Cooperation in the Moshav¹

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The moshav is a cooperative village in which members own and operate their farms individually. The moshav supervises cooperative marketing of most of the farms' products. But its most important function is as financial intermediary since its members are handicapped when acting by themselves in the credit market. Despite occasional internal conflicts about the cooperative marketing, in the long run the moshav enhances capital accumulation and income. This paper reports an empirical study of cooperative marketing, credit, and capital in the moshav. A dynamic model is developed and estimates are presented. J. Comp. Econ., March 1984, 8(1), pp. 54–73. Faculty of Agriculture, Hebrew University, Rehovot, Israel.

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1. INTRODUCTION AND SUMMARY

The *moshav* is a cooperative village, typically consisting of 40–80 households that operate their own farms. Only members operate farms in the moshav village and, by being members, they participate in all aspects of collective action.² Despite common structural traits, *moshavim* differ widely in degree and nature of cooperation. Some maintain joint cash management, central planning and direction, and strong public services. Others are loosely organized

¹ This study is an extension of part of the doctoral dissertation of the first author (Haruvi, 1980). We are indebted to many colleagues, in particular to Claudia Dodge, Joel Guttman, Yakir Plessner, Ezra Sadan, and Dov Weintraub for helpful discussions. Comments and suggestions offered by Pinhas Zusman who read an earlier draft of the paper and by two anonymous referees improved the present version significantly. The remaining errors and shortcomings are ours. The study was supported by a grant from the United States–Israel (Binational) Agricultural Research and Development Fund (BARD).

² The identity of the cooperative and the village is maintained in practice. However, an attempt to incorporate explicitly this identity into the law in Israel failed when a strong fraction in the moshavim opposed what they saw as a potential breach of members' individual freedom. Particularly dangerous, in their view, was the possibility that a member expelled from the cooperative will have to leave his home and livelihood in the village.

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farm communities in which families operate individually farm and nonfarm activities.

Historic circumstances made the moshav the most prevalent form of socioeconomic organization in Israeli agriculture. In its early years Israel was flooded with a large number of immigrating refugees who were incorporated into a developing economy aided by outside capital, mostly channeled through public agencies. The moshav, with its egalitarian principles, family operation, mutual aid, and scale economies in services, was deemed the most suitable institutional form for wide agricultural settlement because it prevented accumulation of national resources—land and capital—in the hands of a few individuals. Most moshavim were established with public support and all have been aided significantly by the government.

This paper is a report on a study of financial cooperation—the major mode of cooperation in the moshav. The basis for financial cooperation is joint marketing of farm products. The share of the value of output marketed jointly is, therefore, taken in the paper as a measure of the degree of cooperation. The operation of the moshav, the factors determining the degree of joint marketing, and the conflict between the individual and the group are discussed in the first part of the paper.

By improving the position of the moshav in the credit market, financial cooperation enhances capital intensity; capital intensity raises income and the value of the member's time and, in turn, strengthens cooperation. These mutual relations are the focus of the second part of the paper. A simple dynamic model of capital and cooperation is developed and estimates are presented.³ The dynamic interdependence of capital and cooperation raises the issue of the stability of the cooperative in the moshay. This issue is of particular practical relevance since in many moshavim cooperation is not complete. The question posed is, therefore, whether partial cooperation is stable or whether a moshav faces a dichotomy of either complete cooperation or disintegration into separate family units. The conclusion reached in the empirical analysis is that partial cooperation is stable. This conclusion is qualified since it is based on observations on the operation of moshavim in a period in which agriculture was actively assisted by the government, particularly through credit subsidies. It is not clear whether partial cooperation can be maintained in a less supportive environment.

2. THE MOSHAV AS A COOPERATIVE

The first moshav was established in 1921 and was based, from its inception, on a clear, well-articulated and documented doctrine: maximum self-suffi-

³ Focusing on empirical investigation, we do not discuss structural issues of cooperation in terms of group-decision theory as, for example, in Olson (1977) or Zusman (forthcoming).

ciency in food for the farm family, cooperation in services, mutual aid in farm cultivation, exclusive family operation without hired labor or off-farm work, democratic government of the cooperative (Weintraub et al., 1969; Baldwin, 1972). Eighty moshavim were established before the creation of the State of Israel in 1948. More than 300 have been added since, the majority in the early 1950s. The prestate settlers were, as a rule, ideologically motivated; the majority were immigrants from Eastern Europe. Most of the "young" (post-1948) villages were populated by newcomers from Middle Eastern countries, directed to the moshav upon arrival in the country, with no prior preparation in agriculture and lacking ideological commitment to cooperation.

Being both an economic cooperative and a village, the moshav offers municipal services as well as marketing, supply facilities, and technical services such as a pool of farm equipment or grain storage. In addition to the privately run farms, most moshavim operate a joint agricultural enterprise—field crops in many villages, or orchards if distance to available land makes individual cultivation too costly. The cooperative organization of the moshav is supported by the economic environment in which it functions. Moshavim cultivate national land that is allotted to the village and subdivided among members according to detailed regulations: the plots must be of equal size, they cannot be subdivided, and only one son can continue on the father's farm. Water and production quotas (recently in milk and poultry) are also distributed nationally at the village level and realloted to individual members by the cooperative.

The moshavim are organized in several "settlement movements," each associated with a political party. The movements represent the interest of the moshavim in the political arena and attempt to guide the individual moshav in cooperative life-style. Economically, the moshavim are members of regional "buying organizations" that centrally purchase farm supplies and consumer goods for the village members and operate processing plants, transportation services, and credit facilities. The buying organizations and their subsidiaries sell to village cooperatives and collect payments for products marketed through the cooperatives; they seldom deal directly with individual farmers, thus strengthening cooperation in the moshav.

3. FINANCE

The cooperative in the moshav acts as a financial intermediary that receives credit and distributes it among its members. There are many advantages to financial cooperation. National land cannot be used as credit security by the individual member and the bank cannot repossess the farm in case of failure to repay.⁴ The village functions as a riskpool. Lenders, including banks and

⁴ Membership in a moshav can be transferred, but the cooperative has to approve the new member. A farm cannot be transferred to a commercial concern.

regional organizations, prefer to operate at the village level. Private dealers, mostly wholesalers of farm products, may supply short-term credit directly to members in need against the coming crop. They probably can enforce repayment by methods that banks and cooperatives would not follow. However, private dealers will naturally not be able to match the terms of subsidized, particularly long-term, credit and will not finance investment in structures and equipment. Sole reliance on private sources will severely restrict the volume of finance to the moshav farms.

The operation of the cooperative as a financial intermediary greatly simplifies mutual aid within the moshav. Assistance to a member in distress, which was based in the past on actual work on the member's farm, now takes the form of sharing the financial burden.⁵ Furthermore, members are allowed to draw on their credit in the cooperative in periods of lower income.⁶ In some cases the moshav may also decide to contribute from its own sources in the development of a new enterprise on a member's farm.

By acting as a financial intermediary, the success of the moshav depends on its credit standing, which depends, in turn, on the cooperation of the members. Moshavim often pledge their crops as collateral for credit. The only way the cooperative can be sure of timely repayments is when marketing is actually done through its offices; then debts are simply deducted from the member's market revenue. This explains the critical role of cooperative marketing in the moshav. Without joint marketing the moshav cannot operate as a financial intermediary, that is, it cannot function as a cooperative. On the other hand, the higher the degree of cooperation in marketing, the better the credit standing of the moshav, and the easier capital accumulation becomes. Cooperation enhances capital intensity.

The moshav can, within limits, encourage cooperation and protect itself against moral hazards. It is customary, for example, to supply feed on credit in proportion to livestock products marketed through the cooperative. But members may choose low levels of utilization of village services and only partial participation in joint marketing. Moreover, once a member has accumulated debt and reduced his participation, the power of the moshav to enforce repayment is limited and legal actions are costly, financially and

⁶ The marginal propensity to consume estimated from a cross section of families in moshavim was 0.293 (Arbel, 1973). This value is much lower than all the estimates for urban families in Israel and reflects maintenance of similar levels of consumption despite income variations in households in moshavim.

⁵ The bylaws of the moshav, suggested in 1951 by the largest movement, stated under the title of Mutual Aid: "Every member shall cultivate his farm himself with the assistance of members of his family and he shall not employ hired laborers. The cooperative shall assign another member to help in case of illness. Members shall be assigned according to a given order" (our translation). No mention of mutual aid in labor appears in more recent regulations of moshavim. (We are indebted to P. Zusman for this reference.)

socially. As a result, marketing in moshavim is seldom completely cooperative and conflicts may arise between the cooperative and the members who have incentives to market privately. We turn now to a schematic analysis of these conflicts.

4. THE INDIVIDUAL AND THE COOPERATIVE

This section outlines a schematic single-period model⁷ of the behavior of the cooperative and the individual member with particular attention to financial intermediation and joint marketing. Time requirement of private dealing in the product and input markets plays a major role in our analysis. Private marketing will therefore be made a function of labor devoted to this activity. We first disregard labor requirements of private market dealings. Basically, the analysis of product allocation to private and cooperative marketing is analogous to the analysis of effort allocation in labor cooperatives (Sen, 1966; Israelsen, 1980). The reader will recognize lines of similarity.

A. The Model

Output of farm i, y_i , is a function of labor, L_i , and capital, K_i ,

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$$v_i = f(K_i, L_i) \tag{1}$$

and, disregarding hired labor and off-farm employment, we assume $L_i = \text{const.}$ We also assume constant and identical variable cost V per farm.

Capital in production is the initial amount, K_{0i} , plus investment, which is assumed for the purpose of the present analysis equal to borrowing, B_i ,

$$K_i = K_{0i} + \mathbf{B}_i \tag{2}$$

The farmer markets q_i percent of his product through the cooperative and $s_i = 1 - q_i$ privately. Some products are more easily sold privately (calves, cut flowers to local markets), and farmers may secure individually better prices. On the other hand, subsidies (recently in milk and poultry) are paid only through certified dealers and are mostly limited to cooperative marketing. Other products are marketed jointly for technical reasons: milk, for example, is collected by the tanker only in the village station. To reflect the differential advantages of private and cooperative marketing for various products we assume a constant price p_c for joint marketing, disregarding the possibility of economies of scale, and a variable price $p_i(s_i)$ for private marketing, this price being a decreasing function of s_i .

⁷ We disregard consumption, saving, capital accumulation, risk in production and in financial operations. Some of these issues are discussed below, but a complete theoretical analysis of the moshav is outside the scope of the present discussion.

The value of private and joint cooperative marketing for farmer i is, respectively,

$$I_{i} = s_{i}p_{i}(s_{i})f(K_{0i} + B_{i}, L_{i}),$$

$$Q_{i} = q_{i}p_{c}f(K_{0i} + B_{i}, L_{i})$$
(3)

and for the moshav

$$I_{c} = \sum I_{i}$$

$$Q_{c} = \sum Q_{i}$$

$$B_{c} = \sum B_{i},$$
(4)

where the summation is on all i (i = 1, ..., n).

Borrowing is through the cooperative which faces an upward sloping supply curve of credit with average rate of interest, r, a function of both borrowing and the moshav's cooperative revenue:

$$r = r(B_{\rm c}, Q_{\rm c}) \tag{5}$$

with partial derivatives $r_B > 0$, $r_Q < 0$. Increased joint revenue augments risk pooling and reduces the risk of lending to the moshav.

Although efficiency consideration would dictate that cooperatives charge their members the marginal rate of interest, most moshavim follow the patronage principle and charge the average rate. There are several reasons for this seemingly suboptimal policy: it is comparatively simple to administer, it looks "just," and it permits indirect mutual aid—farmers in distress can expand their borrowing at a rate that may often be lower than the social cost of credit. We shall also assume here that members in debt are charged the average rate (and members holding financial reserves in the cooperative are paid the average rate). This assumption will not alter the conclusion of our analysis.

B. Analysis

We first assume centralized allocation (Sen, 1966). The moshav's "GNP," net of interest payments, is

$$G_{\rm c} = I_{\rm c} + Q_{\rm c} - nV - r(B_{\rm c}, Q_{\rm c})B_{\rm c}.$$
 (6)

Maximizing with respect to the two farm-level control variables, B_i and s_i , we get from the first-order conditions (f_K is the partial derivative of $f(\cdot)$ with respect to K_i):

$$f_{K}[s_{i}p_{i}(s_{i}) + q_{i}p_{c}] = r + B_{c}(r_{B} + r_{Q}q_{i}p_{c}f_{K}),$$
(7)

$$p_i(s_i) + s_i p'_i(s_i) = p_c(1 - r_Q B_c).$$
(8)

Equations (7) and (8) are the conditions for maximum social income in the

moshav. There are n pairs of such equations, a pair for each farm. We assume that internal solutions exist.

Alternatively, taking the individual member's point of view and assuming voluntary allocation, income on the farm is

$$G_i = I_i + Q_i - V - r(B_c, \mathbf{Q}_c)B_i$$
(9)

and maximizing with respect to B_i and s_i we get for each farmer

$$f_{K}[s_{i}p_{i}(s_{i}) + q_{i}p_{c}] = r + B_{i}(r_{B} + r_{Q}q_{i}p_{c}f_{K})$$
(10)

and

$$p_i(s_i) + s_i p'_i(s_i) = p_c(1 - r_Q B_i).$$
(11)

Equations (10) and (11) define the conditions for maximum income on farm i, disregarding externalities—the effect of the action of a farmer on other members in the moshav—or, in Sen's (1966) terminology, assuming zero sympathy.

The left-hand side in Eqs. (7) and (10) is the value of the marginal product of capital on the farm, valued at the average (weighted) price. The right-hand side is the marginal cost of credit—in Eq. (7) the marginal cost to the moshav, in Eq. (10) the cost to farmer *i*. Since $r_B > 0$, and $r_Q < 0$, the marginal cost can be either higher or lower than average cost. When the effect of capital accumulation and production expansion on lowering the cost of credit outweighs the effect of borrowing on raising this cost, *r* decreases with borrowing. Optimal credit under centralized allocation will then be higher than under voluntary allocation. This possibility is plausible. There are moshavim in which officers encourage members to invest and expand, explaining that "it will be good for everyone." Under different circumstances, the individual member may borrow "too much" from the social point of view.

Equations (8) and (11) determine the optimum s_i . The marginal price of individual marketing is equated to the marginal price of cooperative marketing. The last term incorporates the lowering effect of expanded joint marketing on cost of credit. As $B_i < B_c$, individual marketing under voluntary allocation exceeds the social optimum. The interests of member and cooperative are, at least partly, in conflict.

C. Labor in Marketing

The major hypothesis of our study is that private marketing (and purchase of inputs) is time-consuming and is affected, therefore, by the member's valuation of his time. To incorporate this aspect in the analysis, we adopt the schematic assumption that the share of private marketing is equal to the percentage of labor input devoted to this activity.

Normalize labor in such a way that the total amount of labor on the farm equals unity (L = 1). Let L_i be the amount of labor in agricultural production

on farm *i*, and now write $s_i = 1 - L_i$ —labor devoted to private marketing. The shares of farm product marketed individually and jointly are $s_i = 1 - L_i$ and L_i , respectively:

$$I_{i} = s_{i}p_{i}(s_{i})f(K_{0i} + B_{i}, L_{i}),$$

$$Q_{i} = L_{i}p_{c}f(K_{0i} + B_{i}, L_{i}).$$

Total values of marketed product at the moshav level, I_c , Q_c are defined as in (4) with L_i replacing q_i ; the moshav's and the farm's "GNP" are defined, similarly, as in (6) and (9), respectively.

Maximizing G_c and G_i with respect to B_i , we get from the first-order condition expressions that are identical to Eqs. (7) and (10). Maximizing with respect to L_i , we get at the moshav level (f_L is the derivative of $f(\cdot)$ with respect to L_i):

$$f_L[s_i p_i(s_i) + L_i p_c] - r_Q p_c[f(K_i, L_i) + L_i f_L] B_c$$

= $f(K_i, L_i)[p_i(s_i) - p_c + s_i p'_i(s_i)].$

The expression for the individual farmer is identical to (12), except that B_c is replaced by B_i .

The left-hand side in (12) is positive since $r_Q < 0$ and all other terms in this expression are positive. The first term on the left, $f_L[\cdot]$, is the value of the marginal product of a unit of labor on the farm—a unit shifted from marketing to agricultural production; the second term, $r_Q p_c[\cdot]B_c$, is the value to the moshav of the reduction in interest payments due to increased joint marketing on farm *i*. The additions to the product marketed cooperatively comes from two sources: the withdrawal of one unit of labor from individual marketing increases cooperative marketing by $f(K_i, L_i)$ and this same unit of labor also contributes to production on the farm f_L , of which $L_i f_L$ are marketed through the cooperative. The term on the right-hand side of (12) (in the second line) is the marginal revenue of the farm—marginal with respect to a unit of labor withdrawn from private marketing.

Again, assuming internal solutions, since $B_c > B_i$, optimal cooperative marketing from the social point of view exceeds the optimum from the individual perspective. We are interested in the effect of capital accumulation on the share of cooperative marketing. This effect can be positive or negative. Capital accumulation will shift both sides of (12). The net effect is subject to empirical investigation, which is attempted in the empirical sections to follow. We start with a description of the data utilized in the study.

5. THE SAMPLE

Commonly, moshavim are divided in Israel according to period of foundation: established moshavim settled before 1948; young moshavim settled

(12)

after statehood. Another division, utilized in this study, is between *developed* and *developing* moshavim. This division is in accordance with administrative practice⁸ but it also reflects the age and level of economic development. The developing moshavim are all "young" and all the "established" villages are included among the developed group.

The data, available at the moshav level, were mostly utilized in the study as averages per farm.⁹ The most complete information was for 1976 and the sample is for this year. Included are 249 villages, 115 developing and 134 developed moshavim, but certain information was available only for part of the sample. Only 95 developing moshavim are therefore included in the data base for the regressions reported. Excluded from the sample were moshavim for which reliable data were not available. In some cases these may have been less well-organized communities whose exclusion might have biased the sample somewhat in favor of higher levels of cooperation. We do not know the extent of this possible bias.

Some of the attributes of the moshavim in the sample are reported in Table 1. For easier reference, averages were converted to dollars at the 1976 exchange rate (\$1 = 7.94 IL). Output per farm in the developed moshavim is almost twice as high as in the developing villages, despite lower levels of value of capital per farm.¹⁰ The share of farm enterprises run directly by the cooperative (not including village services) is higher in the developing moshavim, which are less efficient in utilizing productive resources. The discrepancy is partly due to a different natural environment: 51% of the developing moshavim are located in the hilly regions of the country, as against 9% of the developed moshavim. Cooperation, defined as the share of farm product marketed by or revenue passed through the offices of the moshav, was 65 and 72% of output, respectively, in the subsamples of the developing and developed moshavim.

Some economic characteristics associated with cooperation are reported in the last part of the table. A moshav is defined as a livestock-type if more than 50% of the village output is from livestock enterprises. Of the developing moshavim, 18% are populated by Western families; the rest are of Eastern origin. The efficiency of the village services was studied in a survey conducted by the extension service.¹¹ Thirty percent of the moshavim in the sector were

⁸ Developing moshavim are associated with the Jewish Agency, developed with the Ministry of Agriculture.

⁹ A detailed description of the data and sources appears in Haruvi (1980) and can be obtained from her.

¹⁰ Capital in the developing moshavim was estimated by the extension service; capital in the developed group was estimated by us. It may be that the procedures used to construct the two measures are not exactly identical.

¹¹ Extension officers graded the services as good, bad, or of intermediate quality. We took the "good" as being efficient.

TABLE	1	
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THE SAMPLE—AVERAGE VALUES

Moshavim in the sample	Developing	Developed	All
Number of moshavim	115	134	249
Number of farms per moshav	60	78	70
Value of output per farm (IL)	130,600	214,500	174,000
(US dollar)	(16,450)	(27,015)	(21,915)
Value added per farm (IL)	45,200	73,300	59,700
(US dollar)	(5,690)	(9,230)	(7,520)
Farm capital (IL)	292,700	267,200	278,900
(US dollar)	(36,805)	(33,652)	(35,125)
Share of cooperative farm enterprise ^a (%)			
In output	20	11	14
In value added	26	14	18
Cooperation—products marketed through the cooperative as percent of total value			
of output			
Family farms	65	72	69
The village	72	74	73
Structural characteristics (percent)			
Farm type—livestock	58	65	62
Ethnic origin—Western	18	76	49
Region-hilly	51	9	28
Moshavim with efficient village services	30	_	
Inequality (coefficient of variation of			
output in family farms, in percent)	88	_	_

^a The agricultural production enterprise run by the cooperative; in many cases, distant orchards or field crops. See text for description of other variables.

regarded as having efficient services. As a measure of inequality we propose to use the value of the coefficient of variation of output. This coefficient averaged 88% for the developing moshavim. (The data are not available to calculate the coefficient for the developed moshavim.)

Average flows of long- and short-term credit, indicators of financial activity, are reported in Table 2 for developing and developed moshavim. Governmentor Jewish Agency-subsidized credit is grouped under the heading of "directed finance." The rest is commercial credit.

6. STRUCTURAL ATTRIBUTES

Moshavim vary widely by social, ideological, and economic attributes, all of which affect cooperation. In the next section we present a simultaneousequations model of the joint determination of cooperation and capital intensity. Since the two variables are determined simultaneously, cooperation

TABLE	2
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	Directed finance ^b	Own finance ^c	Investment	Short-term finance
Developing moshavim				
Value (IL)	18,000	9,400	27,400	34,900
(U. S. dollar)	(2,267)	(1,184)	(3,451)	(4,395)
Share (percent)	66	34	100	(),
Developed moshavim				
Value (IL)	13,700	16,100	29,800	38.600
(U. S. dollar)	(1,725)	(2,028)	(3,753)	(4,861)
Share (percent)	46	54	100	

FINANCIAL FLOWS, 1976^a

^{*a*} Average per farm in the moshav.

^b Includes credit and subsidies by government and the Jewish Agency.

^c Including savings and short-run commercial (nonsubsidized) credit.

and the amount of capital are highly correlated; factors that affect one of the variables also affect the other. Moreover, the effect of most of the structural attributes was obscured in the simultaneous-equations analysis. The discussion in this section is therefore limited to ordinary least squares and the estimates are taken as measures of association.

Cooperation is a form of social behavior that is difficult to police. The power of the officers of the moshav to enforce cooperative action is limited. The legitimacy of sanctions is greatly affected by the standards and interests of the groups, which vary widely across the moshavim. Individual members can often be motivated to act privately. Hence the importance of the structural—social and economic—factors that enhance cooperation. We shall discuss a few of them.

Income. The higher the income of the member of the moshav, the higher the alternative cost of his time. In the sample, higher income is associated with higher levels of schooling and a higher degree of modernization (Sadan and Weintraub, 1980), factors which themselves affect the member's comprehension of the advantages of cooperation.

Product composition. Products differ in suitability for individual or cooperative marketing. In the long run farm structure and product composition may be affected by the willingness to cooperate; in the short run the causation goes from product composition to cooperation.

Income distribution. A homogeneous moshav is stronger socially. If, on the other hand, comparatively large income differences exist, coordination and compromises are harder to achieve. *Ethnic origin.* Moshavim with "European" settlers, who joined, in most cases, at their own initiative and were often ideologically motivated, can be expected to maintain stronger cooperation than communities populated by immigrants from Middle Eastern countries.

Efficiency of services. When the cooperative is run well, members are encouraged to use its services and to trust its officers.

Table 3 summarizes the association between structural attributes and the degree of cooperation. Availability of data limits the analysis to the sector of the developing moshavim. By regression 1, an increase of 1000 IL in the value of output per farm, a proxy for income, is associated with an increase of 0.135% in the share of cooperative marketing. The value of this parameter is somewhat lower in the other regressions. As hypothesized, inequality is associated with reduced cooperation in the estimates of Table 3, while efficiency in village services is associated with higher levels of cooperation. The coefficient of ethnic origin is insignificant, perhaps due to insufficient variation of this factor in the subsample. Region and farm type are correlated: the hilly moshavim tend to have more orchards (deciduous fruits, mostly), quite often run jointly due to distance from the village; and typically they do not have dairy enterprises. As the findings indicate, the variable "region" is stronger than our farm-type classification in explaining cooperation; with region included in the regression, the influence of farm type is insignificant. In the long run, farm type (product composition) may be affected by willingness to cooperate. In the short run, the chain of causation runs from farm type to cooperation. But to the extent that farm type is influenced by geographical considerations, it is an exogenous variable, which will not be affected by cooperation, even in the long run.

7. CAPITAL AND COOPERATION

Two factors affect the capital-labor ratio in the moshavim. The first is the general process of capital accumulation in the individual farms in reaction to increases in nonfarm income. Farmers either increase the amount of resources at their command or give up farming (Kislev and Peterson, 1982). It also often happens that exit from agriculture is incomplete, in which case the share of part-time farming increases.

The second factor is the process of mutual development of capital and cooperation. Cooperation improves credit and increases capital intensity. Higher capital-labor ratios increase income and the cost of self-service in marketing and procurements. It also increases the share of capital-intensive enterprises, the products of some of which are more conveniently marketed cooperatively.

However, despite past capital accumulation in agriculture, cooperation is not complete. Evidently structural attributes prevented complete cooperation.

TABL	E	3
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STRUCTURAL ATTRIBUTES AND COOPERATION, DEVELOPING MOSHAVIM

	Regression					
	1	2	3	4	5	
R^2	0.15	0.29	0.41	0.28	0.42	
1. Intercept	53.91	64.99	55.67	48.86	55 53	
•	(12.33)	(12.94)	(11.11)	(10.05)	(9.81)	
2. Output	0.135	0.13	0.073	0.121	0.076	
	(4.33)	(4.33)	(2.33)	(4.28)	(2.53)	
3. Inequality		-14.35	-6.06		-5.83	
		(3.42)	(1.43)		(1.37)	
4. Village services-efficient		9.15	8.33		8.72	
		(2.19)	(2.15)		(2.22)	
5. Ethnic origin-Western		-3.46	-0.65		-0.98	
		(-0.73)	(-0.14)		(-0.23)	
6. Region-hilly			18.30		15.36	
			(4.06)		(3.00)	
7. Farm types						
Field crops				0.62	-1.46	
				(0.13)	(0.33)	
Orchards				16.37	3.53	
				(3.72)	(0.66)	

Notes. Observations are averages per farm in the moshav. Output and cooperation, for the moshav as a whole, include members' farms and the cooperative enterprise. Dependent variable: share of value of product marketed cooperatively (in percent). Independent variables: output—value of average output in the moshav ('000 IL); inequality—coefficient of variation of output in family farms in the moshav. Dummy variables: village services—1 = efficient, 0 = inefficient; ethnic origin—1 = Western, 0 = Eastern; region—1 = hilly, 0 = others; farm type—1 = field crops or orchards, 0 = livestock. The regressions are linear. t ratios are in parentheses.

Also, with better roads and communication, self-service in marketing and procurement may be more efficient. The effect of economic growth was thus both to increase and to decrease the incentive to cooperate. The crucial structural issue is the question of stability; namely, is the growth process of capital-cooperation stable or should we expect a complete breakdown of cooperation in the labor-intensive villages? In an attempt to examine this issue empirically we propose the following dynamic model. The model is restricted to conform with the available data—a single cross section.

Let us define

- q degree of cooperation (share of joint marketing, 0 < q < 1)
- K capital on the farm
- C long-term credit
- S short-term credit and saving
 - D depreciation of capital.

Since all variables are moshav-specific, the moshav index (or subscript) is omitted. Time differences are defined as $\Delta x_t = x_{t+1} - x_t$ for any variable x.

Cooperation is a function of capital and structural variables (in the intercept)

$$q_t = a + bK_t$$
 $a, b > 0.$ (13)

Long-term credit is a function of capital and cooperation

$$C_t = c + eq_t + fK_t$$
 $e, f > 0.$ (14)

Saving and short-term credit (a single variable in the data) are also functions of q and K:

$$S_t = h + gq_t + sK_t \qquad g > 0, \ 0 < s < 1.$$
(15)

Depreciation is a function of the capital stock:

 $D_t = dK_t \qquad 0 < d < 1.$ (16)

By construction,

$$K_{t+1} = K_t + C_t + S_t - D_t.$$
(17)

Equations (13)–(17) constitute the *dynamic model* of our analysis. Rewriting (17),

$$\Delta K_{t} = c + h + a(e + g) + K_{t}(b(e + g) + f + s - d)$$
(18)

from which one derives

$$K_{t+1} = K_t + \Delta K_t,$$

= $B + AK_t,$ (19)

where

$$A = 1 + b(e + g) + f + s - d;$$

 $B = c + h + a(e + g).$

From (19),

$$K_{t} = B\left(\frac{1-A^{t}}{1-A}\right) + A^{t}K_{0},$$

$$= \frac{B}{1-A} + A^{t}\left(K_{0} - \frac{B}{1-A}\right).$$
 (20)

In equilibrium, under the present assumptions, $\Delta K_t = 0$ and $K_{t+1} = K_t$; then, Eq. (19) can be rewritten as K = B/(1 - A). The possible equilibrium values of capital, \bar{K} , are

$$\bar{K} = \infty \qquad \text{for } A = 1$$

$$= \frac{B}{1-A} \qquad \text{for } 0 < \frac{B}{1-A}, A < 1$$

$$= 0 \qquad \text{if } \frac{B}{1-A} \leq 0.$$
(21)

The last line in (21) indicates that actual capital cannot be negative; calculated equilibrium values can be. The equilibrium value of capital is further limited by the fact that cooperation is a positive magnitude. The calculated equilibrium value of cooperation equals

$$\bar{q} = a + b\bar{K} \tag{22}$$

and since, from $0 \le q \le 1$, capital is constrained, $0 \le \overline{K} \le (1 - a)/b$. Substitute \overline{K} into (20):

$$K_t = \bar{K} + A^t (K_0 - \bar{K}),$$
 (23)

and

$$\Delta K_t = (A^{t+1} - A^t)(K_0 - \bar{K}).$$
(24)

$$A^{t+1} - A^t \ge 0 \qquad \text{if } A \ge 1, \tag{25}$$

which implies the following interpretation of (23) and (24). If 0 < A < 1, equilibrium is stable, K will converge in the long run to \bar{K} and cooperation to $\bar{q} = a + b\bar{K}$. The equilibrium is unstable if A > 1. Then, if $K_0 < \bar{K}$, capital will grow and cooperation will develop to completion. If, on the other hand, $K_0 < \bar{K}$, capital and cooperation will both continuously decline. It is also useful to note that

$$A \ge 1 \qquad \text{as } b(e+g) + f + s \ge d. \tag{26}$$

This means that if the rates of increase of saving and credit due to cooperation and capital intensity add up to more than the rate of depreciation, equilibrium is unstable and the solution diverges either to complete cooperation or to its breakdown.

8. ESTIMATES

Past capital accumulation and degree of cooperation can be taken as exogenous in determining credit availability. Therefore, Eqs. (14) and (15) of the dynamic model—the long- and short-term borrowing—are estimated by ordinary least squares. Equation (13) is estimated in a simultaneous-equations model to be detailed below. Data on depreciation of capital, Eq. (16), are not available; we have assumed that d = 0.15 for the calculations in the present section.

The model is estimated for each subsample separately and for the sample as a whole. The OLS estimates of Eqs. (14) and (15) are reported in Table 4. Cooperation affects positively finance in all the regressions reported in Table 4. The estimates of the coefficient of capital in regressions 1 and 2 are insignificant. This may be a reflection of the effect of the support of public agencies in the sector of the developing villages which comes mostly in the form of subsidized finance and is biased in favor of the weaker, relatively capital-poor moshavim. In comparison, the significant and strong effect of cooperation in these regressions may be interpreted to indicate that the better organized moshavim make better use of opportunities offered by the public agencies and by commercial financial institutions.

To incorporate simultaneity of size of capital and cooperation we suggest the following two-equation model (other variables will be added below):

$$q = a_1 + b_1 K + c_1 0_q + e, (27)$$

$$K = a_2 + b_2 q + c_2 0_k + u, (28)$$

in which the newly defined variables are 0_q , 0_k , c_1 , c_2 , vectors of exogenous variables; the corresponding coefficients e, u are error variables. The common exogenous variables in 0_q and 0_k are farm type and geographic location

TABLE 4

			Regre	ssion				
	Devel mosh	oping avim	Devel mosh	oped avim	Whole sample		Parameters	
	1	2	3	4	5	6	in mo	the odel
Dependent								
variable	С	S	С	S	С	S	С	S
R ²	0.14	0.04	0.16	0.19	0.12	0.20		
Intercept	-26.11	3.99	-1.15	7.37	-12.17	-6.02	С	h
	(-1.62)	(0.38)	(-0.15)	(1.02)	(-1.47)	(-1.03)		
Cooperation	0.64	0.22	0.20	0.13	0.37	0.12	е	g
	(3.20)	(1.69)	(2.22)	(1.52)	(3.77)	(1.71)		
Capital	0.008	-0.032	0.022	0.026	0.027	0.023	ſ	5
	(0.14)	(-0.96)	(4.23)	(5.30)	(3.37)	(4.03)		
Subsample (dummy,								
developed = 1)					-2.67	14.46		
,,					(-1.01)	(5.60)		

Notes. Dependent variables: C—long-term finance in IL per farm: S—short-term finance and farm savings in IL per farm. Independent variables: (1) Cooperation—share of product marketed cooperatively (%), (2) capital—net value of capital per farm in IL. Observations are for 1976, at the moshav level, for the village as a whole, including the cooperative enterprise. *t* ratios are in parentheses.

(region) of the moshav. Specific variables are ethnic origin, affecting only cooperation, and the age of the moshav (years from establishment) affecting, by assumption, only the amount of accumulated capital.

Equation (27) is the empirical formulation of the earlier Eq. (13) in which the exogenous variables were represented by the intercept *a*. Second-stage estimates of Eq. (27) are reported in Table 5. The coefficient of capital is significant in regressions 4 and 6. Estimates from these regressions are therefore utilized in the analysis that follows.

By Eqs. (21) and (24), the long-run behavior of the system depends on the magnitudes of the parameters A and B. As we have seen, if A > 1, the system is unstable; cooperation and capital in the moshav will tend to either grow to completion or decline to zero. The value of a that maintains A < 1 can be consistent with a stable long-run equilibrium of above zero but less than complete cooperation.

TABLE 5	
CAPITAL AND COOPERATION—EQUATION	(27)

			Regre	ession			
	Developing moshavim		Developed moshavim		Whole sample		Parameters
	1	2	3	4	5	6	in the model
<i>R</i> ²	0.36	0.37	0.08	0.11	0.20	0.22	
Intercept	97.90	74.37	59.37	56.19	51.59	47.73	а
	(0.08)	(3.16)	(9.17)	(10.16)	(8.68)	(10.84)	
Capital	-0.176	-0.077	0.009	0.025	0.011	0.026	b
	(-0.30)	(-0.84)	(0.44)	(2.08)	(0.61)	(2.36)	
Ethnic origin	1.19	0.72	6.83	4.74	5.66	3.80	
	(0.19)	(0.13)	(1.21)	(0.90)	(1.41)	(0.99)	
Farm type	13.41	10.77	8.56	8.72	8.62	8.54	
	(0.91)	(2.28)	(1.96)	(2.04)	(2.81)	(2.82)	
Region	34.11	27.63	14.49	17.29	20.52	20.28	
	(0.90)	(3.87)	(1.73)	(2.22)	(5.38)	(5.37)	
Subsample							
(dummy,					7.72	9.09	
developed = 1)					(1.94)	(2.39)	

Notes. Dependent variable—cooperation. Regressions are two-stage estimates of the model's Eq. (27). Estimates are for the whole sample. Qualitative variables are included as dummies: Ethnic origin—1 = Western, 0 = Eastern; Farm type—1 = livestock, 0 = others; Region—1 = hilly, 0 = other. Settlement movements are included as dummy variables in the first stage of the estimation procedure in regressions 2, 4, and 6.

The calculated equilibrium values of capital, \bar{K} , and cooperation, \bar{q} , are reported in Table 6 for several cases. The values are calculated utilizing the estimated parameters of Table 4 and of regressions 2, 4, and 6 of Table 5. Examples of the calculations are explained in the notes to Table 6. The calculated values of A and its standard deviation are also reported in Table 6. In all cases 0 < A < 1, indicating stable equilibrium.

According to Table 6, the long-run equilibrium value for cooperation in developing moshavim (by regression 2 of Table 5), of Eastern origin, nonlivestock farms and nonhilly regions, is 0.61. That is, in the average moshav of these characteristics, 61% of the farm product will be marketed cooperatively. In the same line, in Table 6, a developing moshav of Western origin, with livestock-type farms and located in the hilly regions will typically market cooperatively 91% of the farm output. Cooperation will be, by our calculation, much higher in the last case, mostly because of the exogenous conditions encouraging it—region and farm type.

9. SUMMARY

Cooperation has many economic advantages and the principles of the moshav fit well the prevailing ideas on the desired land-tenure system and sectoral structure of agriculture in Israel. However, a deteriorating cooperative can be extremely costly to its members. If farmers gradually cease to market through the cooperative, yet attempt, as long as they can, to rely on its service facilities and credit, the cooperative will sink into debt. Since the cooperative is run separately from the individual farm, information is seldom complete and members rarely realize the full severity of the economic difficulty their moshav may face. If, as a result of these difficulties the cooperative will have to be dissolved, members will find themselves shouldering their shares in a debt much exceeding the size they anticipated or their ability to pay from their farm income.

TABLE 6A

	A	σ(A)
Developing moshavim		
Regression 2	0.760	0.054
Regression 6	0.912	0.011
Developed moshavim		
Regression 4	0.906	0.034
Regression 6	0.912	0.011

TABLE	6B
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EQUILIBRIUM VALUES OF CAPITAL AND COOPERATION

	1	2	3	4	5	6
Ethnic origin						
(Western)	No	Yes	Yes	No	Yes	Yes
Farm type (livestock)	No	No	Yes	No	No	Yes
Region (hilly)	No	No	No	Yes	Yes	Yes
Developing moshavim (regression 2)						
Ŕ	174.32	176.90	224.95	273.33	275.84	323.96
ā	0.61	0.61	0.71	0.81	0.81	0.91
Developing moshavim (regression 6)						
ĸ	59.05	80.21	127.77	171.97	193.13	240.69
ą	0.40	0.54	0.63	0.72	0.77	0.87
Developed moshavim (regression 4)						
Ŕ	263.42	280.06	310.63	324.12	340.76	371.83
ą	0.63	0.68	0.77	0.82	0.87	0.96
Developed moshavim (regression 6)						
Ŕ	243.64	264.80	312.36	356.58	377.73	425.28
$ar{q}$	0.63	0.68	0.77	0.86	0.91	1.00

Notes. Equilibrium value of capital is calculated as $\overline{k} = B/(1 - A)$, as in Eq. (21). Cooperation is calculated by (22): $\overline{c} = a + b\overline{k}$. The parameters A and B are calculated according to Eq. (19) where the parameters are the estimated values reported in Table 4 and in the indicated regressions of Table 5. Two examples of this calculation are given:

(1) The first value of \overline{k} in column 1 is calculated as

A = 0.760 = 1 - 0.077(0.64 + 0.22) + 0.008 - 0.032 - 0.15;B = 41.838 = -26.11 + 3.99 + 74.37(0.64 + 0.22);

 $\bar{K} = 174.32 = 41.838/(1 - 0.760).$

(2) In the first value of column 2, the estimate of the dummy for the Western ethnic origin in regression 2 in Table 5 is added to the intercept, the parameter a. Accordingly,

B = 42.457 = -26.11 + 3.99 + (74.37 + 0.72)(0.64 + 0.22);

 $\bar{K} = 176.90 = 42.457/(1 - 0.760).$ Similarly for other values.

The dangers of economic entanglements call for close monitoring of the operation of the moshav, both by its own officers and members and by its creditors and public mentors. Effective monitoring is based on thorough understanding of the monitored system. The finding that partial cooperation can be stable can assist in evaluating the economic situation of a moshav. Needless to say, even if our study contributed to better understanding of the functioning of the moshav, we are still far from complete identification of the social and economic determinants of cooperation and its success.

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