and 5, below. Since grower prices are per gross ton, rather than exported ton, it is expected that the grower prices are less volatile, than prices in target markets. However, the figures show that the correlation between the two series is extremely low, which is inconsistent with the competitive regime or the linear version of the oligopoly model. The results are consistent with the prediction of the multiplicative version of the theoretical model.

5.2 Supply Elasticity

Since export services are nearly homogenous and are very close substitutes, in a world of prefect information, one would expect that exporters face a very elastic supply function. However, the previous section theoretical model with imperfect information predicts that firm supply functions are not perfectly elastic and, the lower the availability of price information, the smaller the supply elasticity. To assess the importance of this effect in the Israeli citrus industry, individual firm supply function is estimated for each of the four main Israeli citrus exporters. We estimate a system of equations, where each firm export share is explained by its relative price to growers. Shares do not sum to 1, since a few small exporters are excluded. Export quantities are used as proxy for total quantities supplied. We use shares and not quantities as a dependent variable because weekly export quantities are very volatile. This is the result of 1) certain logistic requirements and 2) exogenous and unobservable disturbances to supplies such as weather changes. We estimate the following econometric model:

$$\frac{q_i}{\sum_{i=1}^{N} q_i} = \beta_i^0 + \beta_i^1 (\frac{t_i}{\frac{1}{N}\sum_{i=1}^{N} t_i} - 1) + \beta_i^2 D(\frac{t_i}{\frac{1}{N}\sum_{i=1}^{N} t_i} - 1) + \epsilon_i,\ i \in (1, ..., N) \qquad (16)$$

where q_i is the quantity exported by exporter i, t_i is the grower price paid by exporter i, and N is the number of exporters. The dummy variable, D, indicates periods where the government intervened and solicited more informative contracts. Finally, ϵ_i is an error term with a distribution that satisfies the usual assumptions.

The coefficients estimated for relative prices are expected to be positive. If $\beta_i^1 \to \infty$, supply faced by firms is completely elastic, and the market is competitive. In this case,

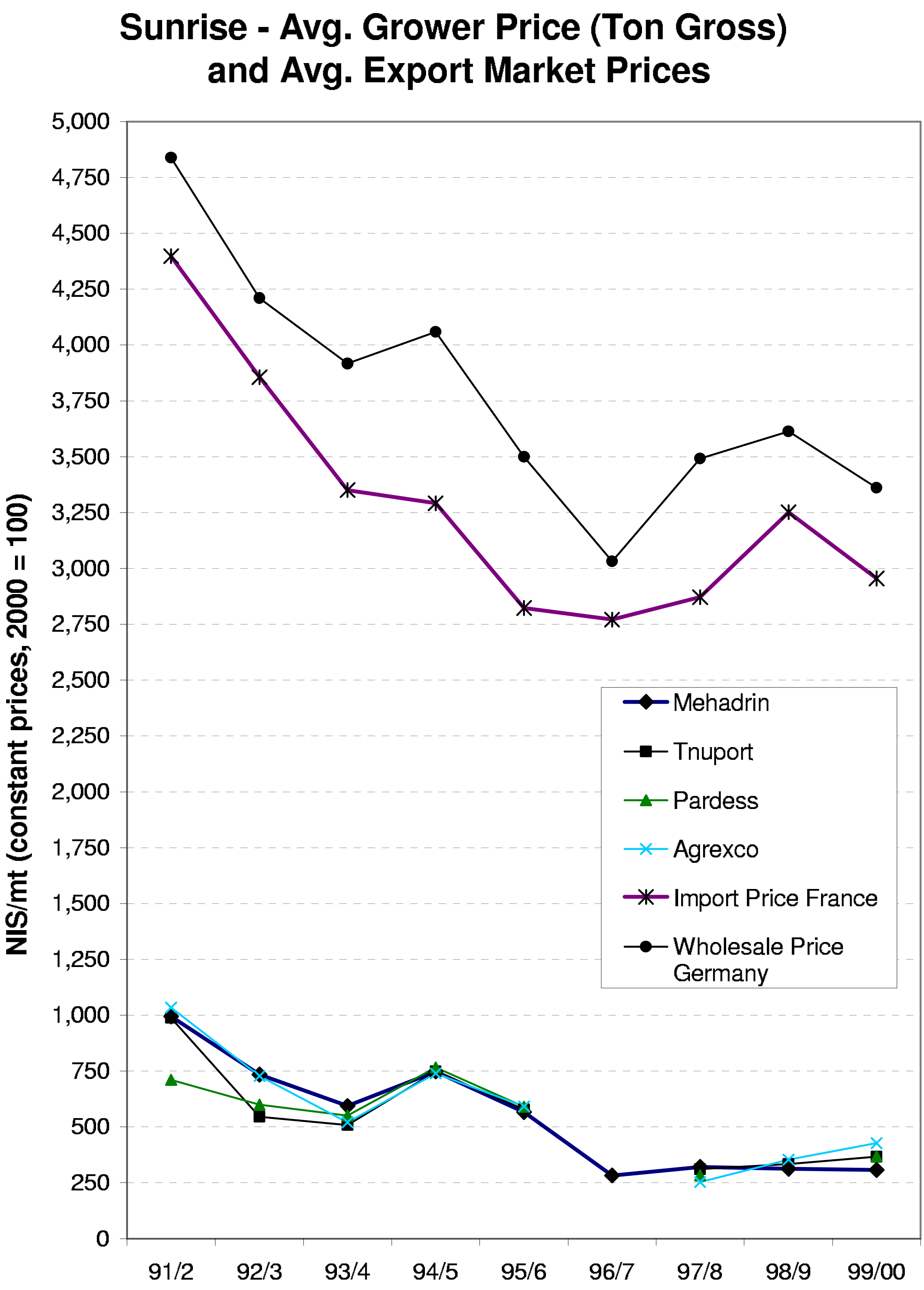

Figure 3: Export Versus Growers Sunrise Prices

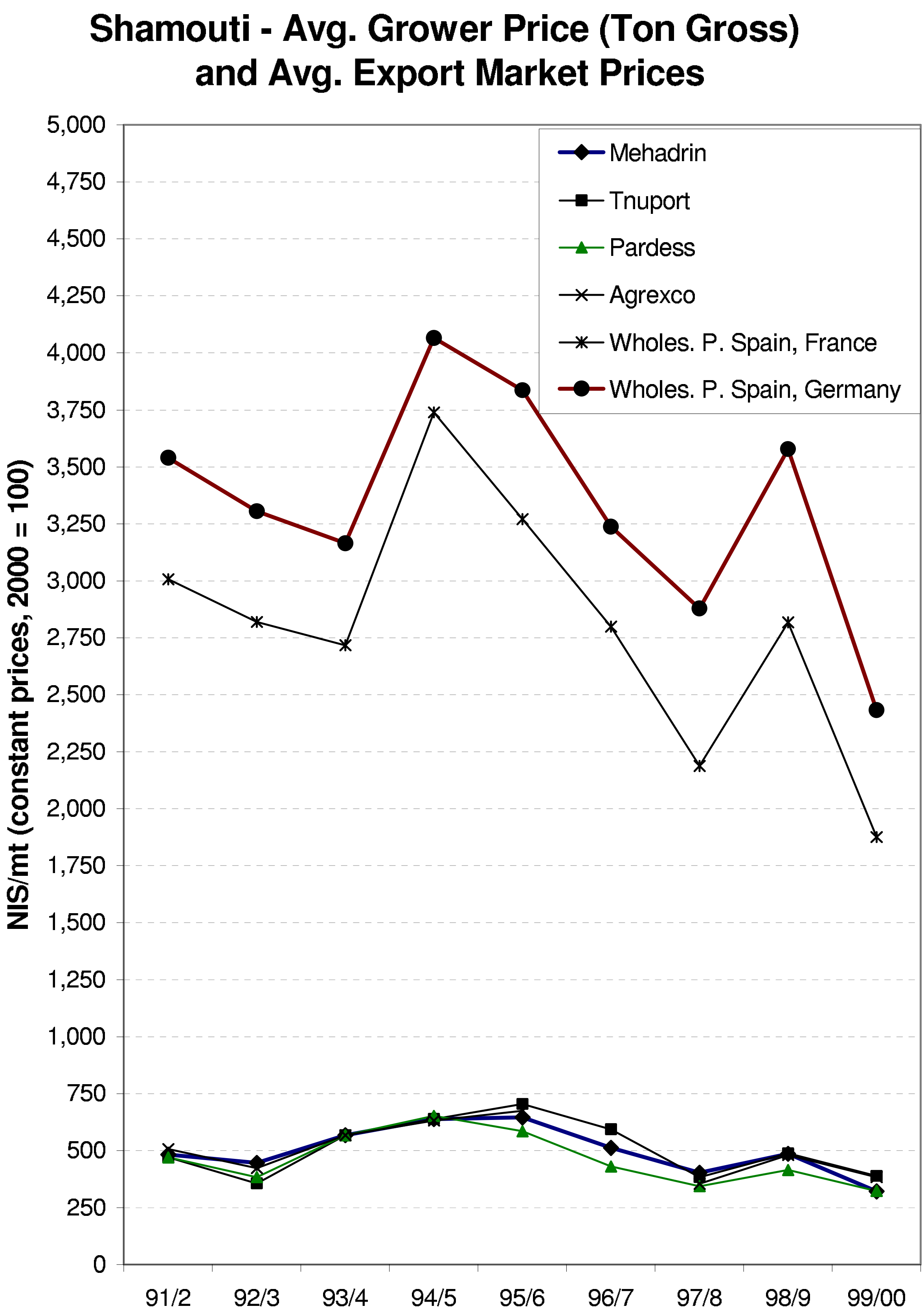

Figure 4: Export Versus Growers Shamuti Prices

we should expect that exporters pay growers identical prices. If $\beta_i^1 \to 0$, supply does not depend on prices firms pay. This result would indicate a market where growers have no information on prices and choose firms randomly. As an additional explanatory variable, the relative price multiplied by a dummy for periods of the minimum-price agreement or fixed-price contracts is included in the regression equations. The coefficients β_i^2 are expected to be positive because these contractual agreements increase growers price information and thus the elasticity of supply.

We focus on estimating the equation system for weekly data to try to capture the nature of short-term competition in the market of citrus growers selling their fruit to exporters. It is important to mention that the exporters' relative prices vary over time, allowing the regression analysis. The system is estimated using the seemingly unrelated regression (SUR) method, accounting for heteroscedasticity and correlation in the errors across equations.

The estimated coefficients of relative price are positive for all exporters, but only the Mehadrin's coefficient is significant (Table 5). The estimated value is 0.083, so that an increase in Mehadrins price by 5% relative to the average price will increase its market share by less than half a percent (0.42%).

At the 5% significance level, the hypothesis that $\beta_i^2 = 0 \ \forall i$ can not be rejected . Overall, the explanatory power of the regressions is quite poor, as indicated by low R^2 values.

Table 5:Weekly Data, Dependent Variable: Share Sunrise

	Mehadrin		Tnuport		Agrexco		Pardess	
Variable	Coeff	t	Coeff	t	Coeff	t	Coeff	t
Constant	.3	28.5	.4	28.7	.2	22.9	.1	14.8
Rel Price	.1	1.8	.0	.7	.0	.330	.0	.1
D×Rel P	-.3	-.9	1.3	-1.0	-1.0	-1.7	.1	.2
R^2		.1		.0		.0		.0
Adj R^2		.0		.0		.0		.0
DW Stat		2.0		1.6		1.6		1.7
Observations		239		240		240		200

Variations of the original equation system were estimated to account for possible additional exogenous influences. The various specifications yield similar results.

The estimation results, for the Shamouti variety are similar. Only for one out of the four exporters the coefficient for relative prices is significant and positive as expected (Table 6). According to the estimated coefficient (0.422), an increase in the relative price of this exporter by 5% increases its market share by 2%. The coefficient for the interaction between relative price and the period of the minimum price agreement is significant (at the 5% level) and positive only for one exporter.

Table 6: Weekly Data, Dependent Variable: Share Shamuti

	Mehadrin		Tnuport		Agrexco		Pardess	
Variable	Coeff	t	Coeff	t	Coeff	t	Coeff	t
Constant	.4	28.9	.2	15.2	.1	15.3	.1	10.0
Rel Price	.1	.4	.4	2.3	-.2	-1.3	.1	.2
D×Rel P	2.5	5.3	-.5	-1.8	-0.3	-.0	-.3	-.2
R^2		.2		.0		.0		.0
Adj R^2		.2		.0		.0		.0
DW Stat		1.6		1.1		1.6		1.4
Observations		127		121		112		127

Weekly shares are rather unstable, probably depending on additional unobserved variables. On the other hand, prices usually do not change for some weeks because exporters pool returns over time. Therefore the aggregated monthly and seasonal data are analyzed for comparison. To economize on space the detailed tables are not presented, but the main results are similar to those obtained with the weekly data.

Finally, we estimated a regression for pooled average seasonal data. It is found that the coefficient for relative Sunrise prices is significant and positive but there is no significant influence of fixed-price seasons on the slope of the regression equation. For Shamouti, price coefficients are not significant.

To summarize, the results suggest that supply to firms does not depend on prices firms pay (with the exception of one exporter). Low price elasticities are characteristic for a market with very little price information where growers choose exporters randomly or based on factors other than price.

5.3 Estimation of Equilibrium Pricing Strategies

The equilibrium price equations (Theorem 1) for Sunrise and Shamouti are estimated to further test the theoretical model and quantify the duopoly markup of exporters. Our data are for grower prices with a pack-out of 50 percent fresh fruit while the other 50 percent are supplied to the processing industry, hence for these data the linear model predicts that the coefficient of the variable market prices will be close to 0.5. According to the multiplicative version of the model, exporters transfer just part of market price changes to growers. The percentage transferred depends on contract forms and the range of price estimates. For example, if consignment is used ($\lambda = 1$) and $d = 0.2$, then the model predicts that a unit change in market prices will change growers' prices for exported fruit by 0.83. For our data (50 percent exported fruit), the predicted coefficient is 0.42. As illustration, if $d = 0.2$, then growers' estimate for price of 500 NIS per ton will lay between 400 and 600 NIS. If grower prices decrease to 300 NIS, estimates will be between 240 and 360 NIS.

Grower prices are estimated as a function of prices in export markets, prices for culls, dummies for periods of minimum price agreements or payment of fixed prices, and dummies for exporters. As proxy for prices paid by the processing industry, the average price for culls paid by the three main exporters (Mehadrin, Tnuport, Agrexco) is used. Results for Sunrise are presented in Table 7. The regression was estimated twice, once with the French import prices for Sunrise from Israel and once with German wholesale prices for Israeli Sunrise. Results for both versions are similar. All coefficients are significant at the 5% level with the exception of dummies for exporters. As expected, grower prices increase with an increase in prices obtained in export markets and in prices for culls. According to the linear model we would expect a coefficient close to 0.5, which represents a full transmission of a change in export market prices to growers. This is also the coefficient expected for a market with perfect competition. The coefficient for export market prices is 0.32 for both French and German prices which is significantly lower than 0.5 (t-statistic French prices: -4.80, t-statistic German prices: -4.06). Coefficients for the price of culls are not significantly different from 0.5 (t-statistic French prices: 0.44, t-statistic German prices: 1.19).

Data for season 1994/95 are only for the period of the minimum-price agreement while the data for 1995/96 include also the part of the season without minimum price agreement (beginning of season until January). In addition, Mehadrin did not take part in the minimum-price agreement in 1995/96. Therefore separate dummies for 1994/95 and 1995/96 are included in the regressions. The coefficients of these dummies are significant and positive, with higher coefficients for 1994/95 and in the regression including prices in France. The difference between the two seasons is not significant. The effect of the minimum-price agreement estimated in the regression considerably exceeds the subsidy paid to encourage exporters to take part in this agreement, even for the lower coefficients estimated with German Sunrise prices. This subsidy was around $ 30 per ton exported, which translates to about 60 NIS per ton gross (constant prices, 2000 = 100), much less than the price increases of 160 or 270 NIS estimated in the regressions. Dummies for exporters indicate that grower prices paid by Tnuport and Pardess are lower than prices of Mehadrin while prices of Agrexco are higher, but the differences are not significant. A linear trend variable, added to account for eventual changes in marketing costs, is not significant for both versions of the regression.

According to the predictions of the multiplicative model, a change of λ will change the coefficients of the explanatory price variables. Hence, the effect of the minimum-price agreement has to be estimated as interaction of the dummy for this period with the price variables. We use a single dummy for both seasons. The coefficient of the interaction of export price and dummy is significant and positive for the equation with French export prices, indicating that during the period of the minimum price agreement the influence of a change in export market prices on grower prices increases. For the equation with Sunrise prices in Germany, the coefficient of the interaction is positive but not significant. The interaction between prices for culls and the dummy is not significant in both cases (see Table 7). Coefficients and t-statistics for the other variables in the model, the R^2 and the Durbin-Watson statistics are identical to the linear version.

Table 7: Seasonal Data, Equilibrium Price equation, Sunrise (n=32)

	Price-France		**Price-Germany**	
Linear Model:	Coefficient	t-Statistic	Coefficient	t-Statistic
Constant	-652.68	-5.11	-813.26	-6.50
Price Export	0.32	7.46	0.32	8.89
Price Culls	0.62	2.34	0.75	3.52
Dummy P.Min.94/5	266.14	6.36	162.28	4.53
Dummy P.Min.95/6	213.20	3.56	130.89	2.87
Dummy Tnuport	-23.75	-0.65	-31.63	-0.98
Dummy Agrexco	10.21	0.28	2.32	0.07
Dummy Pardess	-42.67	-1.12	-57.15	-1.71
R-squared	0.91		0.93	
Adjusted R^2	0.88		0.91	
D.W stat.	2.26		1.97	
Multiplicative Model:				
D.P.Min. * P. Export	0.089	2.29	0.044	1.51
D.P.Min. * P. Culls	-0.194	-0.25	-0.118	-0.17

According to the multiplicative model, a coefficient of 0.32 for export market prices while consignment contracts are used indicates that growers' estimates of prices are very noisy– plus/minus 54% of the actual grower prices, implying that price estimates are distributed in the range $500NIS \pm 250NIS$. The coefficient increases to 0.41 during periods of fixed-price agreements (for the equation with French Sunrise prices). If we assume that d does not change this coefficient indicates a decrease in λ from 1 to 0.4. Moreover, the above consignment contract implies a generous markup. The oligopolist exporters' rent is 25% of price in target markets. Government intervention lead to a significant decline in the oligopoly markup to about 15%.

According to estimation results for Shamouti, export market prices for oranges seem to have little influence on grower prices (Once more, space consideration preclude the inclusion of detailed tables). The estimated coefficients are 0.09 for Spanish orange prices in Germany as well as in France. This is much less than the coefficient of 0.5 expected according to the linear version of the model and also much less than the coefficients estimated for Sunrise. No data on Shamouti export market prices are available, therefore Spanish orange prices were used as a proxy. It is expected that the development of orange prices from different origins in the same export market is closely related but there may be exceptions, for example quality problems specific to one origin . Another possible reason explaining a weaker connection between export market prices and grower prices is the increase in the relative importance of the domestic market for Shamouti oranges.

For Shamouti oranges too, the price increase in seasons with the minimum-price agreement exceeds the subsidy paid to exporters taking part in the program. According to estimation results, grower prices increased by about 120 to 135 NIS per ton as result of the minimum price agreement. As for Sunrise, the subsidy was around \$30 per ton exported (about 60 NIS per ton gross in constant prices, 2000 = 100). In the period following the minimum-price agreement where some exporters continued paying a fixed price, prices increased by about 100 NIS per ton gross. For the multiplicative version, we receive significant and positive coefficients for export prices multiplied with a dummy for the period of the minimum price agreement and the following two seasons with fixed price agreements. The coefficients are quite small, increasing the coefficient estimated for periods of consignment contracts (0.08 for both equations) by about 0.03. The price coefficients are much smaller then predicted by the multiplicative model.

To summarize, the above regression results are consistent neither with a competitive market nor with the linear oligopoly model. In both these cases, one would expect full transmission of price changes to growers, while the results indicate only partial transmission. In addition, according to the competitive regime, price increases during periods of fixed-price agreements should not exceed the subsidy. This is contrary to regression results, which show a substantial increase of grower prices far exceeding subsidies. These two phenomena are consistent with the multiplicative version of the oligopoly model and imply very noisy price estimates and substantial oligopoly markup.

References

Carlton, D. W., and Perloff, J. M., Modern Industrial Organization, USA: Harper Collins Publishers, 1990.

CBS (Central Bureau of Statistics), Statistical Yearbook, Israel, various years.

C.L.A.M., Les Exportacions d'Agrumes du Bassin Mediterraneen, various years.

Fershtman C., and Judd., K., "Equilibrium Incentives in Oligopoly", American Economic Review, (December, 1987): 927-40.

Fresh Produce Journal (October,1995), "Labels Add Value to Jaffa".

Hadarim (Publication of Israel's Citrus Grower Association), various issues, (in Hebrew).

Gerchak., Y., and Khmelnitsky E., "Consignment System Where Suppliers can not Verify Retailer's Sales Reports", International Journal of Production Economics", 83 (2003): 37-43.

Hertzano, Y. and Y. Kachel, Comparison of Prices and Marketing Costs Citrus in Israel and Spain, Ministry of Agriculture, Department of Market Research, Israel, December 1999 (in Hebrew).

Melamed, A., "The Citrus Marketing Board of Israel", in S. Hoos, ed., Agricultural Marketing Boards - An International Perspective, Cambridge, Massachusetts, 1979, 179-208.

Perloff, J., and Salop, S., "Firm-specific Information, Product Differentiation and Industry Equilibrium", Oxford Economic Papers, (November 1986): 184-202.

Pomona: Import Prices of Citrus Fruit to France.

Rungis Hebdomadaire: Wholesale Price Report from Rungis, Paris.

Xia, T., and Sexton, T., "Can Food Processor Use Contracts to Influence Farm Cash Prices? The Competitive Implication of Top-of-The-Market and Related Pricing Clauses", 2002, working paper, Department of Agricultural and Resource Economics, University of California, Davis.

ZMP (Zentrale Markt- und Preisberichtsstelle): Wholesale Price Report from German Wholesale Markets.

Zhang, M., and Sexton, R., "Fob or Uniform Delivered Prices: Strategic Choice and Welfare Effects", Journal of Industrial Economics, (June, 2001): 197-217.

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