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**Welfare Implications of Price
Stabilization Policies Implemented by
Israeli Agricultural Marketing Boards**

H. Shalit, A. Schmitz

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Names of Investigators:

Principal Investigator: Haim Shalit

Cooperating Investigator: Andrew Schmitz

Name and address of Affiliated Institutions:

Principal Institution: Center for Agricultural Economic Research, POBox 12,
Rehovot, Israel

Cooperating Institution: Department of Agricultural Economics, University
of California, Berkeley, U.S.A.

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Signatures:

Principal Investigator

Haim Shalit.

Institution's Authorizing Official

Nitzan Sadeh

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A. Abstract

The objectives of the research were to assess the welfare implications of price stabilization policies brought about by Marketing Boards activities. The research focuses on the Vegetables Marketing Board in Israel which deals with a large number of farmers and a small number of wholesalers. Fresh vegetables account for a fair share of the household budget spent on food implying on size of consumer gains or losses that arise from price stabilization policies.

Two approaches were used to determine the welfare effects. The first estimates directly from parameters of the demand equations, the preference for price stabilization. This is done by calculating the tax premium consumers are prepared to spend in order to avoid or incur price instability. The results of this examination show that for all vegetables, consumers with sensible risk aversion prefer unstable price to prices stabilized at the arithmetic mean.

The other approach used the more conventional method of economic surplus and evaluated society's welfare gains from intervention by means of price-support. This is done by a simulation model which estimates quantitatively the changes in consumer's surplus, Marketing Board Costs, intermediaries profit, and the producers revenue. For society in a whole, price intervention is beneficial if compensation between sectors is permissible.

B. Main Scientific Report

The purpose of this report is to evaluate empirically the welfare implications of price stabilization policies brought about by the Vegetables Marketing Board in Israel. Fresh fruits and vegetables account for a large share (27%) of the household budget spent on food in Israel, implying that any policy that attempts to change the price of these commodities has a great impact on consumer welfare. Stabilizing fresh food prices has remained the domain of action of Marketing Boards who were planned to insure steady supply of food to the consumers by means of supporting income to producers. The Israeli Vegetables Marketing Board was set by the government to regulate the production and the sale of fresh vegetables and was assigned legal powers upon producers and wholesalers to control the marketing of the products up to the consumers.

The usual policy instruments used by the Board include prices support to producers, quotas on cultivated areas, and the removal of excess supply. In theory, these policies should have been designed to take into account the welfare interest of both producers and consumers as well as the government costs. However, it seems that in practice, the Board represents mostly the interests of the producers whereas the consumers remain silent in the process of policy design. The objective of this paper is to determine the costs of consumer prices stabilization and the benefits, if any, of the stabilization policies. For that purpose, two approaches are used: First, one looks directly at the demand functions parameters to determine whether or not consumers prefer unstable vegetable prices to prices stabilized at

their arithmetic mean. This method determines the consumer's willingness-to-pay measure to achieve price stability and assesses the risk premium consumers are prepared to spend in order to avoid or incur price instability. The second approach is by means of consumer's surplus and cost benefit analysis. A model of supply and demand has been designed to account for the marketing channels , the intermediaries impact , the governmental constraints, and the policies effects of the Marketing Board. A simulation of the model is used to compute the welfare costs and benefits of price stabilization policies.

The first method is attractive because of its simpleness since the risk premium is computed from parameters obtained mostly from demand functions such as price elasticities, income elasticities, and budget shares. Furthermore, it permits to establish selective price stabilization policies. Then, if for example, consumer prefer price instability while producers are better off with stable prices, a stabilization policy can be implemented for the sake of the producers. The second approach is much more conventional but demands building an econometric model of the market that cannot cope with policies differentiating between the consumer's or the producer's preference for price stability.

1. Consumer's Preference for Price Stability

The conditions under which consumers prefer or not price stabilization were derived by Turnovsky, Shalit, and Schmitz. In the single price stabilization problem, the consumer is assumed to adjust instantaneously the consumption level of the commodity in order to maximize the expected value of his indirect utility function $EV(p, I)$ where E is expectation factor, V is the indirect utility, p is the vector of commodity prices, and I income. The desirability of price stabilization at the mean is analyzed by comparing $EV(p, I)$ with $V(\bar{p}, I)$ where $\bar{p}$ is the vector of prices stabilized at their mean. The condition for which consumer prefer the price of commodity i , stabilized at its mean can be shown to be

$$(1) \quad s_i(\eta_i - r) - e_i < 0,$$

where s_i is the share of budget spent on commodity i , η_i the demand elasticity with respect to income, r the Arrow-Pratt relative degree of risk aversion, and e_i the demand elasticity with respect to price.

For a normal good, it is usually the case that $e_i < 0$ and $\eta_i > 0$. Hence, what determines the preference for price stability is the relative size of the degree of risk aversion. For different purposes, one can evaluate the degree of risk aversion for which a consumer will switch from price instability to stable prices. Furthermore, one can calculate the

premium consumers would rather pay to move from a state of unstable prices to a state of price stability and vice-versa. Following Pratt, the premium is calculated to equal

$$(2) \quad t_i = - \frac{1}{2} \frac{\sigma_i^2}{\bar{p}_i} (s_i(\eta_i - r) - e_i),$$

where σ_i^2 is the variance of p_i , $\bar{p}_i$ its mean, and t_i the premium for each unit of the commodity.

If consumers prefer stable prices, the premium is positive and t_i is a value to be added to price to have it stabilized. The willingness-to-pay measure of price stabilization welfare is more appropriate than the consumers surplus approach since it takes in account the individual's attitude towards risk. I will use this method to analyze the preference for stabilizing the price of vegetables in Israel.

2. Testing the Preference for Vegetables Price Stabilization

The market for vegetables in Israel is characterized by short-run demand functions with high price elasticities and long-run supplies with very low price elasticities. The demand for tomatoes in Israel has been analyzed by Melnick and Shalit who devised estimation model to account for the existing spread between the producer and the consumer price. This difference was explained by the presence of intermediaries who exert monopolistic power on the two sides of the market. This type of framework issued for estimating the demand for vegetables. The main feature of the model resides in the fact that the quantity channelled to the consumers is determined by the profit maximizing behavior of the intermediary. Since the middleman uses the deterministic parameters of the demand equation to supply the quantity to the market, one can assume that this quantity is not affected by the stochastic disturbance of the inverse demand function. Thus, a simple regression model of the consumer price on the quantity consumed and all the other variables will provide consistent estimators by using ordinary-least-squares (OLS). The estimation results are presented in Table 1 for the eight major vegetables consumed in Israel. The inverse demand equation was estimated as:

$$(3) \quad Pc_t^i = a_0^i + a_1^i Qc_t^i + a_2^i I_t + a_3^i Pa_t^i + a_4^i Pc_{t-1}^i + \sum_{j=1}^{12} d_j^i (J_{jt}) \quad i = 1, \dots, 8$$

where Pc_t^i = consumer price, Qc_t = consumed quantity, I_t = income, Pa_t = price index of all other vegetables, and J is a set of dummy variables representing the monthly effect.

Table 1 : The Demand for Vegetables in Israel; Inverse Demand Function Estimates
168 Monthly Observations (January 1966 - December 1980)

Vegetable	Constant	Qc	I	Pa	Pc _{t-1}	Monthly Effect						R ²	D.W.	σ_{pc}	$\bar{P}_c$
Tomatoes	3.81 (3.8)	-1.34 (-7.6)	-.001 (2.9)	.87 (5.9)	.332 (7.4)	3 .8	4 1.4	6 .2				.74	2.12	1.85	4.29
Cucumbers	13.43 (10.9)	-3.61 (-10.5)	-.005 (-9.8)	.39 (2.4)	.14 (2.6)	1 1.9	2 1.7	3 1.3	5 .9	6 .7	12 .6	.86	1.42	2.88	5.86
Carrots	.29 (.8)	-1.02 (-4.1)	.0006 (2.8)	.18 (3.7)	.596 (10.4)	3 -.2	4 .3	8 .6	9 1.3	10 .2	11 -.3	.78	1.68	.92	3.16
Potatoes	.31 (1.8)	-.03 (-.8)	.0009 (7.0)	.01 (.6)	.38 (6.4)	6 -.14	7 -.17	8 .08	9 .07	10 -.04	11 -.03	.69	1.43	.33	2.53
Onions	.50 (1.5)	-.19 (-2.5)	.00008 (.4)	.04 (.8)	.75 (13.0)							.63	1.14	.72	2.60
Eggplants	2.25 (3.6)	-5.08 (-8.1)	-.0003 (-.9)	.50 (5.1)	.48 (8.9)	1 .4	2 1	3 1.1	5 -.5	7 .7	8 .4	.93	1.61	2.31	4.16
Peppers	3.78 (3.5)	-1.78 (-3.4)	-.002 (-4.1)	1.01 (5.4)	.19 (3.6)	1 1.2	2 2.7	3 1.4	4 1.	5 .4	6 .4	.75	1.20	2.81	5.46
Zucchini	3.78 (7.2)	-8.96 (-14.7)	.00005 (.2)	.39 (4.6)	.39 (7.5)	1 .47	2 .24	3 -.9	4 -.6	9 .4	10 .2	.85	1.94	1.60	4.79

These results are used to compute the price and the income elasticities at the mean, and the share of the vegetable budget spent on the specific vegetable that is:

$$s_i = \bar{P}c_i \bar{Q}c_i / \sum_{j=1}^8 \bar{P}c_j \bar{Q}c_j .$$

With these, we are able to compute the coefficient of risk aversion for which $s_i(\eta_i - r) - e_i > 0$ and the tax premium for $r = 1$. The choice for that value of relative risk aversion is suggested by Arrow for a bounded utility function. However, any other value can be assigned if obtained from individual experiments of behavior under uncertainty. These computations are reported in Table 2.

First, we remark that using time-series data presents serious problems concerning the estimation of the income elasticity. This is especially crucial when dealing with all the vegetables whose consumption per capita has decreased over time, while income per capita has increased during the years 1966 to 1980. That is the reason negative income elasticities are obtained for tomatoes, cucumbers, and peppers which form the classical Israeli salad. On the other hand, the consumption for potatoes over time has increased, a fact can be assigned to the rise in the standard of living since 1967. Furthermore, one can question the validity of the estimates for income elasticities obtained from the inverse demand function. The elasticities presented in Table 2 must be considered as upper-bound estimates since the correlation coefficient between Qc and Pc must be

provided for the transformation.

The results of Table 2 show that in general, consumers prefer price instability to mean price stabilization since the tax premium is always negative for a unitary relative degree of risk aversion. For tomatoes, which in the average consist of the largest share of the budget spent on vegetables, the coefficient of risk aversion at which consumers switch their preferences is close to 7. However, if the price elasticity and the income elasticity of the tomatoes demand functions are corrected to 1.00 and to 0.68 respectively according to the 0.60 correlation between Q_c and P_c , it appears that consumers will prefer price stability when their relative degree of risk aversion exceeds 2.70. In general it can be ascertained that consumers will prefer price instability to mean price stabilization even when their aversion towards risk is recognized.

Table 2 : Testing the Preference for Price Stability

Vegetable	Share s_i	Income Elasticity η_i	Price Elasticity e_i	Tax Premium $t_i(r=1)$	Risk Aversion r
Tomatoes	.295	-.505	-1.68	-.49	6.90
Cucumbers	.152	-2.12	-1.84	-.94	9.98
Carrots	.068	1.30	-5.08	-.51	56.89
Potatoes	.265	15.31	-31.94	-.77	121.83
Onions	.055	.94	-23.19	-2.31	405.49
Eggplants	.049	-.206	-2.10	-1.31	42.65
Peppers	.072	-4.09	-8.29	-5.73	111.05
Zucchini	.044	.03	-1.91	-.49	43.44

All figures are computed at the arithmetic mean for the variables.

See Table 1 for the means of price and quantity. $\bar{I} = 1347.73$.

3. The Market Model

A model of vegetables market in Israel has been designed to evaluate directly the welfare implications of price stabilization policies. The model is not only a conventional representation of supply and demand relationships but includes also the market activities of intermediaries such as wholesalers and retailers, together with the intervention of the Marketing Board. Price responsive supply functions were not included because of poor estimation results, thus quantity supply was estimated as a function of time and past realisations.¹

The model is centered around the activities of the Marketing Board who intervenes by guaranteeing a price P_m to be paid to the producer whenever the market price falls below that minimum. When it happens, the intermediaries sell the surplus to the Marketing Board who removes it from the market.² Growers are selling their product to accredited wholesalers who market it to retailers and consumers. By law, the intermediaries must purchase all the quantity produced by the growers under fixed quotas. However, the

¹This is different from the model by Bigman who presents a simulation analysis with risk supply responses.

² For an economic background of the Agricultural Marketing Boards in Israel see Sadan and Melamed.

wholesalers can fix the quantity to be channeled to the market by deciding upon the size of the surpluses to be sold for P_m to the Marketing Board. This decision depends upon their monopolistic-monopsonistic position in the marketing channel. The wholesalers pay Ps^i to the growers for their product. These prices are a function of the power exerted by the wholesalers on the farmers. In the absence of a short-run supply function, the monopsonistic middleman pays the lowest allowable price, which is the minimum price P_m^i . On the other hand, in perfect competition, wholesalers pay the consumer price, Pc_t^i less the normal markup θ^i . If we denote β^i is the degree of monopsonistic power existing in vegetable i , the producer price can be expressed as the function:

$$(4) \quad Ps_t^i = \beta^i P_m^i + (1 - \beta^i) \cdot (Pc_t^i - \theta^i), \text{ for } i = 1, \dots, 8,$$

where $\beta^i = 0$ for perfect competition and $\beta^i = 1$ for pure monopsony, Ps_t^i the producer price, Pc_t^i the consumer price. The surpluses to be sold to the Marketing Board are the residuals of the quantities supplied by the growers less the quantities channelled by the intermediaries. Thus,

$$(5) \quad Qe_t^i = Qs_t^i - Qc_t^i \quad \text{for } i = 1, \dots, 8,$$

where Qs_t^i is the supply of vegetable i at time t , Qe_t^i the surplus, and Qc_t^i is the quantity consumed.

The intermediaries maximize their profit subject to the producer price functions (4), the quantity constraints (5), and the demand functions (3).

The resulting decision of that maximization expresses the surplus to be removed from the market as a function of the quantity supplied, Qs_t^i , and the minimum price, Pm_t^i . This is essentially explained by the fact that as Qs_t^i increases, so does Qe_t^i ceretis paribus, and the same for Pm_t^i . Thus the surplus equation.

$$(6) \begin{cases} Qe_t^i = d_0^i + d_1^i Pm_t^i + d_2^i Qs_t^i & \text{for } Qe_t^i > 0 \\ Qe_t^i = 0 & \text{for } Qe_t^i \leq 0 \end{cases}$$

Equations (4) and (6) have been estimated separately; the first expressing the size of markup for each vegetable, the second presenting the surplus removed from market as the result of the intermediaries behavior. The results are shown in Table 3. The large β^i (monopsonistic power) is obtained for vegetables produced mainly by smallholders (Moshavim and private farmers). This is especially true for tomatoes, peppers, and eggplant. On the other hand, the monopsonistic power of the intermediaries seems weaker for vegetables grown mainly by larger farms (Kibbutzim and private ranches) such as for potatoes, onions, and carrots. For the surplus equation, however, satisfactory results could be provided only for tomatoes.

Table 3 : The Producer Pricing Function and the Surplus Equation

Vegetable	θ	β	R^2	Constant	Pm	Qs	R^2	D.W.
Tomatoes	1.85 (16.5)	.65 (34.8)	.74	-.67 (-7.8)	.073 (1.5)	.37 (16.4)	.62	1.67
Cucumbers	2.19 (25.0)	.36	.92	-.017 (-2.9)	-.003 (-.6)	.04 (6.9)	.26	1.69
Carrots	1.36 (30.2)	.43 (24.3)	.84	-.10 (-6.2)	.08 (5.0)	.12 (8.4)	.35	1.20
Potatoes	1.36 (33.8)	.28 (4.2)	.16	-.39 (-3.2)	-.09 (-1.6)	.24 (5.9)	.16	1.20
Onions	1.04 (17.4)	.35 (10.8)	.56	-.02 (-.8)		.16 (5.3)	.15	1.63
Eggplants	.68 (6.8)	.56 (49.6)	.90	-.025 (-1.7)		.13 (8.8)	.33	1.30
Peppers	.13 (.4)	.58 (22.5)	.62	-.01 (-1.7)	.007 (1.2)	.05 (5.3)	.16	2.11
Zucchini	1.75 (17.6)	.46 (27.4)	.85	-.01 (-3.9)		.08 (11.0)	.43	1.35

The working of the model is synthesized by the flow chart presented in Figure 1. The decision-maker fixes the minimum prices that will prevail during the period to be analyzed. For each month, the model simulates the supplies of each vegetable according the functions estimated by ARIMA methods.³

Following these quantities, consumer and producer prices are simultaneously computed according to the demand functions (3) and the intermediaries rules (4). If the computed producer price is smaller than the minimum price, surplus is created according to the behavioral equations (6).

Then, the quantities consumed are adjusted and the market producer and consumer prices are determined. By the end of the month, benefits and costs are computed for the four sectors involved: the consumers, the producers, the intermediaries, and the government. The consumers benefits are obtained by means of the consumer's surplus which is computed by the end of each month. The limitation of that criterion are well-known; especially in the context of price stabilization policies. For consumer's surplus to be a valid measure of the utility changes, it is necessary that the income elasticity of the demand function equals the coefficient of relative risk aversion (See Turnovsky, Shalit, and Schmitz). However, as shown by Willig

³ The functions are shown in the Appendix.

and furthermore by Just, Hueth, and Schmitz, the error can be approximatively small. For the intermediaries, profits are calculated as the revenue generated by the products sale less the payments to the farmers. The government expenses are simply the value of the surplusses evaluated at the respective minimum prices. For the farmers, we calculate as benefits the revenue received from the sales of all eight vegetables.

Figure 1 : Flow Chart of Simulation Model

Table 4 : The Impact of Changes of the Tomatoes Minimum Price

Pm	CV(Pc)	CV(Ps)	$\overline{CS}$	$\overline{TR}$	$\overline{TI}$	$\overline{TG}$	$\overline{TS}$	$\overline{Pc}$
a) 0.00	.52	.62	13472	5960	18830	0	38262	3.52
0.60	.47	.59	11867	8472	20145	334	40150	4.25
1.20	.40	.38	11048	12749	19699	748	42748	4.78
1.80	.31	.27	9931	15283	15814	1515	39513	4.68
2.40	.26	.20	8889	20263	13820	3493	39479	5.05
b) 0.00	.43	.60	14955	7493	24985	0	47434	4.45
0.60	.36	.44	12530	10619	23070	195	46025	4.83
1.20	.33	.32	12651	13450	21247	532	46817	4.85
1.80	.28	.22	11850	17680	19350	1155	47725	5.19
2.40	.28	.22	10077	22055	18472	2332	48273	6.00

- a) The minimum price of other vegetables is held at zero for all crops.
- b) The minimum price of other vegetables is held at the mean of past minimum prices that is 1.16 IL for cucumbers, 0.70 for carrots, 1.20 for potatoes, 0.60 for onions, 0.30 for eggplants, 0.60 for peppers, and 0.40 for zucchini.

The problem is to define several criteria that will account for the success or the failure of the price stabilization policies. We expect that as the Marketing Board raises the minimum price of a vegetable, the consumer price and the producer price will become more stable, the farmer total revenue will increase, so will the intermediaries profit, a decline in the consumer's surplus is expected. In Table 4, this process is exemplified for a ceteris paribus change in the minimum price of tomatoes; the first at the no-intervention state for all other vegetables and the second at a given positive level of minimum prices. The table presents the average weekly costs and benefits of the tomatoes branch only. Increasing the tomatoes minimum price reduces the coefficient of variation of both the producer and the consumer price $CV(P_c)$. Consumer's surplus $(\bar{CS})$ is declining since the consumer price is increasing. The average intermediaries profit $(\bar{TI})$ from sales of tomatoes is declining although we did not expect it. Furthermore, the average producer revenue from tomatoes $(\bar{TR})$ increases. In general, we obtain no sensible change in the total average $(\bar{TG})$ surplus but merely an exchange between the average government expenses, intermediaries profit and the producer revenue. However, increasing all other minimum prices raises the average total surplus $(\bar{TS})$ extracted from the tomatoes market. This can be explained by the fact that average consumer prices of other vegetables being high, the demand for tomatoes has generally increased. In conclusion, changing the tomatoes minimum price increases price stability for the consumer and the producer. The consumer does not benefit from that stabilization whereas the producer does.

We now analyze the change in prices an all vegetables and try to find a general price policy that will maximize total surplus together with a sensible price stabilization. The search is performed by changing gradually all the minimum prices to obtain a larger value surplus for all the vegetables. The results are provided in Table 5 where the non-intervention state is presented with $Pm^i = 0$ for all vegetables together with the optimum policy of price stabilization. The increase in total surplus is apparent in all the vegetables but potatoes and onions whose surplus decline is due to loss of profit by the intermediaries. The gains are mainly those of the producers whereas consumers suffer welfare losses due mainly to increase in the average consumer prices of all vegetables. Intervention at the given minimum prices is made only for tomatoes, potatoes and zucchini. However, the prices of these vegetables affect all others. In general one remarks a considerable decrease in price instability as presented by the coefficient of variation for the consumer and the producer prices. The model has shown that, because of substitution effects between commodities, it is sufficient to stabilize prices in one vegetable to affect the price stability of the others.

Table 5 : Changes in all vegetables minimum price: The optimal policy

	Pm	CV(Pc)	CV(Ps)	CS	TR	TI	TG	TS	Pc	Ps
Tomatoes	0.00	0.52	0.62	13472	5959	18830	0	38262	3.52	0.81
Cucumbers	0.00	0.44	0.61	6011	5547	8694	0	20253	6.15	2.72
Carrots	0.00	0.38	0.47	1247	1896	3731	0	6875	2.58	0.87
Potatoes	0.00	0.05	0.14	936	7010	12314	0	20260	2.36	0.85
Onions	0.00	0.14	0.29	158	1964	3263	0	5387	2.44	0.91
Eggplants	0.00	0.60	0.64	1750	1412	2404	0	5566	3.60	1.35
Peppers	0.00	0.38	0.40	181	2408	3407	0	5997	5.95	2.49
Zucchini	0.00	0.30	0.41	1373	1295	2651	0	5320	4.37	1.47
Tomatoes	1.14	0.31	0.31	12508	14373	22617	506	48993	5.15	1.92
Cucumbers	0.00	0.37	0.46	5312	8205	9039	0	22557	6.91	3.47
Carrots	0.00	0.29	0.45	1310	2396	5031	0	8737	3.19	1.07
Potatoes	1.20	0.04	0.16	195	8927	4583	4126	9580	2.56	1.25
Onions	0.00	0.11	0.22	165	2082	2463	0	4711	2.52	1.16
Eggplants	0.00	0.49	0.52	1721	2176	3141	0	7039	4.89	2.03
Peppers	0.00	0.31	0.30	222	3877	4301	0	8401	7.28	3.42
Zucchini	0.40	0.30	0.40	1490	1789	2827	1	6105	4.99	1.97

CONCLUSION

From the two approaches used to determine the welfare effects if price stabilization policies, the first has shown that risk-averse consumers prefer unstable prices to price stabilized at their arithmetic mean; the second that if welfare transfers are made, some price stabilization is optimal.

The stabilization policy encompasses in general the main vegetables, that is, tomatoes and potatoes. However this has a great impact on the whole market because of the substitution and complementary effects. Although quantitative answers were provided for consumers' mean price stabilization, only the market model could weight the benefits and losses of a general intervention policy. This policy is carried out by supporting the price to the producer, affecting the benefits and costs of the consumers, the intermediaries, the producers and the government.

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6. A p p e n d i x

ARIMA Estimation of the Supply Functions

Tomatoes: $Qs_t = Qs_{t-12} + a_t + .2032a_{t-1} - .8962a_{t-12} - .1821a_{t-13}$ with
 $\sigma_a = 2069.031$

Cucumbers: $Qs_t = Qs_{t-12} + a_t + .3985a_{t-1} - .7669a_{t-12} - .3056a_{t-13}$ with
 $\sigma_a = 770.$

Carrots: $Qs_t = Qs_{t-12} + a_t + .5893a_{t-1} - .9124a_{t-12} - .5377a_{t-13}$ with
 $\sigma_a = 448.$

Potatoes: $Qs_t = Qs_{t-1} + a_t - .8665a_{t-1} + .3029a_{t-12} - .2625a_{t-13}$ with
 $\sigma_a = 1445.6.$

Onions: $Qs_t = Qs_{t-12} + a_t - .3616a_{t-12}$ with $\sigma_a = 1264.6.$

Eggplants: $Qs_t = Qs_{t-12} + a_t + .5083a_{t-1} - .5644a_{t-12} - .2669a_{t-13}$ with
 $\sigma_a = 279.3.$

Peppers: $Qs_t = Qs_{t-12} + a_t + .2571a_{t-1} - .9121a_{t-12} - .2345a_{t-13}$ with
 $\sigma_a = 596.5.$

Zucchini: $Qs_t = Qs_{t-12} + a_t + .4860a_{t-1} - .8599a_{t-12} - .4179a_{t-13}$ with
 $\sigma_a = 265.5.$

where Qs_t is the total supply of vegetable and a_t a stochastic disturbance with standards deviation σ_a .

C. Evaluation of Research Achievements

The first stage of research was channelled into three directions. First, state collection was arranged in a form suitable for empirical work. The data basis consists of 168 monthly observations of prices, quantities of all vegetables as published by the Israeli Central Bureau of Statistics. Second, an estimation model was designed for the Tomatoes Market whose results are presented in paper (2) which has been since revised. Third, the welfare implications of price stabilization policies were developed in different papers (1), (3), (4). This theoretical background was necessary to establish willingness-to-pay measures and to show the size of the computation error that arises by using the consumer's surplus measure. This first stage corresponds to the original research plan for all the subjects that are related to consumers only. The difficulties of estimating producer behavior functions that will be sensible to producer minimum price has led us to use Box-Jenkins Methods.

The second stage of the research consists of building a market model, which simulates the behavior of all participants, such as consumers, producers intermediaries and the Marketing Board. This corresponds fairly to the research plan since it enables us to evaluate the welfare accrued to society as a result of changes in price policies. In addition, a study assessing qualitatively the success and failure of the Marketing Board was conducted. Its goal consists of establishing the

organizational structure and the decision making processes of the Board. Furthermore, it evaluates empirically the elasticity of the relative price variability with respect to intervention costs. This study conformed also with the original plan and the complete results appear in Scheinkopf M.Sc. Thesis (5).

D. Description and Results of Cooperation

The theoretical background was developed in cooperation with my colleague, Professor Andrew Schmitz. Furthermore, we have designed the model during his visit in Israel, whereas I presented the results during my stay in Berkeley.

E. Thesis

The main thesis is that the vegetable Marketing Board should limit its intervention on the market, mainly because the subsidies spent on price stabilization do not reduce price variability. Although society in the whole prefer stable prices, stability does not benefit the consumers. Furthermore, the Marketing Board should increase the number of wholesalers to reduce the monopsonistic power.

F. Benefit to Agriculture

The research has assumed the welfare effects of price stabilization policies used by the vegetables Marketing Board. Thus it will contribute

to the general effort of increasing the economic efficiency of Israeli agriculture. Vegetable growers wonder as to whether industry planning should be enforced or that "laissez-faire" should prevail. The research results should contribute to that discussion.

G. List of Publications

1. Haim Shalit, Andrew Schmitz, and David Zilberman, "Uncertainty Instability and the Competitive Firm." Revised Version 1982.
2. Rafi Melnick and Haim Shalit, "Estimating the Market for Tomatoes". published in Hebrew in Issues in the Economy of Israel 1981 Jerusalem 1983:283-292.
3. Haim Shalit, "Who Should Pay for Price Stabilization", Working Paper No. 8006.Center for Agricultural Economic Research, Rehovot.
- ✓ 4. David Bigman and Haim Shalit, "Applied Welfare Analysis for Consumers with Commodity Income", De Economist, 1983.
- MSC 5. Avraham Sheinkopf, "Assessing the success of the vegetable marketing board," Unpublished MSc. Thesis presented to the Department of Agricultural Economics, Hebrew University, Rehovot.
6. Haim Shalit, "Does it Pay to Stabilize the Price of Your Salad? Unpublished Manuscript, Hebrew University, Rehovot.