THE LIMITS OF EQUALITY: INSIGHTS FROM THE ISRAELI KIBBUTZ[*]

Ran Abramitzky

What limits the capacity of society to redistribute? What determines the structure of compensation in organizations striving for income equality? This paper addresses these questions by investigating the economic and sociological forces underlying the persistence of the Israeli kibbutzim, communities based on the principle of income equality. To do this, I exploit newly assembled data on kibbutzim and a financial crisis in the late 1980s that affected them differentially. The main findings are that (1) productive individuals are the most likely to exit and a kibbutz's wealth serves as a lock-in device that increases the value of staying; (2) higher wealth reduces exit and supports a high degree of income equality; and (3) ideology facilitates income equality. Using a simple model, I show that these findings are consistent with a view of the kibbutz as providing optimal insurance when members have the option of leaving. More generally, these findings contribute to an understanding of how mobility limits redistribution, and to an understanding of the determinants of the sharing rule in other types of organizations, such as professional partnerships, cooperatives, and labor-managed firms.

I. Introduction

Throughout history, societies and organizations have engaged in redistribution. What limits the capacity of society to redistribute and provide insurance? What determines the structure of compensation in organizations aiming at income equality? According to standard economic theory, equal compensation schemes provide insurance, but are likely to unravel because of moral hazard and adverse selection. This trade-off between redistribution and incentives is central to public finance, welfare economics, insurance schemes, and organizational design. Nevertheless, empirically investigating it is challenging.

The main challenge to studying the trade-off between redistribution and incentives is that it requires detailed data at both the organization level, notably the degree of redistribution, and the individual level, notably the quality of individuals selecting into redistributive schemes. This paper addresses this challenge by assembling such data and using them to study the determinants of redistribution.

Specifically, this paper investigates the economic and sociological forces underlying the persistence of the Israeli kibbutzim (plural of kibbutz). Kibbutzim are voluntary communities that have provided their members with a high degree of income equality for almost a century. As such, their persistence has generated a great deal of interest among scholars and the popular press. Traditionally, all kibbutzim were based on equal sharing; each member of a kibbutz received an equal share of the total income regardless of her ability and effort. Recently, kibbutzim shifted asymmetrically away from equal sharing, allowing a test of the forces behind this shift.

This paper provides a case study of how voluntary participation (particularly the option of exit) limits redistribution. I build a model of a kibbutz that captures the trade-off between insurance (income equality) and incentives to stay. The model highlights the role of common ownership of assets (wealth) that cannot be taken upon exit in retaining productive individuals and facilitating redistribution. In the first period, *ex ante* identical individuals make a sunk contribution and set the degree of equality. In the second period, each individual learns whether she has high or low productivity, and decides whether to exit. The equilibrium level of equality is determined endogenously and reflects the trade-off between insurance and participation of productive individuals. High equality improves insurance, but productive individuals are more likely to exit and earn a wage premium outside. Low equality reduces insurance but retains high-ability individuals. Higher wealth lessens the trade-off between insurance and incentives to stay by acting as a cost of exit.

The model yields three main testable predictions related to exit and redistribution. First, under equal sharing, higher wealth leads to less exit. Second, the propensity to leave is a function of productivity. Specifically, the most productive individuals have the highest propensity to exit. Third, the degree of equality is a function of the kibbutz's wealth. Specifically, the higher the wealth,

the higher the degree of equality. A simple extension of the model suggests that the degree of equality increases with the level of socialist ideology of members.

I test the model's predictions using a census panel data set of individuals exiting kibbutzim between 1983 and 1995, and a data set that provides kibbutz-level information including measures of equality, wealth, group size, ideology, and ideological decline. These data sets provide the most systematic data on kibbutzim to date.

Events of the late 1980s provide the variation needed to identify the effect of wealth on the degree of equality. Following a dramatic government anti-inflation program, different kibbutzim unexpectedly found themselves with different wealth positions.

The empirical analysis supports the model's predictions that higher wealth leads to a higher degree of equality and to lower exit rates, and that productive individuals are more likely to exit. Specifically, I find that (1) wealthier kibbutzim maintained a higher degree of equality; (2) when kibbutzim were all based on equal sharing, higher wealth led to lower exit rates; and (3) individuals who left in the equal-sharing period were more educated and skilled than the stayers.

The other empirical results relate the degree of equality to ideology and to group size. Specifically, I find that (1) kibbutzim whose members have a stronger socialist ideology, as proxied by the percentage of members voting for socialist parties and by kibbutzim's movement affiliation, maintained a higher degree of equality; (2) kibbutzim that experienced milder declines in socialist ideology after the 1980s maintained a higher degree of equality; and (3) group size does not affect the degree of equality. The first two findings are consistent with a sociological conjecture that the more ideological kibbutzim, or those whose ideology level remained stronger, would be more likely to maintain equal sharing. The third finding suggests that group size does not undermine the norms that determine the degree of equality, suggesting that the free-rider problem may play a lesser role in profit sharing than previously thought.[1]

At a broader level, my paper provides empirical support for the literature suggesting that labor mobility (migration) limits

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1. For example, the seminal paper by Alchian and Demsetz (1972) suggests that profit sharing is more appropriate for small teams.

the ability of local governments (individual jurisdictions, states, or provinces) to redistribute.[2] This paper also contributes to the analysis of revenue sharing in other organizations, such as professional partnerships, cooperatives, and labor-managed firms. Despite a rich theoretical literature, only a few empirical studies have investigated these organizational forms.[3] Moreover, in part because of lack of data, the empirical literature focuses on the effects of revenue sharing, but abstracts from its determinants.[4]

This paper proceeds as follows. Section II provides the theoretical framework and relevant historical background. I build a simple model for highlighting the constraints of exit (voluntary participation) on redistribution, and show that the model describes kibbutzim well. As mentioned earlier, the model's main predictions are that wealthier kibbutzim maintain a higher degree of equality, that higher wealth leads to less exit, and that the most productive individuals are more likely to exit. Section III describes the kibbutz and individual-level data as well as the main identifying variation in kibbutzim wealth. Section IV uses the kibbutz-level data to show that the degree of equality is increasing in wealth, increasing in the level of socialist ideology, and is not negatively correlated with group size. Section V uses the kibbutz-level data to show that, under equal sharing, exit rates are decreasing in wealth. Section VI uses the individual-level data to show that, under equal sharing, high-productivity individuals are more likely to exit. Section VII discusses how kibbutzim have mitigated moral hazard by using social sanctions and prohibitions, and suggests that kibbutzim share many characteristics of clubs. Section VIII concludes and discusses how the paper's insights can be generalized.

II. THEORETICAL FRAMEWORK AND BACKGROUND

I provide a simple stylized framework for highlighting the constraints of exit (voluntary participation) on redistribution.

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2. For example, Epple and Romer (1991), Feldstein and Wrobel (1998), and Cremer and Pestieau (2004).

3. Theoretical contributions include Ward (1958), Farrell and Scotchmer (1988), Kandel and Lazear (1992), Kremer (1997), Garicano and Santos (2004), and Levin and Tadelis (2005).

4. The studies by Craig and Pencavel (1992), Lang and Gordon (1995), and Gaynor and Gertler (1995) focus on the effect of revenue sharing on productivity; Pencavel and Craig (1994) focus on a cooperative's response to shocks compared with conventional firms; Lamoreaux (1995) studies the choice between partnerships and other forms of organization in early nineteenth-century American business; Garicano and Hubbard (forthcoming 2008) is a study of law firms' field boundaries.

Specifically, I model a kibbutz as an insurance device, trading off equality and participation of productive individuals. Intuitively, consider a group of individuals where information about each individual's productivity is revealed symmetrically over time.[5] A contract that guarantees full insurance against low productivity has to provide equal consumption levels to high-productivity and low-productivity individuals. If individuals have outside options, then these consumption levels should be at least as high as the outside option of high-productivity individuals. Otherwise, high-productivity individuals will exit. However, providing this consumption level requires a higher level of production than is produced by the group—that is, this consumption level does not satisfy the budget constraint. To restore a balanced budget, assume that before productivity is realized, each individual makes a sunk contribution that cannot be recovered upon exit. In the context of kibbutzim, common ownership of assets increases the cost of exit and facilitates insurance. However, not all kibbutzim provide full insurance, suggesting that the common wealth is not always high enough to support it. The comparative static of common wealth on the degree of insurance provides the main testable implication of the model.

While the model highlights insurance as a motive for redistribution, other rationales for redistribution can be integrated naturally into this conceptual framework. Redistribution is desirable because of the concavity of the objective function. The objective functions of kibbutzim could be concave because of insurance motives, or because of preferences for equality, such as a taste for redistribution, or some degree of altruism. The key insight of the model and the key comparative static would hold for many rationales for redistribution. Specifically, regardless of the reason for the concavity of kibbutzim's objective functions, participation limits redistribution and common wealth facilitates a high degree of equality.

Moreover, ideology can relax the *ex post* participation constraint by increasing the value of staying in the kibbutz. I introduce ideology into the model and allow it to vary across kibbutzim. This adds a comparative static—the higher the level of ideology, the higher the degree of equality. Note that interpreting ideology as a direct preference for equality would yield the same comparative static.

5. The model is similar to the model by Hendel and Lizzeri (2003) (which describes the life insurance market), which was built on Harris and Holmstrom (1982) (in the context of the labor market).

II.A. Ideology and Insurance as Motives for Redistribution

Israeli kibbutzim are unique experiments in voluntary communal living and socialism. Until recently, the key principle of kibbutzim was equal sharing, which meant that the income of all members and the profits from all operations of an individual were pooled and distributed equally.[6] In this section, I discuss the role of socialist ideology and insurance as motives for redistribution in kibbutzim.

Socialist ideology was an important and explicit motive for redistribution. The founders of kibbutzim had a taste for redistribution—they were socialist idealists committed to equality. They rejected capitalism and wanted to create an egalitarian society based on the Marxist principle "from each according to ability, to each according to his needs." The founders of kibbutzim mostly came to Israel in what are called the second and third waves of immigration (*Aliya*) between 1904–1914 and 1919–1923, respectively. The second *Aliya*, which brought about 40,000 immigrants from Russia and Poland, was triggered by pogroms such as the Kishinev pogrom and other outbreaks of anti-Semitism. Among those who came in the second *Aliya* were young *Halutzim* (pioneers) who established the first kibbutzim based on a synthesis of global socialism and nationalist Zionism. The third *Aliya* (1919–1923) was, in part, a continuation of the second *Aliya* that had been interrupted by the war. About 40,000 immigrants came from the Russian empire. This migration followed a combination of push factors, such as the war, pogroms, and the Russian revolution, and such pull factors as the hope to establish a home for the Jewish people within Palestine, which was to be created through a British mandate in Palestine and the Balfour declaration, stating the support of the British government in the Zionist plan. Many immigrants were ideological *Halutzim* with agricultural training who were instrumental to the development of kibbutzim. Although ideology has declined, with each generation becoming less ideological than its predecessor, some degree of ideology has always played a role in kibbutzim.

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6. In practice, kibbutzim used a few distribution techniques that ensured equality, took into account heterogeneity in needs and preferences, and were within the kibbutz budget constraint (Barkai 1977). Some goods, such as food (in the communal dining hall), medical care, retirement benefits, child rearing, and education, were distributed directly for free. Children were housed in separate living quarters until the 1970s and were offered fourteen years of education at the kibbutz's expense. Other commodities, especially durable ones, were at first directly allocated to members and later (by the end of the 1920s) were divided into categories (e.g., clothing) within which a member could choose his preferred bundle.

Insurance motives also were important in kibbutzim. Mutual aid among members within a kibbutz and across kibbutzim were fundamental principles.[7] Kibbutz members knew that whatever their circumstances might be, and whatever their ability and income, they (and their families) would always be provided with an average income and be taken care of when necessary. Founders of kibbutzim faced income shocks and needed insurance, but insurance markets were underdeveloped. In early days, the newcomers often became sick with malaria, and "as much as half of the work force could be idle because of illness on a given day" (Near 1992). Itzhak Tabenkin, an early leader in the kibbutz movement, commented that "in the conquest of work in town and country, in the conquest of the soil, the need for the kvutza [kibbutz] always appeared; for we were alone and powerless, divorced from our parents and our environment, and face to face with the difficulty of life—the search for employment, illness, and so forth."

Because an average kibbutz consists of about 400 members with different occupations and abilities, working in different industries, equal sharing provides members and their families with valuable insurance against productivity shocks. Such productivity shocks could result from illness, unemployment, disability, and occupation-specific demand shocks. Even as insurance markets developed, equal sharing provided kibbutz members with potentially valuable insurance against shocks to their human capital— that was limited outside kibbutzim, and only available in the form of life insurance and disability insurance. Indeed, the language used by kibbutzim to define their new status illustrates the importance of insurance. Kibbutzim that maintain equal sharing are called *shitufim* (Hebrew for "full sharing")—even ones that have shifted away from equal sharing are called *reshet-bitachon* (Hebrew for "safety net"), emphasizing that even a widely reformed kibbutz provides substantial insurance.

The importance of ideology and insurance in the early days is evident in a survey conducted in the late 1960s covering over a thousand members of the first and second generations (Rosner et al. 1990). The most important objective listed by kibbutz members was the "establishment of a just society," including both ideological and insurance elements. Other factors with insurance elements

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7. In their bylaws these organizations committed to "provide the economic, social, cultural, educational and personal needs of members and their dependents . . . [and] to ensure a decent standard of living for kibbutz members and their dependents," as well as to "have mutual aid with other kibbutzim and rural villages."

also were ranked as important objectives of members, specifically, factors "guaranteeing full social security," "freedom from economic concern and competition," and "guaranteeing an adequate standard of living." Some ideological objectives listed as important were "collectivity and equality," "developing a model socialist society," and "fostering fellowship among members."

A recent survey of public opinion conducted by the Institute for Research of the Kibbutz (Palgi and Sharir 2001) asks a sample of 900 kibbutz members about their level of satisfaction with various aspects of their lives in the kibbutz. The survey includes a question on whether the various principles of kibbutzim are useful or harmful for the future of kibbutzim. The vast majority of respondents view the mutual guarantee and common ownership of the means of production as crucial elements for the future of kibbutzim. Most members, however, believe that some assets should be held privately by members rather than commonly.

II.B. Sunk Contribution and Voluntary Participation

Key features are that all assets belong to the kibbutz and members have no private property. A kibbutz member does not even own his house and can enjoy his share of the assets only as long as he stays in the commune. The bylaws suggest that

> each kibbutz member must live inside the kibbutz, bring to the possession of the kibbutz his full working power and any income and assets he owns and/or receives from any source, and the kibbutz determines the member's job and takes care of all his needs including the needs of his dependents.[8]

Consistent with this principle is the provision of many local public goods such as swimming pools, green public areas, tennis courts, and cultural centers, which can be enjoyed only inside the kibbutz.

Another key feature is voluntary participation. That is, members can exit at will and earn a wage premium for their ability outside the kibbutz (but they cannot take their share in the kibbutz upon exit).[9] Moreover, kibbutz-born individuals are, by and

8. Furthermore, the bylaws state that "the property of the kibbutz cannot be distributed among members, both when the kibbutz persists and when it is dissolved," and that "the kibbutz does not distribute profits in any way, and every surplus goes to the kibbutz." Kibbutz members are not allowed to sell any of the assets they use, and the kibbutz can seize members' property.

9. This voluntary aspect makes kibbutzim different than institutions such as the Russian Kolkoz, which did not have to take participation constraint into account. Moreover, the fact that, unlike many other communes in history, kibbutz members have never been at the margin of society and have always both influenced

large, entitled to stay. Kibbutz-born individuals who are young also can be thought of as the same *ex ante*. As they learn their productivity, they decide whether to leave. Members who exit are entitled to only a small "exit payment." Still, exit is costly because members cannot take their share in the kibbutz (or their parents' share) or the local public goods upon exit. Indeed, the data suggest that very few members leave after age 45 (see Figure I).

Entry to kibbutzim from the outside is highly restricted as they are well aware of their attractiveness to low-ability individuals. In the past three decades their main source of population growth has been internal, that is, kibbutz-born individuals who decide to stay. In the early days, adverse selection in entry was less severe. Kibbutzim were founded by individuals who were young and similar in their expected productivity. The literature emphasizes that one of the "main characteristic of the kibbutzim (at the outset) was homogeneity. These organizations were established by young unattached individuals who shared a comparatively long period of social, ideological, and vocational training" (Talmon 1972, p. 2). Other sources of entry prevalent before the 1970s were youth movements from Israel and abroad, and the army, through service in units called Nahal. Those typically consisted of individuals who were young and similar in their expected productivity (*ex ante* homogenous).

II.C. The Rise and Fall of Kibbutz Population and Equal Sharing

The kibbutz movement was instrumental in the creation of the state of Israel and the implementation of its Zionist goals, and since then has played a central role in Israeli society. A disproportionate number of kibbutz-born individuals can be found among Israeli political and intellectual leaders.

The first kibbutz (named Degania) was established in 1910, but most kibbutzim were established in the 1930s and 1940s, shortly before the creation of the State of Israel in 1948. In 1995, there were 268 kibbutzim located all over Israel with 120,000 members, or 2.6% of the Jewish population. Kibbutzim vary in size from fewer than a hundred to over a thousand. The majority of kibbutzim have between 200 and 600 members.

and been influenced by it makes the participation constraint an important consideration in kibbutzim.
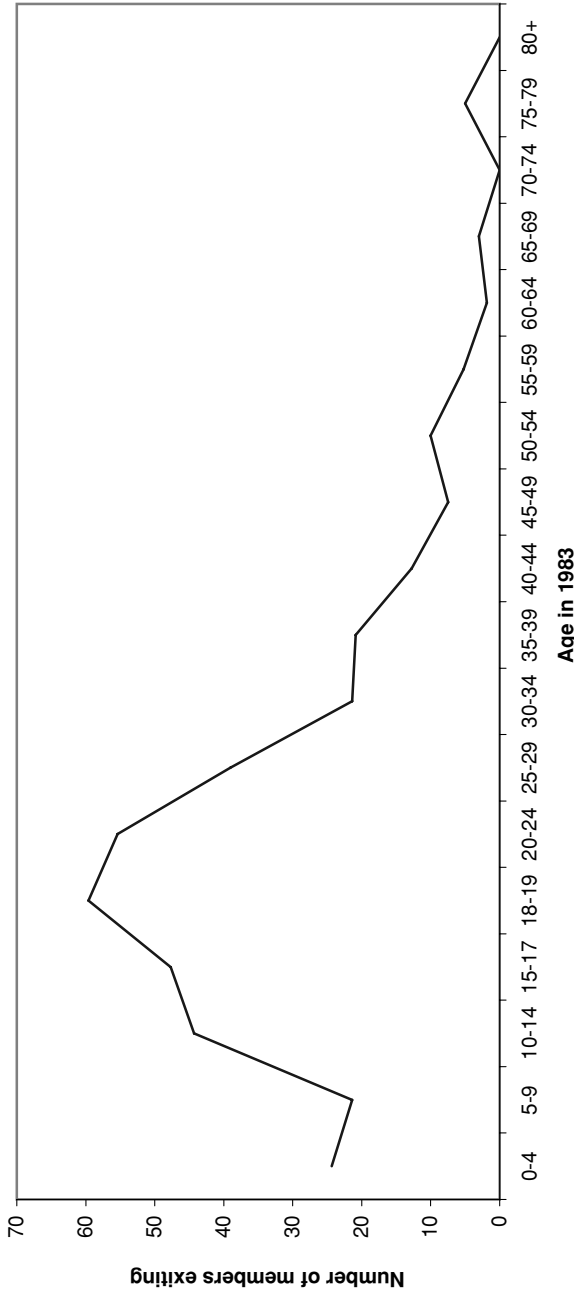
FIGURE I

Exit from Kibbutzim by Age, 1983–1995

Notes: The number of members exiting between 1983 and 1995 (Y) by age in 1983 (X). For example, sixty individuals who, in 1983, were ages 18–19 and lived in a kibbutz, lived outside the kibbutz in 1995. The data source is the linked censuses of population 1983–1995. The data are a 4% representative sample of the population.

TABLE I
Kibbutzim Population, 1910–1999

			Kibbutz population as % of:		
Year	Number of kibbutzim	Kibbutz population	Rural Jewish population	Jewish population	Israeli population
1910	1				
1920	12	805			
1930	29	3,877			
1940	82	26,554			
1950	214	66,708			
1952		69,089	20.9	4.7	4.2
1960	229	77,955			
1961	228	77,153	25.9	3.8	3.5
1970	229	85,100			
1972	227	89,700	33.9	3.3	2.8
1980	255	111,200			
1983	267	115,500	35.1	3.4	2.8
1987	268	127,000			
1990	270	125,100			
1994	269	124,600	29.4	2.9	2.3
2000	268	115,300	25.1	2.3	1.8

Source: Pavin (2001).

Initially, kibbutzim were primarily communal farms, but they later shifted to industrial production. The standard of living in kibbutzim was considered higher than the country's average (Barkai 1977), and virtually all kibbutzim were based on equal sharing. Before the late 1980s, exit rates were relatively low, but since then have increased sharply. Specifically, Table I shows that, overall, membership in kibbutzim grew continuously throughout the century until the late 1980s, but has shrunk since then.[10] As shown later, over 20% of members left their kibbutz between 1983 and 1995.

The rise in exit rates followed a substantial decline in living standards in many kibbutzim following a financial crisis (described in Section III.C). Subsequently, many kibbutzim shifted away from equal sharing by introducing various degrees of reform. The reforms range from small deviations from equal sharing to substantial reforms that essentially transformed those kibbutzim into capitalist neighborhoods.

10. The source for this table is Pavin (2001).

II.D. Model

Consider an endowment economy with a single consumption good c and a unit-mass continuum of *ex ante* identical agents. Agents' utility $u(c)$ is strictly increasing and strictly concave. Each agent has K units of physical assets (wealth) and one unit of human capital. Information about the productivity level (human capital) is revealed over time. With equal probabilities, each agent can become either a high-productivity type with an income of θ_H or a low-productivity type with an income of θ_L, where $\theta_H > \theta_L$.[11]

At $t = 0$, the planner (kibbutz) offers a contract (c_L^*, c_H^*), which is a mapping from (θ_L, θ_H) to consumption. Before knowing their types, agents decide whether to accept the contract, in which case they contribute their K units of wealth to the planner. Agents' expected utility from accepting the contract (contributing their physical assets and joining the kibbutz) is $\frac{1}{2}u(c_H) + \frac{1}{2}u(c_L)$. Agents' expected utility if they reject the contract (do not join the kibbutz) is $\frac{1}{2}u(\theta_H + K) + \frac{1}{2}u(\theta_L + K)$.

At $t = 1$, each agent's type is revealed. Agents then can stay and have a utility of $u(c_H)$ if they are high-productivity types and $u(c_L)$ if they are low-productivity types, or exit, in which case they take their human capital with them but forgo their wealth (now the planner's wealth) of K units. Thus, agents who leave enjoy $u(\theta_H)$ if they are high-productivity types and $u(\theta_L)$ if they are low-productivity types.

The planner is subject to a budget constraint (BC), $\frac{1}{2}c_H + \frac{1}{2}c_L \leq \frac{1}{2}\theta_H + \frac{1}{2}\theta_L + K$; that is, he cannot provide members with more than the sum of their income and assets. The planner is also subject to an *ex ante* participation constraint (*ex ante* PC), $\frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \geq \frac{1}{2}u(\theta_H + K) + \frac{1}{2}u(\theta_L + K)$ and to *ex post* participation constraints (*ex post* PCs), $u(c_H) \geq u(\theta_H)$ and $u(c_L) \geq u(\theta_L)$; that is, agents will only accept the contract if it provides them at least their expected outside option.[12]

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11. A model that accounts for the possibility of residual uncertainty, whereby individuals get imperfect signals on their productivity, is available from the author.

12. The model simplifies in that there is only one point in time when agents can choose whether to exit, but in the data, movers tend to be young adults and few leave after age 45. One way of capturing why exit is less likely to occur in old age is to extend the model from two periods to three periods. Assume that older individuals (i.e., in the third period) have made higher sunk contributions K in that they have had to contribute their incomes to the kibbutz and to forgo private savings for a longer period of time. Similarly, older individuals are likely to value their inside option more, since it is more difficult to get a job and to start over in old age. Thus, the participation constraints of older individuals will not be binding

The planner's problem is therefore to choose a contract (c_L, c_H) that maximizes the members' expected utilities, subject to the budget constraint and participation constraints. Formally, the planner solves

$$\max_{c_L, c_H} \frac{1}{2}u(c_H) + \frac{1}{2}u(c_L)$$

subject to:

$$\text{BC:} \quad \frac{1}{2}c_H + \frac{1}{2}c_L \leq \frac{1}{2}\theta_H + \frac{1}{2}\theta_L + K$$

$$\textit{ex ante} \text{ PC:} \quad \frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \geq \frac{1}{2}u(\theta_H + K) + \frac{1}{2}u(\theta_L + K)$$

$$\textit{ex post} \text{ PCs:} \quad u(c_H) \geq u(\theta_H) \text{ and } u(c_L) \geq u(\theta_L).$$

A few properties of the solution are worth noting. First, the budget constraint binds, since kibbutzim would like to spend all the resources available to them.[13] Second, the *ex ante* participation constraint is not binding. Note that the model captures the original founders of kibbutzim who gave up their private property. Kibbutz-born individuals, however, have no private property themselves because their parents' assets belong to the kibbutz. Their *ex ante* PC will be $\frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \geq \frac{1}{2}u(\theta_H) + \frac{1}{2}u(\theta_L)$ and it will also not be binding. The model's predictions thus will be the same for individuals born in kibbutzim. Third, in the absence of participation constraints, the optimal contract satisfies equal sharing $(c_H^* = c_L^*)$ because the objective function is concave.[14] With participation constraints, the high-productivity type has a higher propensity to reject the contract and receive his marginal productivity θ_H. The optimal contract thus reflects this propensity.

The equilibrium degree of equality is captured by $c_H^* - c_L^*$, the difference between the consumption allocated to the high-productivity type and the consumption allocated to the low-productivity type. Higher wealth (K) relaxes the *ex post* participation constraint of high-productivity types and enables a higher degree of equality. This is stated formally in Proposition 1.

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when those of younger individuals are, and older individuals will stay in their kibbutzim (assuming that contracts do not depend on age).

13. Formally, suppose BC is not binding and that c_H^*, c_L^* are the equilibrium contracts. Then, the kibbutz can increase c_H and c_L and still satisfy BC and PCs, which increases the objective function. Such an increase implies that c_H^*, c_L^* are not optimal, which is a contradiction.

14. Specifically, the optimal contract satisfies $c_H^* = c_L^* = E[\theta] + K = (\theta_L + \theta_H)/2 + K$. This is a straightforward implication of the facts that the budget constraint is binding and the planner's objective function is concave.

PROPOSITION 1. The degree of equality is weakly increasing in wealth (K).

Proof. There are two cases. If $K \geq (\theta_H - \theta_L)/2$, then $c_H^* = c_L^* = E[\theta] + K = (\theta_L + \theta_H)/2 + K$ and the participation constraints do not bind. If $K < (\theta_H - \theta_L)/2$, then the degree of equality increases ($c_H^* - c_L^*$ decreases) with K and satisfies $c_H^* = \theta_H$ and $c_L^* = \theta_L + 2K$. To see this, note that the *ex post* participation constraints imply that $c_H \geq \theta_H$ and $c_L \geq \theta_L$. The BC implies that $c_L + c_H = \theta_L + \theta_H + 2K$. The condition $K < (\theta_H - \theta_L)/2$ or $\theta_L + 2K < \theta_H$, together with BC and *ex post* participation constraints, suggests that every $c_H^* \neq \theta_H$ and $c_L^* \neq \theta_L + 2K$ has to be a mean-preserving spread of the allocation $c_H^* = \theta_H$ and $c_L^* = \theta_L + 2K$. Since $u(c)$ is a strictly concave function, a mean-preserving spread reduces the objective function.   ∎

The contracts described so far are contingent on productivity. However, contracts that are not contingent on productivity (i.e., equal sharing $c_H^* = c_L^*$) were practiced in all kibbutzim for a long time. It is thus important for the empirical analysis to characterize these contracts. I show that non-contingent equilibrium contracts exist and feature exit of high-productivity types if the planner's wealth is below a certain threshold. To see this, note that the noncontingent contract $c_H = c_L = \theta_L + 2K$ is allocationally equivalent to the optimal contingent contract described above. When $K > (\theta_H - \theta_L)/2$, both contracts are noncontingent as $c_H^* = c_L^* = (\theta_L + \theta_H)/2 + K$, and there is no exit. When $K < (\theta_H - \theta_L)/2$, then the noncontingent contract $c_H = c_L = \theta_L + 2K$ is allocationally equivalent to the contingent optimal contract $c_H^* = \theta_H$ and $c_L^* = \theta_L + 2K$. The low-productivity type in both cases gets $c_L = \theta_L + 2K$. The high-productivity type will exit under the noncontingent contract and will get her outside option $c_H = \theta_H$, which is equivalent to what she gets under the contingent contract. Note that BC in the noncontingent case becomes $c_L \leq \theta_L + 2K$, and so it is satisfied. The objective function $\frac{1}{2}u(c_H) + \frac{1}{2}u(c_L)$ is identical in both cases.[15] This is stated formally in Proposition 2.

PROPOSITION 2. There exists an equilibrium noncontingent (equal sharing $c_H^* = c_L^*$) contract that is allocationally equivalent to

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15. When $K < (\theta_H - \theta_L)/2$, contingent contracts without exit may be preferred over noncontingent contracts with exit when dynamic considerations are introduced. For example, if high-ability individuals are disproportionally likely to have high-ability children, kibbutzim will prefer that high-ability individuals will stay. Indeed, the empirical analysis suggests that kibbutzim eventually introduced contingent contracts after facing a shock to their wealth.

the equilibrium contingent contract. Under this noncontingent contract: (a) if the planner's wealth K is below a threshold level $\overline{K}$, high-productivity individuals θ_H will exit and low-productivity individuals θ_L will stay, and (b) if $K > \overline{K}$, both high-productivity θ_H and low-productivity individuals θ_L will stay.

Proof. This proof is based on Hendel and Lizzeri (2003). When $K > (\theta_H - \theta_L)/2$, then $c_H^* = c_L^* = E[\theta] + K = (\theta_L + \theta_H)/2 + K$ and there is no exit. This is equivalent to the case described above in which the participation constraints do not bind. I need to prove that when $K < (\theta_H - \theta_L)/2$, the noncontingent contract is allocationally equivalent to the optimal contingent contract that satisfies $c_H^* = \theta_H$ and $c_L^* = \theta_L + 2K$. Consider the noncontingent contract $c_H^* = c_L^* = \theta_L + 2K$. Under this contract, high-productivity individuals will exit and get their outside option θ_H, since $\theta_H > \theta_L + 2K$. Low-productivity individuals will stay and get $c_L = \theta_L + 2K$ since $c_L = \theta_L + 2K > \theta_L$, which is their outside option. A noncontingent contract with exit of high-productivity individuals is thus allocationally equivalent to the optimal contract described in Proposition 1. Notice that the BC (which is $c_L \leq \theta_L + 2K$ under exit) is satisfied, the PCs are satisfied, and the objective function is maximized. ∎

Notice also that the noncontingent contract involves exit of high-productivity types when $K < (\theta_H - \theta_L)/2$, but no exit when $K > (\theta_H - \theta_L)/2$. That is, under an equal-sharing contract, higher wealth leads to less exit.

A simple extension of the model allows the introduction of ideology into the conceptual framework. Assume that individuals have ideologies that increase their value of staying in their kibbutz. They get utility from taking part in a community based on socialist values. Denote ideology by i (in units of consumption). Assume that ideology is identical for all members within a kibbutz, but it can vary across kibbutzim. The planner's problem becomes

$$\max_{c_L, c_H} \frac{1}{2}u(c_H + i) + \frac{1}{2}u(c_L + i)$$

subject to:

$$\text{BC:} \quad \frac{1}{2}c_H + \frac{1}{2}c_L \leq \frac{1}{2}\theta_H + \frac{1}{2}\theta_L + K$$

ex ante PC: $\dfrac{1}{2}u(c_H + i) + \dfrac{1}{2}u(c_L + i) \geq \dfrac{1}{2}u(\theta_H + K) + \dfrac{1}{2}u(\theta_L + K)$

ex post PCs: $u(c_H + i) \geq u(\theta_H)$ and $u(c_L + i) \geq u(\theta_L)$.

Then stronger ideology relaxes the *ex post* participation constraints and facilitates redistribution. This is stated formally in Proposition 3.

PROPOSITION 3. The degree of equality is weakly increasing in ideology (i).

Proof. To see this, note that the BC remains unchanged; the *ex ante* participation constraint still does not bind; and the *ex post* participation constraints imply that $c_H \geq \theta_H - i$ and $c_L \geq \theta_L - i$. There are two cases. If members' ideology in the kibbutz is above a threshold $i > (\theta_H - \theta_L)/2 - K$, then the equilibrium contract is equal sharing $c_H^* = c_L^* = (\theta_L + \theta_H)/2 + K$. If the ideology is below the threshold $i < (\theta_H - \theta_L)/2 - K$, then the degree of equality increases in ideology since $c_L^* = \theta_L + 2K + i$ and $c_H^* = \theta_H - i$. ∎

It is worth noting that in the presence of ideology i, the noncontingent contract described in Proposition 2 involves exit for fewer levels of planner's wealth K. That is, in the case of contracts that are not contingent on productivity (equal sharing), introducing ideology reduces the threshold level of the planner's wealth $\overline{K}$ above which both high-productivity θ_H and low-productivity individuals θ_L will stay. Thus, *ceteris paribus*, ideology reduces exit and facilitates redistribution.

Finally, although the model assumes that contracts are written *ex ante* (before individuals know their type), the same contracts are optimal when contracts are written *ex post* (after individuals learn their type) assuming the kibbutz owns wealth.[16] Specifically, the main comparative static that the kibbutz's wealth facilitates redistribution holds even if individuals know their types when the contracts are written (*ex post*). To see this, suppose that the kibbutz has $2K$ units of wealth and two members who already know their types are θ_H and θ_L. The kibbutz offers members the contracts c_H and c_L, respectively. The optimal redistribution level will be the highest possible that still retains the high-ability individual. That is, $c_H = \theta_H$ and $c_L = \theta_L + 2K$ if $K < (\theta_H - \theta_L)/2$ and $c_H = c_L = (\theta_L + \theta_H)/2 + K$ if $K \geq (\theta_H - \theta_L)/2$. These are the

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16. *Ex post* redistribution will also be optimal when voting is allowed for. Kremer (1997) considers an environment where members of cooperatives are subject to shocks to their abilities, and they can vote on a redistribution policy after their abilities are realized (*ex post*). He shows that if the median voter has less than average ability, members will vote for a redistribution schedule. Cooperative members with high abilities will be reluctant to leave even if the firm redistributes away from them, since upon exit they will have to give up the dividends on their capital contribution.

same contracts that are optimal *ex ante*. Note that the main comparative static holds, namely, the higher the kibbutz wealth, the higher the degree of equality. However, when contracts are from an *ex post* perspective and given the planner's objective function, noncontingent contracts seem less appealing because it does not seem plausible that the planner's objective function should include individuals who exit.

To summarize, the model yields the following predictions:

- Optimal contracts involve giving up assets (wealth) to the planner.
- The higher the wealth, the higher the degree of equality.
- Under equal sharing, high-productivity individuals are more likely to exit.
- Under equal sharing, higher wealth reduces exit.
- The stronger the ideology, the higher the degree of equality.

III. DATA AND IDENTIFICATION

III.A. Kibbutz-Level Data

The data set contains information on 188 kibbutzim (over 70% of all kibbutzim) and was assembled from numerous sources, including demographic and economic data from kibbutz archives and institutions, economic data from Dunn and Bradstreet (D&B, a credit rating company), information on the degree of equality, collected by the Institute for Kibbutz Research in Haifa (Israel), and censuses and voting data from Israel's Central Bureau of Statistics. Kibbutzim that were excluded either have not yet decided on their degree of equality (about 40 kibbutzim), or are religious kibbutzim (16 kibbutzim), which are different in their nature and about which there is insufficient quantitative information.

The data contain kibbutz-level information on the degree of income equality, six measures of wealth per member, four measures of socialist ideology, year established, and demographic information such as the group size (number of members), age distribution, and average household size.

Members' earnings go to their kibbutz and each member receives a budget according to the compensation scheme used. Some kibbutzim maintain equal sharing, whereby all members receive an equal budget. In other kibbutzim, the member's budget is partly shared equally and partly based on her earnings. Some

kibbutzim use a compensation scheme that is mostly based on equal sharing, while others use a scheme that is mostly based on pay for performance. The Institute for Kibbutz Research has classified kibbutzim into one of four categories ranked by their degree of income equality. I use two alternative definitions of the degree of equality. The first, ranging from a low of 1 to a high of 4, assigns a value of 1 to kibbutzim in the "safety net" category, 2 to kibbutzim in the "sharing with differential pay" category, 3 to the "sharing with differential pay only in the margin," and 4 to the "full sharing" category (see Appendix for definitions). My second alternative definition is a dummy variable that takes the value 1 if the kibbutz is based on equal sharing ("full sharing") and zero otherwise.

Because there is no single ideal measure of a kibbutz's wealth per member, I use several: the fixed capital per member as reflected in balance sheets; the assets per member; a credit rating (1–4) assigned by D&B; a credit rating (1–100) assigned in a later year; and the economic status as assigned by the government. I also create a weighted average variable of all of these measures using factor analysis. There is a single dominant factor, which builds on all five measures and accounts for 60% of the variation between them. I call this (standard deviation–normalized) measure "wealth score" and use it as a sixth measure of kibbutz wealth per member.

I also use four measures of a kibbutz's ideology and ideological decline, acknowledging that ideology is more complex than can be captured by observable measures. My first measure is a dummy variable for whether the kibbutz belongs to the Artzi movement, a standard measure of ideology used by sociologists of kibbutzim.[17] Artzi is viewed as a more ideological movement than Takam, the other major movement, and as more conservative in preserving kibbutz values.[18] On the other hand, such movement

17. See, for example, Rosner and Tannenbaum (1987a), Rosner and Getz (1996), and Simons and Ingram (1997). The Kibbutz Artzi movement was formed by a leftist Eastern European group called Ha'shomer Ha'tzair. It was an independent political group, but was supported by the Socialist League (a small party).
18. A more refined measure exploits the variation in ideology within the less ideological Takam movement, as was revealed in an ideological split during the 1950s into two submovements. In the early 1950s, the Meuhad movement was divided into Meuhad and Ihud. Ihud continued to support Mapai. Meuhad supported the leftist Mapam, and was pro-Soviet during the Cold War (its supporters often celebrated Soviet occasions such as Stalin's birthday). Forty-eight kibbutzim remained in the Meuhad movement and twenty-three joined the Ihud. Kibbutzim and sometimes even families were split to Ihud and Meuhad supporters, and hundreds of individuals transferred to another kibbutz. In 1980, Ihud and Meuhad reunited again to form the Takam (Near 1997, pp. 210–215). The regression results

affiliation has no practical implication on life in kibbutzim (Near 1997). The second measure of a kibbutz's ideology is the percentage of members voting for socialist parties in national elections. The third measure is the decline in the percentage of members voting for socialist parties over the 20 years before the reforms. The fourth measure—"ideology score"—is a weighted average of all these measures (calculated by factor component analysis). There is a single dominant factor, which builds equally on all the ideology measures and accounts for 70% of the variation among them.

The kibbutz-level data set allows me to test the model's predictions that the higher the organization's wealth, the higher the degree of equality, and that under equal sharing, higher wealth leads to lower exit rates. Moreover, the data set allows me to test the sociological conjecture that more ideological organizations (or those whose ideology declined less) maintain higher degrees of equality.

The variables used in the kibbutz-level analysis are further described in the Appendix, and descriptive statistics are presented in Table II.

III.B. Individual-Level Data

To test whether productive members are more likely to exit under equal sharing, I use a linked sample of members who stayed and members who left their kibbutz in a period when kibbutzim all were based on equal sharing and the reforms had not yet been implemented.

The data set is a random representative sample of individuals linked between the 1983 and the 1995 Israeli Censuses of Population (the link was done by the Israeli Central Bureau of Statistics). The data include all Israeli citizens who answered the "extensive questionnaire" in both years: it was given at each census to 20% of the households in a way that adequately represented the entire population. Thus, the matched sample accounts for a representative 4% of the Israeli population (including a representative 4% of kibbutz members). The data identify individuals who live in "a cooperative rural settlement, in which production, marketing, and consumption are organized in a cooperative manner." This uniquely defines kibbutz members. For this study, I employ

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(available from the author) suggest that there are no differences between kibbutzim belonging to the Ihud and Meuhad movements in their degree of equality.

TABLE II
DESCRIPTIVE STATISTICS OF KIBBUTZ-LEVEL DATA

Variable	Mean	Std. dev.	Min	Max
Degree of equality	1.973	1.216	1	4
Wealth				
Credit rating (1–4)	2.184	0.860	1	4
Economic strength (1–4)	2.361	0.921	1	4
Credit rating (1–100)	40.663	17.914	2	78
Fixed capital (in millions) per member	0.115	0.068	0.025	0.540
Assets (in millions) per member	0.239	0.169	0.045	0.918
Wealth score per member (factor component)	−0.023	1.018	−1.633	3.096
Ideology				
Most socialist movement (Artzi)	0.340	0.475	0	1
Percent of votes for socialist parties	90.271	7.803	24.800	98.440
Ideological decline				
Decline in percent of votes for socialist parties	16.436	6.839	0.126	36.483
Ideology score (factor component)	0.157	0.833	−1.967	1.948
Other				
Group size	320.646	146.714	107	1017
Year established	1941.293	10.093	1915	1969
Average household size	2.130	0.202	1.700	2.800
Land per member	19.533	12.123	1.843	64.865
Members' average age (over 29)	52.211	4.339	41.900	60.400
Exit rates (%)	6.152	2.877	1.368	19.592

Notes: Summary statistics are calculated for the sample of 147 kibbutzim for which data on all measures of wealth are available. Summary statistics for the percent of votes for socialist parties are calculated for the sample of 142 kibbutzim for which data on voting are available.

a subsample of kibbutz members in 1983 who also are observed in 1995. This sample allows me to compare the education and skill of kibbutz-to-city migrants with those of kibbutz members who stayed in the kibbutz.

To make these comparisons meaningful, I concentrate on members between the ages of 21 and 54 in 1983 (and thus between the ages of 33 and 66 in 1995). A total of 343 of the 1,577 individuals in the sample left the kibbutz between 1983 and 1995, over 20%.

The data set has a couple of important shortcomings. First, because of confidentiality concerns of the Israeli Central Bureau of Statistics, the data do not provide information on the specific kibbutz of individuals (I can only control for the location of the kibbutz). This can create a bias, because the selection is different

across kibbutzim. Since exit rates are higher in the poorer kibbutzim, considering only an average kibbutz might make it more difficult to document positive selection in exit. Second, wages inside the kibbutz are not recorded in the population censuses. Thus, when examining kibbutz-to-city migrants, I must compare movers to stayers in their education and skills rather than in their wages.

As mentioned earlier, entry to kibbutzim from the outside is low, in part because kibbutzim are well-aware of the tendency of low-ability individuals to apply; there are centralized screenings to mitigate adverse selection. A total of 77 of the 15,948 individuals in the sample entered a kibbutz in this period, fewer than 0.5%. Abramitzky (2008) analyzes entry into and exit from kibbutzim to test the selection patterns induced by intensive redistribution, and finds evidence for the Roy model of selection.

III.C. Identifying Variation in Kibbutzim Wealth

Before the 1980s, members of all kibbutzim had similar living standards, based on their movements' recommended per-member expenditure. To support similar living standards across kibbutzim, assets and corporations were shared, and a system of mutual guarantees was in place.[19] In other words, the relevant variable for each kibbutz was the total wealth of all kibbutzim. However, events in the late 1980s and 1990s created exogenous variation in the wealth of kibbutzim.

The first was an unexpected crisis (known as "the kibbutzim crisis") that reduced the wealth of some kibbutzim more than others. The crisis and its severity were largely exogenous to kibbutzim and created exogenous variation in the cost of exit. Specifically, in the decade prior to the financial crisis, kibbutzim had been borrowing on a large scale to enlarge members' apartments and facilitate the move of their children home (prior to that, children lived in separate residences) and to improve the dining halls, swimming pools, theaters, etc. At first, the loans were not linked to the cost-of-living index and were easy to repay in the presence of escalating inflation. The indexation of loans, and the artificially high interest rates announced by the government in 1985, suddenly left many kibbutzim with high levels of debt, depending on

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19. See, for example, Rosner and Getz (1996), Near (1997), and Gavron (2000). The system of mutual aid across kibbutzim goes back to the 1920s. All kibbutzim were members of their movement funds, such that each kibbutz was liable for the total debt in addition to its private one.

the exact timing of their loans.[20] There were a few other contributing factors. First, several kibbutzim faced losses when the shares of the major banks crashed. Second, an investment adviser, who was hired by many kibbutzim to guarantee their money against inflation, went bankrupt and could not pay them back. Third, kibbutzim "had overexpanded their industries with the help of borrowed capital, and acquired a huge burden of debt, vastly exacerbated by the high real rates of interest" (Near 1997, p. 346).

The system of mutual guarantees could have made each kibbutz liable for the debt of all kibbutzim. However, the independent Kibbutz Arrangement Board, which was established in the late 1980s by the government, the banks, and the kibbutzim, ensured that each kibbutz was fully responsible for its own economic circumstances, essentially leaving each with a different level of wealth, as largely determined by the crisis. Kibbutzim suddenly had to face their own wealth constraints and to reduce their living standards to various degrees.

To sum up, the crisis hit kibbutzim asymmetrically, and created for the first time a large and mainly exogenous variation in the wealth of kibbutzim.

In terms of the model and its predictions, the case of high wealth (K) and no exit corresponds to the precrisis period, when kibbutzim all were based on equal sharing and exit rates were relatively low. Postcrisis, kibbutzim with lower wealth are expected to have maintained a lower degree of equality. Section IV shows that indeed the degree of equality is decreasing in wealth. In the postcrisis and prereform period, when all kibbutzim were still based on equal sharing, kibbutzim with lower wealth are expected to have experienced higher exit rates. Section V shows that this was indeed the case. Moreover, productive individuals are expected to have been more likely to exit. This prediction is tested and confirmed in Section VI.

IV. The Degree of Equality Is Increasing in Wealth

This section tests the prediction that wealthier kibbutzim and more ideological kibbutzim maintain higher degrees of equality. Because wealth and ideology are measured postcrisis but prereform, reverse causality is not an issue.

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20. Many other businesses went bankrupt, and the cooperative Moshav villages were also hit severely.

Kibbutzim practice one of four sharing rules, ranging from equal sharing (i.e., income of all members is shared equally) to "safety net," under which a member's budget is in part an equal share but also includes a large percentage based on her own earnings. To test the determinants of the degree of equality, I regress the degree of equality on the kibbutz's wealth and a set of controls:

$$\text{Equality}_i = \alpha + \delta_1 \text{Wealth}_i + \beta' X_i + \varepsilon_i,$$

where Equality$_i$ is kibbutz i's degree of income equality, Wealth$_i$ is the postcrisis wealth per member of kibbutz i, and X_i are other variables that may affect the degree of equality, including group size, year of establishment, average household size, land per member, and the average age of members.

To evaluate the role of ideology in maintaining a higher degree of equality, I include measures of socialist ideology and run the following regressions:

$$\text{Equality}_i = \alpha + \gamma_1 \text{Ideology}_i + \gamma_2 \text{Wealth}_i + \beta' X_i + \varepsilon_i,$$

where Ideology$_i$ is the level of socialist ideology (or the decline in kibbutz i's socialist ideology).

As mentioned earlier, I use two definitions of the degree of equality (Equality$_i$). The first dependent variable is discrete and can be ranked from high (4) to low (1). Therefore, I perform an ordered probit regression analysis to test the determinants of the degree of income equality.[21] Columns (1)–(6) of Table III report a regression, each using a different measure of wealth and the same

21. The ordered probit regression treats outcomes as ordinal rather than cardinal. A kibbutz is assumed to have its "preferred" degree of equality D_{2i}^* and choose the equality-level category Equality$_i$ closest to its preferences. Let D_{2i}^* be the (unobserved) preferred level of equality of kibbutz i.

(1) $$D_{2i}^* = \alpha + \delta_1 \text{Wealth}_i + \beta' X_i + \varepsilon_i,$$

where $\varepsilon_i \tilde{} N(0, 1)$. Although D_{2i}^* is not observed, we do observe to which of the four categories it belongs. In particular,

$$
\begin{aligned}
D_{2i} &= 1 \quad \text{if } D_{2i}^* \leq 0 \\
&= 2 \quad \text{if } 0 \leq D_{2i}^* \leq \mu_2 \\
&= 3 \quad \text{if } \mu_2 \leq D_{2i}^* \leq \mu_3 \\
&= 4 \quad \text{if } \mu_3 \leq D_{2i}^*.
\end{aligned}
$$
(2)

The marginal effects in the ordered probit regression are $[\partial Prob(D_2 = 1)]/\partial x_1 = -\Phi(-\beta' x_1)$, $[\partial Prob(D_2 = 2)]/\partial x_1 = [\Phi(-\beta' x_1) - \Phi(\mu_2 - \beta' x_1)]\beta$, $[\partial Prob(D_2 = 3)]/\partial x_1 = [\Phi(\mu_2 - \beta' x_1) - \Phi(\mu_3 - \beta' x_1)]\beta$, $[\partial Prob(D_2 = 4)]/\partial x_1 = \Phi(\mu_3 - \beta' x_1)\beta$.

TABLE III
RESULTS OF ORDERED PROBIT REGRESSION ANALYSIS TO TEST DETERMINANTS OF DEGREE OF INCOME EQUALITY

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Wealth											
Credit rating (1–4)	0.397*** (0.111)										
Economic strength (1–4)		0.377*** (0.103)									
Credit rating (1–100)			0.019*** (0.005)								
Fixed capital per member				4.459*** (1.569)							
Assets per member					2.032*** (0.613)						
Wealth score						0.479*** (0.107)	0.476*** (0.097)	0.453*** (0.108)	0.490*** (0.110)	0.471*** (0.111)	0.462*** (0.112)
Ideology											
Most socialist movement (Artzi)								0.446** (0.214)			
Percent of votes for socialist parties									0.026 (0.021)		
Ideological decline											
Decline in percent of votes for socialist parties										−0.036** (0.016)	

TABLE III
(CONTINUED)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Ideology score											0.317**
											(0.130)
Controls											
Group size	0.001*	0.001*	0.001*	0.001*	0.001	0.0008		0.0008	0.0004	0.0001	0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0009)		(0.0009)	(0.0009)	(0.0010)	(0.0010)
Year established	−0.012	−0.014	−0.019	−0.020	−0.025**	−0.013		−0.015	−0.016	−0.017	−0.017
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)		(0.013)	(0.014)	(0.014)	(0.014)
Average household size	−0.858	−0.875	−0.863	−0.767	−0.903	−1.205*		−1.067*	−1.081*	−1.163*	−1.016
	(0.555)	(0.556)	(0.543)	(0.586)	(0.597)	(0.620)		(0.625)	(0.632)	(0.633)	(0.635)
Land per member	0.022**	0.020**	0.019**	0.022**	0.021**	0.019*		0.020**	0.019*	0.020**	0.020**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)		(0.010)	(0.010)	(0.010)	(0.010)
Members' average age	−0.083***	−0.081**	−0.085***	−0.061*	−0.074**	−0.060		−0.068*	−0.051	−0.046	−0.052
	(0.032)	(0.032)	(0.031)	(0.035)	(0.035)	(0.037)		(0.038)	(0.038)	(0.038)	(0.038)
Observations	188	188	184	159	156	147	151	147	142	142	142

Notes: The dependent variable is the kibbutz's degree of equality (the higher, the more equal). *t*-test significant at ***1%, **5%, *10%. Standard errors in parentheses.

set of controls. Column (7) reports a regression without controls, and columns (8)–(11) introduce the various ideology measures to the ordered probit regressions.

The second dependent variable is a dummy that equals 1 if the kibbutz implements equal sharing, and so I perform a probit regression analysis to test the determinants of equal sharing. Columns (1)–(11) of Table IV report the probit regression results using the same regressors as in Table III.

The main findings follow.

RESULT 1. The higher the wealth, the higher the degree of equality.

The correlations between the degree of equality and all measures of wealth are high and range from 0.32 (for credit rating) to 0.42 (wealth score per member). Figure II illustrates the unconditional relationship between the two discrete measures of wealth and the degree of equality. It shows that higher wealth is associated with a higher degree of equality.

Tables III and IV show that the wealth measures in all regressions are strongly, positively, and significantly associated with a higher degree of equality. For example, a one-standard-deviation increase in the wealth score increases the probability of equal sharing by 60%, the probability of a medium/high degree of equality by 36%, and the probability of a medium/low degree of equality by 16%. It reduces the probability of a low degree of equality ("safety-net" category) by 36%.

RESULT 2. The stronger the ideology, the higher the degree of equality.

Tables III and IV show that the ideology measures are positively and significantly associated with a higher degree of equality (besides percent of voting for socialist parties, which is not statistically significant). For instance, a one-standard-deviation increase in the ideology score increases the probability of equal sharing by 58%, the probability of a medium/high degree of equality by 31%, and the probability of a medium/low degree of equality by 14%. It reduces the probability of a low degree of equality by 28%.

Other findings relate the degree of equality to four variables: group size (precrisis), average household size, land per member, and age distribution. One finding is that a smaller group is not more likely to maintain equal sharing. Larger groups might be

TABLE IV
RESULTS OF PROBIT REGRESSION ANALYSIS TO TEST DETERMINANTS OF EQUAL SHARING

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Wealth											
Credit rating (1–4)	0.118***										
	(0.032)										
Economic strength (1–4)		0.101***									
		(0.030)									
Credit rating (1–100)			0.005***								
			(0.002)								
Fixed capital per member				0.801*							
				(0.490)							
Assets per member					0.366*						
					(0.190)						
Wealth score						0.115***	0.134***	0.099***	0.106***	0.089***	0.087***
						(0.033)	(0.031)	(0.032)	(0.033)	(0.032)	(0.031)
Ideology											
Most socialist movement (Artzi)								0.189***			
								(0.078)			
Percent of votes for socialist parties									0.008		
									(0.007)		
Ideological decline											
Decline in percent of votes for socialist parties										−0.014***	
										(0.005)	

TABLE IV
(CONTINUED)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Ideology score											0.110***
											(0.036)
Controls											
Group size	0.0004*	0.0004*	0.0004*	0.0006**	0.0005*	0.0004		0.0004	0.0003	0.0002	0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)		(0.0003)	(0.0003)	(0.0003)	(0.0003)
Year established	−0.008**	−0.008**	−0.009***	−0.011***	−0.012***	−0.009**		−0.010**	−0.011**	−0.012***	−0.012***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)		(0.004)	(0.004)	(0.004)	(0.004)
Average household size	0.015	0.007	−0.035	−0.032	−0.044	−0.118		−0.056	−0.035	−0.075	−0.018
	(0.157)	(0.159)	(0.158)	(0.192)	(0.196)	(0.191)		(0.183)	(0.183)	(0.173)	(0.171)
Land per member	0.003	0.003	0.003	0.004	0.004	0.003		0.003	0.003	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.003)	(0.003)
Members' average age	−0.032***	−0.032***	−0.034***	−0.035***	−0.037***	−0.029**		−0.035***	−0.027**	−0.028**	−0.031**
	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.013)		(0.012)	(0.012)	(0.012)	(0.012)
Observations	188	188	184	159	156	147	151	147	142	142	142

Note: The dependent variable is a dummy for whether the kibbutz is based on equal sharing. The marginal coefficients are presented, *t*-test significant at ***1%, **5%, *10%. Standard errors in parentheses.
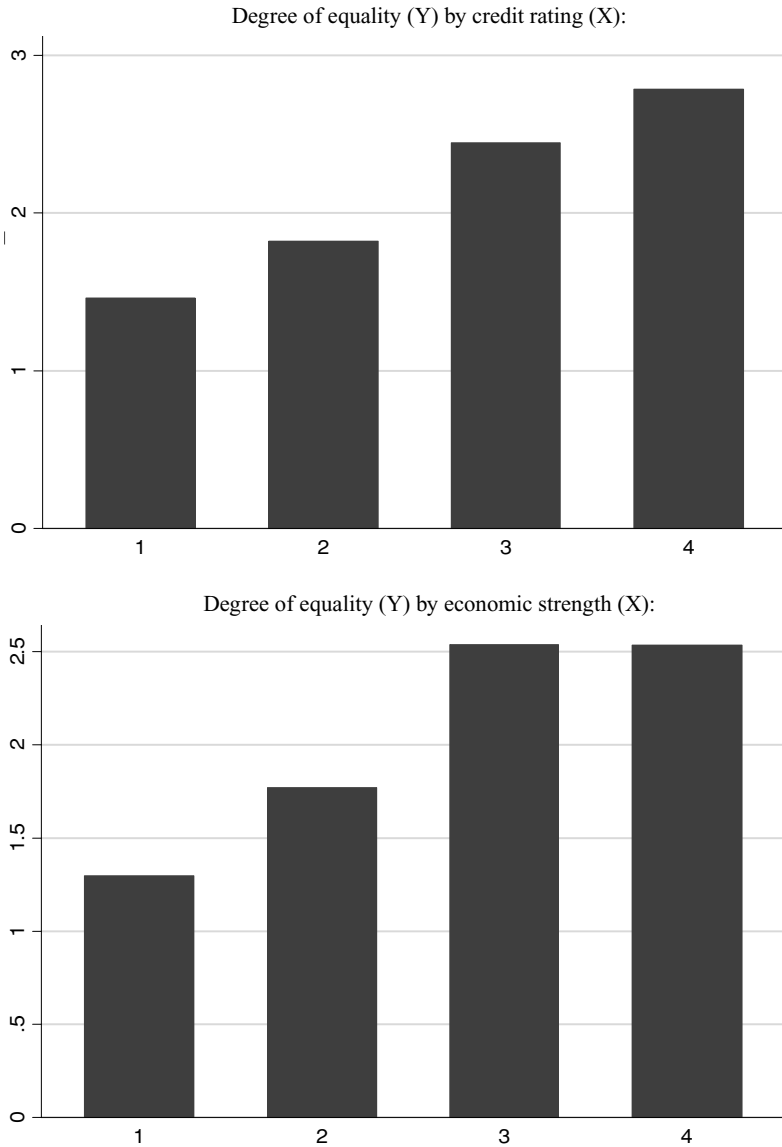
Degree of equality (Y) by credit rating (X):

Degree of equality (Y) by economic strength (X):

FIGURE II

Higher Wealth Is Associated with Greater Equality

Notes: Each graph draws the mean degree of equality (1–4 where 4 is equal sharing) for each discrete value of the wealth measure. The graphs use only the two discrete measures of wealth. Specifically, the first graph uses credit rating (1–4) as the measure of wealth, and the second uses economic strength (1–4). The degree of equality and the wealth measures are defined in the text and the Appendix.

expected to be less effective in alleviating moral hazard by so-cial sanctions. Thus, larger groups might find it more difficult to maintain a high degree of equality. However, the empirical anal-ysis reflects no such effect of group size on equality. Tables III and IV suggest that larger groups are even slightly more likely to maintain a high degree of equality. This probably reflects the fact that even large kibbutzim are small enough to make social sanc-tions effective, and thus moral hazard in kibbutzim is mitigated symmetrically in groups of all sizes.

I control for average household size to capture the possibil-ity that larger households may face higher exit costs, and also may benefit more from the kibbutz's local public goods, which are nonexclusive in nature. Therefore, kibbutzim whose house-holds are bigger are expected to maintain a higher degree of equality.[22] The empirical analysis suggests that the coefficient on the average-household-size variable generally has the expected sign but it is often not statistically significant.

The land-size (in thousands of square meters) variable reflects both residential land and land for agriculture; thus, its coefficient does not have a clear predicted sign. The regression suggests that kibbutzim with more land per member are more likely to maintain a higher degree of equality.

One important determinant of equality appears to be the age distribution of the population. Age distribution is a proxy for the different incentives of individuals at different ages. Old individ-uals might lose from the reforms as they no longer work and thus would earn less under pay for performance than under equal sharing. At the same time, the older generation may be more ideo-logical and committed to kibbutz values of equality. These factors are expected to make kibbutzim with a higher proportion of older individuals more likely to implement a higher degree of equality. On the other hand, old individuals are "locked-in" to their kibbutz, and their compensation largely depends on the younger members. Old members therefore would lose more from high exit rates. This fact makes kibbutzim with a higher share of older individuals less likely to implement a higher degree of equality. The regressions suggest that the latter effect is stronger. That is, the higher the average members' age, the lower the degree of equality. [23]

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22. In the past, when children used to live in special residences outside par-ents' homes, most households consisted of only the parents. Nowadays, children live with their parents.

23. The regressions presented in this paper use the average age of members who are older than 29, but the same negative effect holds when instead using

V. Under Equal Sharing, Exit Rates Decrease with Wealth

This section uses the organization-level data to test the prediction that, under equal sharing, wealthier kibbutzim experience lower exit rates. Figure III illustrates that under equal sharing, higher postcrisis, but prereform wealth, leads to less exit.

I regress (OLS) exit rates on wealth and a set of controls for the period when all kibbutzim were based on equal sharing:

$$\text{ExitRate}_i = \alpha + \beta_1 \text{Wealth}_i + \beta_2 \text{Ideology}_i + \gamma' X_i + \varepsilon_i,$$

where ExitRate_i is kibbutz i's exit rate, Wealth_i is the postcrisis wealth of kibbutz i, and X_i are control variables that may affect the degree of equality such as group size, year of establishment, average household size, land per member, and age distribution. Because Artzi and Takam recorded exit rates differently, I control for Artzi in all regressions. Hence, unlike in the previous regressions, affiliation with Artzi cannot be interpreted here as a measure of ideology. In regressions presented in an online appendix, I allow the coefficients in all variables to differ across Artzi and Takam. I find that whereas exit rates decrease with wealth in both groups, the effect is stronger in Takam.

The regression results, presented in Table V, suggest that when kibbutzim all practiced equal sharing, the wealthier kibbutzim experienced lower exit rates. Each of columns (1)–(12) reports the coefficients from an OLS regression using a different measure of wealth. To avoid reverse causality, I use only the two wealth measures that reflect the wealth immediately postcrisis. Columns (1) and (3) report the results from a regression with a set of controls, and columns (2) and (4) report the results from a regression without controls. Columns (1) and (2) suggest that when credit rating increases by one unit, exit rates decline by 0.78 percentage points with controls and 0.89 percentage points without controls. Columns (3) and (4) suggest that when a kibbutz's economic strength measure increases by one unit, exit rates decline by 0.49 percentage points with controls and 0.56 percentage points without controls. Columns (5)–(12) introduce measures of ideology to the regressions. The regressions suggest that ideology, as measured by the percentage of votes for socialist parties, does not play a role in determining exit rates. However, a bigger decline in

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average age over 21; percent of members over 40; percent of members over 56; or percent of members over 60.

Exit rate from kibbutzim (Y) by credit rating (X):

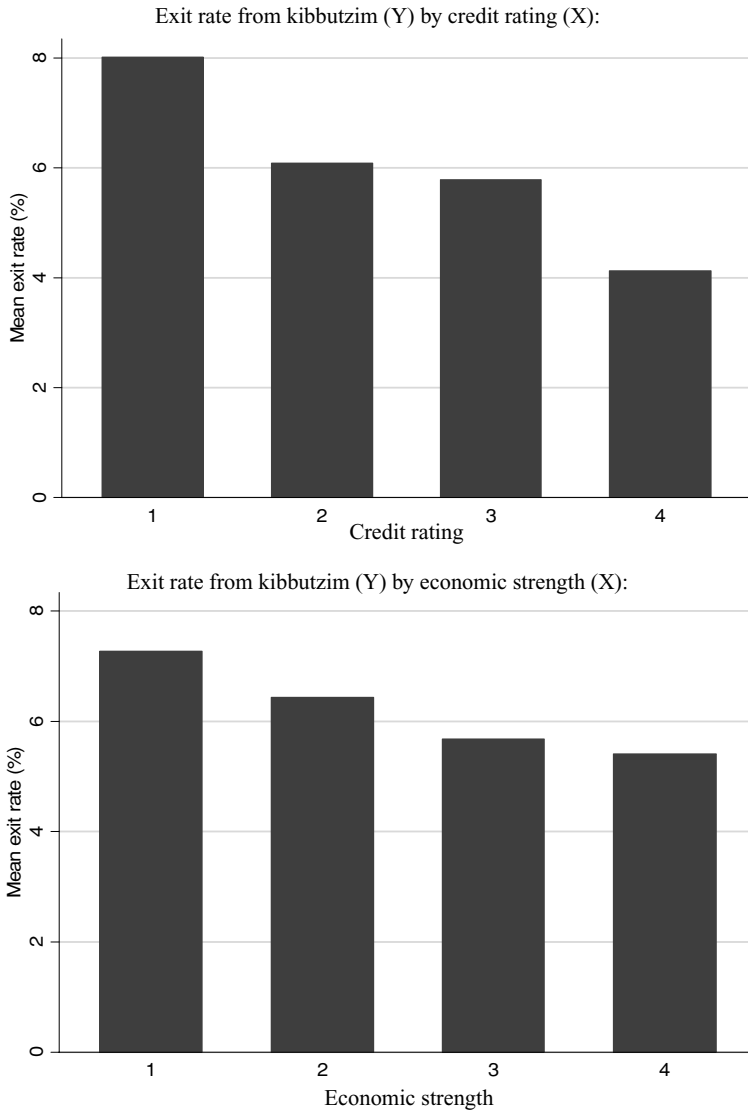Exit rate from kibbutzim (Y) by economic strength (X):

FIGURE III

Under Equal Sharing, Higher Wealth Is Associated with Lower Exit Rates

Notes: Each graph depicts the mean of the exit rate from kibbutzim in % between 1987 and 2000 (Y axis) for each discrete value of the wealth measure (X axis). The graphs use only the two discrete measures of wealth. Specifically, the first graph uses credit rating (1–4) as the measure of wealth, and the second graph uses economic strength (1–4). The exit rates and the wealth measures are defined in the Appendix. All graphs are drawn for kibbutzim in the Artzi movement, but graphs are similar for the Takam movement.

TABLE V
RESULTS OF OLS REGRESSION ANALYSIS TO TEST DETERMINANTS OF EXIT RATES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Wealth												
Credit rating (1–4)	−0.779***	−0.887***							−0.691***	−0.731***		
	(0.182)	(0.179)							(0.194)	(0.193)		
Economic strength (1–4)			−0.494***	−0.558***			−0.425**	−0.435**			−0.383**	−0.379**
			(0.168)	(0.168)			(0.178)	(0.176)			(0.180)	(0.181)
Ideology												
Percent of votes for socialist parties					−0.016	−0.019	−0.018	−0.022				
					(0.015)	(0.016)	(0.016)	(0.017)				
Ideological decline												
Decline in percent of votes for socialist parties									0.039*	0.041*	0.045*	0.050**
									(0.023)	(0.023)	(0.023)	(0.024)
Controls												
Artzi movement	−3.510***	−3.727***	−3.586***	−3.818***	−3.470***	−3.723***	−3.546***	−3.802***	−3.354***	−3.610***	−3.400***	−3.652***
	(0.290)	(0.307)	(0.297)	(0.317)	(0.305)	(0.319)	(0.311)	(0.328)	(0.318)	(0.331)	(0.325)	(0.340)
Group size	−0.002*	No	−0.003**	No	−0.002*	No	−0.003*	No	−0.002	No	−0.002	No
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Year established	−0.024	No	−0.018	No	−0.025	No	−0.018	No	−0.023	No	−0.015	No
	(0.018)		(0.018)		(0.018)		(0.018)		(0.018)		(0.018)	
Average household size	−0.457	No	−0.627	No	−0.408	No	−0.594	No	−0.359	No	−0.538	No
	(0.896)		(0.918)		(0.927)		(0.948)		(0.920)		(0.939)	
Land per member	0.029*	No	0.031**	No	0.030**	No	0.033**	No	0.030**	No	0.034**	No
	(0.014)		(0.015)		(0.015)		(0.015)		(0.015)		(0.015)	
Members' average age	−0.137***	No	−0.133**	No	−0.127**	No	−0.121**	No	−0.133**	No	−0.128**	No
	(0.052)		(0.054)		(0.054)		(0.056)		(0.054)		(0.056)	
Observations	184	187	184	187	178	180	178	180	177	179	177	179
R^2	0.58	0.50	0.56	0.46	0.58	0.50	0.56	0.47	0.58	0.51	0.56	0.48

Note. The dependent variable is exit rate (in %). Since exit rates are recorded differently in Artzi and Takam movements, a dummy variable for Artzi is included, t-test significant at ***1%, **5%, *10%. Standard errors in parentheses.

voting for socialist parties is positively associated with exit rates. Larger groups experience lower exit rates and a higher average age of members is associated with less exit.

Moreover, to the extent that economic motives play a role in members' decisions on whether to stay in their kibbutz, one expects that living in the kibbutz would be more attractive when aggregate economic conditions in Israel are bad, and vice versa. Although I do not have data on exit before the 1980s, membership in the kibbutz was roughly countercyclical in the period 1966–2000. The correlation between kibbutz membership and the growth of GDP per capita in that period is −0.22. For the period 1922–1947, the correlation between kibbutz membership and the growth of NNP is −0.14.[24]

VI. Under Equal Sharing, High-Productivity Individuals Are More Likely to Exit: Individual-Level Analysis

This section uses individual-level data to test the prediction that more productive individuals are more likely to exit under equal sharing. To test for selection in exit, I run a probit regression where the dependent variable takes the value 1 if the individual left the kibbutz (between 1983 and 1995). This is a reduced-form specification of individuals' decisions on whether to stay or leave. Specifically, assume that an individual chooses whether to exit (D_i^*) based on her individual and location characteristics (W_i). The individual exits if an unobservable criterion function is positive:

$$(3) \qquad\qquad D_i^* = \delta_1 W_i + u_i,$$

where $E(u_i) = 0$ and $\mathrm{var}(u_i)$ is normalized to 1 without loss of generality. While we do not observe D_i^*, we do observe whether the individual moved or stayed (denote as D_i). It follows that

$$(4) \qquad\qquad D_i = 1 \quad \text{if } D_i^* > 0,$$
$$D_i = 0 \quad \text{otherwise.}$$

Table VI suggests that kibbutz-to-city migrants are more educated and more skilled than stayers. Column (1) shows the mean characteristics of individuals who stayed in their kibbutz between 1983 and 1995, and column (2) shows the mean characteristics of

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24. The data on Israel's NNP in this period is taken from Metzer (1998). I do not have demographic information on kibbutzim for the period 1948–1966.

TABLE VI

SUMMARY STATISTICS AND PROBIT REGRESSION OF EXIT FROM THE KIBBUTZ,
1983–1995

| | Mean characteristics of individuals who | | |
| | Stayed in kibbutz (1) | Left the kibbutz (2) | Marginal probabilites from probit analysis (3) |
Variable			
At least high school diploma	0.500	0.618	0.098*** (0.021)
High skill	0.084	0.099	0.084** (0.043)
Low skill	0.226	0.134	−0.092*** (0.023)
Age	36.295	29.609	−0.038*** (0.011)
Age squared	1393	937	0.0003** (0.0002)
Male	0.494	0.548	0.022 (0.022)
Born in Israel	0.669	0.729	−0.045* (0.025)
Married	0.796	0.566	−0.064* (0.038)
Family size	3.570	2.708	−0.0006 (0.01)
Israel's north region	0.524	0.522	0.050** (0.024)
Israel's south region	0.199	0.257	0.055* (0.033)
Observations	1234	343	1577
Predicted probability			0.182
LR^2			237.70

Notes: The dependent variable in column (3) equals 1 if the individual exited from the kibbutz and 0 otherwise. The coefficients reported are marginal probabilities. Entries in column (1) represent the mean characteristics of individuals who stayed in their kibbutz between 1983 and 1995. Entries in column (2) represent the mean characteristics of individuals who left their kibbutz between 1983 and 1995. "High skill" are individuals working in either academic or managerial occupations. "Low skill" are individuals working in either unskilled occupations in industry or as service workers. A third omitted group contains all other occupations. "Israel's north region" includes the following districts: Sefad, Kinneret, Yizrael, Akko, and Golan. "Israel's south region" includes Ashkelon and Beer-Sheva districts. A third omitted group contains all other regions. Standard errors in parentheses. All explanatory variables are measured in 1983 (before exit), t-test significant at ***1%, **5%, *10%.

individuals who left their kibbutz during this period. Column (3) presents the results from the probit regression.

The regression analysis suggests that having at least a high school education increases the probability of exit by 9.8 percentage

points as compared with having less than a high school education. Members with high-skill occupations are over 8 percentage points more likely to leave the kibbutz, and low-skill occupation members are over 9 percentage points less likely to exit as compared with members in medium-skill occupations.

One potential concern is that the skill bias in exit could be attributed to "selective" investment in human capital. That is, individuals who intend to leave invest more in their skills because they will get greater returns to these skills outside the kibbutz. Note that the period of study is one of increased migration (over 20% of members in the sample exited between 1983 and 1995) following the crisis. Under these circumstances, the skill bias of movers (compared with stayers) is more likely to reflect brain drain and less likely to reflect differential investment in human capital caused by the migration decision.

As a robustness check, I conduct the same analysis on subsamples of individuals who were over 30, 35, and 40 years of age in 1983. The older individuals had already invested in their human capital years before the period studied here (probably with the intention of staying, because otherwise they would have left much earlier) and their decisions are less likely to represent selective investment in human capital. That last fact is even more true in the kibbutz, where an individual cannot save privately and cannot take her share with her upon exiting, thus making the move more costly at an older age.

The results of the probit regression (1 if left the kibbutz) for subsamples of individuals at different ages are reported in Table VII. The first column considers all individuals who are at least 21 years old in 1983. The second column considers only individuals who are at least 30 in 1983. The third column considers individuals who are at least 35, and the fourth column considers individuals who are at least 40. The regression results suggest that (under all specifications), the more educated and higher-skill workers are more likely to exit, and the low-skill workers are less likely to exit. That is, the effects of education and skill on the probability of migrating are economically large and statistically significant, even when older individuals who probably only migrated as a result of the crisis are considered.

VII. MORAL HAZARD

In principle, equal sharing is expected to reduce the incentives to work. To focus on how exit limits redistribution, the

TABLE VII
PROBIT ANALYSIS OF EXIT FROM THE KIBBUTZ BETWEEN 1983 AND 1995, BY AGE

Variable	Marginal probabilities for individuals of age			
	≥ 21 (1)	≥ 30 (2)	≥ 35 (3)	≥ 40 (4)
At least high school diploma	0.098*** (0.021)	0.059*** (0.019)	0.071*** (0.022)	0.055** (0.024)
High skill	0.084** (0.043)	0.080** (0.037)	0.088** (0.043)	0.128*** (0.053)
Low skill	−0.092*** (0.023)	−0.072*** (0.021)	−0.061** (0.024)	−0.025 (0.029)
Age	−0.038*** (0.011)	0.034 (0.023)	−0.051 (0.044)	−0.160 (0.093)
Age squared	0.0003** 0.0002	−0.0005* (0.0003)	0.0005 (0.0005)	0.002 (0.001)
Male	0.022 (0.022)	0.022 (0.020)	0.011 (0.022)	0.022 (0.024)
Born in Israel	−0.045* (0.025)	−0.056*** (0.021)	−0.040* (0.022)	−0.009 (0.023)
Married	−0.064* (0.038)	−0.005 (0.040)	−0.026 (0.050)	−0.002 (0.045)
Family size	−0.0006 (0.01)	−0.006 (0.009)	−0.004 (0.010)	−0.014 (0.011)
Israel's north region	0.050** (0.024)	0.034 (0.023)	0.026 (0.025)	−0.002 (0.026)
Israel's south region	0.055* (0.033)	0.021 (0.032)	−0.017 (0.031)	−0.007 (0.032)
Observations	1,577	1,085	773	457
Predicted probability	0.182	0.109	0.098	0.061
LR^2	237.70	61.63	53.57	33.63

Notes: The dependent variable equals 1 if the individual exited from the kibbutz and 0 otherwise. Each of columns (l)–(4) reports regression results for subsamples of individuals at different ages. The coefficients reported are marginal probabilities. "High skill" are individuals working in either academic or managerial occupations. "Low skill" are individuals working in either unskilled occupations in industry or as service workers. A third omitted group contains all other occupations. "Israel's north region" includes the following districts: Sefad, Kinneret, Yizrael, Akko, and Golan. "Israel's south region" includes Ashkelon and Beer-Sheva districts. A third omitted group contains all other regions. Standard errors in parentheses. All explanatory variables are measured in 1983 (before exit). *t*-test significant at ***1%, **5%, *10%.

model abstracts from moral hazard. In fact, researchers of the kibbutz movement have found that kibbutz members tend to have higher motivation levels than nonmembers (e.g., Tannenbaum et al. [1974], Palgi [1984], Rosner and Tannenbaum [1987b], and Shimony et al. [1994]). However, it is likely the potential for moral hazard was a concern to kibbutz members, as evidenced by the array of mechanisms used to combat it.

Why would a member work hard if all she got was 1/*N* of the total income? How was the free-rider problem mitigated? Given

the constraints of not being able to exclude shirkers monetarily or legally, other mechanisms had to be used.

First, the internal organization of kibbutzim was such that members were always exposed to social sanctions, which were feasible and effective since kibbutzim were small communities. Specifically, privacy was extremely limited as members lived among the same people they worked with, their children attended the same schools, and they ate in a communal dining hall. The close proximity of members, coupled with the fact that gossip was rampant, facilitated information transmission and made social sanctions effective.

A veteran of the first kibbutz (*Degania*) describes how peer pressure was implemented when a member shirked: "Nobody said a word to him. But in the evening, in the dining hall, the atmosphere around him was such that the following morning he got up and left the *kvutza* [kibbutz]" (Near 1992, p. 38).

While social sanctions were used as the stick, social esteem was used as the carrot. In particular, members who were appreciated by their peers were promoted to leadership positions such as the kibbutz secretary, treasurer, and farm manager. Leadership positions were rotated every few years to provide incentives to members.

The importance of social sanctions and social esteem in the kibbutz have been highlighted by Lieblich (1981), Barkai (1986), and Keren, Levhari, and Byalsky (2006). A similar logic applies to professional partnerships (see Kandel and Lazear [1992]) and for tenured professors in academia.

Second, because the (often unobservable) behavior of each member (especially her effort) affects the utility of other members, the kibbutzim share many characteristics of clubs (see Iannaccone [1992] and Berman [2000]). As in other sects and communes, prohibitions, sacrifices, and screening were used in the kibbutz to deal with free riding and adverse selection.

Prohibitions included occupational and educational restrictions, restrictions on outside work, and dress codes. Such prohibitions increase interactions within the kibbutz, make effort partially observable, and increase the cost of exit.

Giving up private property also entails a sacrifice, in that it is an irreversible costly act demanded in order to be a member of the kibbutz.[25] Communal ownership of all property can be

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25. At the outset, the kibbutz would rather that members not bring their property or not join than not share it. There were even stories of sharing clothes.

interpreted as a signal of commitment in that it made exit costly. In my conceptual framework, giving up property is interpreted as an "entry price" (which cannot be recovered upon exit), which allows the kibbutz to build common assets (K). A signal of commitment provides a complementary interpretation to the practice of giving up private property, but regardless of whether giving up property is an entry price or a signal of commitment, this practice increases the cost of exit.

As mentioned earlier, the screening of members and resulting low entry reflects an attempt to avoid adverse selection. At the same time, screening also reflects an attempt to deal with free riding by selecting types who are suited to communal living. This can explain why much entry has been of individuals who signaled their serious intentions by belonging to a socialist youth movement in Israel or abroad, or who joined through army service as part of a coherent unit that trained individuals to live in a kibbutz.

VIII. Conclusion and Discussion

This paper contributes to our understanding of the evolution of the Israeli kibbutzim, communities based on the principle of income equality. Moreover, it provides a case study of how exit limits redistribution, thus contributing to an understanding of the role of migration in limiting the ability of local government to redistribute.

Analyzing newly assembled data on kibbutzim and their members, I find that under equal sharing, higher wealth leads to lower exit rates, the most productive individuals have the highest propensity to leave, and wealthier kibbutzim choose a higher degree of equality. Strong socialist ideology also contributes to income equality.

Using a simple theoretical framework, I show that these findings are consistent with a view of the kibbutz as providing optimal insurance when members have the exit option; that is, participation is at will. The framework is generalizable to include other motives for redistribution, such as taste for equality. The theory is also consistent with the creation of these organizations, their rules and internal organization, their relatively small size, the

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It was considered better to refuse a gift from the outside than not share it. That often included reparations for holocaust survivors, an issue that raised a great deal of controversy in the kibbutz movement.

high restrictions on entry, demographic patterns, and the timing of their recent shift away from equal sharing.

Specifically, kibbutzim were founded by individuals who can be regarded as *ex ante* homogeneous in their expected productivity, and who came to a new land full of uncertainties. They wanted insurance and had a taste for redistribution, but must have realized that members who would turn out to have high abilities might leave. Collective ownership of assets made exit costly and served as a bond that enabled the creation of equal-sharing arrangements. Common ownership of assets served as a lock-in device and thus mitigated the trade-off between insurance and participation. Specifically, valuable shared assets raised the cost of exit and may have kept productive individuals inside even under equal sharing. Common ownership of valuable assets thus facilitates a high degree of equality. Moral hazard was dealt with by using prohibitions and sacrifices together with monitoring and peer pressure.

I expect that kibbutzim that shift away from equal sharing will experience a decline in exit rates (compared with immediately before the shift). Although it is still too early to test whether this is the case, the anecdotal evidence and official reports suggest that the shift away from equality seems to have been successful in keeping members inside.[26] The (few) kibbutzim that shifted away from equal sharing earlier seem to have experienced a decline in exit rates following that shift.

The empirical focus of this paper is on the determinants of cross-sectional variation in the degree of equality across kibbutzim. The model abstracts from time-series factors, notably the environment under which kibbutzim operated, that affect all kibbutzim symmetrically. It is worth noting, however, that the kibbutz environment has contributed to keeping kibbutzim from unravelling over time. In the past the kibbutz movement enjoyed explicit and implicit governmental subsidies, which came in the form of land, water, and tax advantages. Such subsidies augmented kibbutzim's wealth, increased the value of staying, and facilitated equal sharing with less attrition. These subsidies have played a lesser role since the late 1970s when the Labor party lost its monopolistic control of government. Thus, subsidies

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26. For example, David Koren, a former member of the Knesset (Israeli parliament) and a member of Kibbutz *Gesher Haziv*, commented that "Since we started with the privatization, no member has left (the kibbutz)" (*Yedioth Ahronoth* [2002]).

are not likely to be important after the 1980s, the period analyzed empirically in this paper. Further, collective provision of local public goods in the kibbutz might have been more efficient than the market, especially when government and markets were not well developed. Such public goods include education, health, welfare services, and insurance against time-varying shocks of life.

On the other hand, some external factors have contributed to the unraveling of kibbutzim. First, while talented individuals always could earn a premium for their ability, the returns to skill have increased in recent decades, improving outside opportunities for talented members. Note that members' improved outside options are the same across kibbutzim because Israel is of small size, meaning that the direct costs of moving anywhere are similar. Second, the decline in socialist ideology in the world as a whole, and in Israel in particular, has reduced the attractiveness of kibbutzim.

This paper contributes to two other literatures as well. First, it contributes to our understanding of contracts, as limited commitment has been shown to limit the degree of insurance in informal risk-sharing arrangements in village economies, and in the markets for life insurance (Hendel and Lizzeri 2003) and health insurance (Crocker and Moran 2003).[27]

Second, this paper contributes to our understanding of other organizations, such as cooperatives, labor-managed firms, and professional partnerships. Despite the many differences between kibbutzim and professional partnerships, there are also remarkable similarities. Like kibbutzim, professional partnerships often are based on revenue sharing, which is claimed to provide valuable insurance for partners.[28] Like a kibbutz's members, partners have outside options and can exit at will. Yet, partners cannot recover some of their share upon leaving (e.g., customers, firm's reputation). This paper suggests that there is a tendency for the most productive partners to exit, that the sharing rule reflects the trade-off between insurance and participation, that lock-in devices are required to make exit costly, and that mutual monitoring may give partnerships a comparative advantage in mitigating

27. The literature on risk sharing in village economies includes Coate and Ravallion (1993), Ligon (1998), Ligon, Thomas, and Worrall (2002), and Albarran and Attanasio (2003).

28. See Gaynor and Gertler (1995) in the context of medical groups and Lang and Gordon (1995) in the context of law firms. However, Garicano and Hubbard (forthcoming 2008) suggest that risk sharing is not a main consideration in law firms.

moral hazard and supporting a high degree of equality. Indeed, recent trends in law firms suggest that senior partners often are inclined to leave the firm for corporations. At the same time, law firms seem to be shifting away from seniority-based revenue sharing.[29] These trends are consistent with the theory and evidence provided in this paper.

Finally, we ask whether kibbutzim will persist into the future. There is no obvious answer to this question. On the one hand, this paper demonstrates the limits of equality and the role of negative selection. Moreover, as the surrounding economy becomes wealthier and more complex and as the returns to skill increase, membership in egalitarian kibbutzim becomes less attractive. On the other hand, the recent shift away from equal sharing, the key principle of kibbutzim for many years, illustrates that kibbutzim are flexible and willing to adapt themselves to a changing environment. Another example of their flexibility is that many kibbutzim have been discussing the possibility of privatizing some assets, notably of allowing members to own their apartments. Such flexibility—in contrast to the rigidity of other communes with radical belief systems placing them at the margin of society, and which have dissolved in response to changes—may allow the kibbutzim to continue to survive, even if in an altered form. It is worth noting that many nineteenth century communes that survived the longest were religious, suggesting both that ideology should not be dismissed and that a more detailed examination of the religious kibbutzim is needed.

APPENDIX: VARIABLES USED IN THE ANALYSIS

The variables used in the regression are described.

A. Degree of Equality

The data on the degree of equality were collected by the Institute for Kibbutz Research (Getz 1990–2000) based on kibbutzim's self-reported degree of income equality and were evaluated and coded by the organizational consultant of the kibbutz movement (Gavish 2003). Since the early 2000s, kibbutzim have shifted away from equal sharing by introducing various degrees of differentiating reforms, ranging from small deviations from equal sharing to substantial deviations, whereby a member's budget is mostly

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29. Levin and Tadelis (2005).

based on her earnings. That is, some kibbutzim use a compensation scheme that is mostly based on equal sharing, while others use a scheme that is mostly based on pay for performance. About forty kibbutzim are still debating their status. The measure of degree of equality in kibbutzim classifies these compensation schemes into a few categories:

- "Full sharing" (*shitufi*) (39 kibbutzim). Kibbutzim in this category maintain equal sharing, such that all members in a kibbutz receive an equal budget regardless of their contribution.
- "Sharing with differential pay in the margin" (29 kibbutzim). In these kibbutzim, a member's budget is mostly shared equally, but contains a small percentage based on her own earnings.
- "Sharing with differential pay" (35 kibbutzim). Similar to the preceding category, with a higher fraction of a member's budget based on her earnings.
- "Safety net" (110 kibbutzim). A member's budget contains a higher percentage based on her own earnings compared with the preceding category. Even in this category, the marginal tax is much higher than Israel's marginal tax.
- "Community settlement" (*Yeshuv Kehilati*) (3 kibbutzim). Kibbutzim in this category essentially dissolved the partnership, and their members keep their entire earnings, subject to Israel's progressive tax system.

A public committee that was formed by the government in 2003 to examine the question of "What is a kibbutz today?" confirmed that each kibbutz could choose its distinctive way and its level of sharing, as long as it keeps a minimal level of mutual guarantee among members. The government accepted the committee's recommendations, making the various categories accepted forms of the kibbutz.

As can be seen, the majority of kibbutzim have chosen medium levels of equality, ranging from a high, albeit not full, level of equality in the earnings distribution ("differences in margin" and "combined model"), to a low, albeit substantial, level of equality that provides low-ability members with a "safety net." Only three kibbutzim have abandoned equality altogether; thus they are excluded from the analysis (including them does not affect the results).

I use two specifications of the degree of equality. The first simply ranks the above-mentioned categories from high to low

degrees of equality. That is, I assign a value of 1 to the "safety net" category, 2 to the "sharing with differential pay" category, 3 to the "sharing with differential pay in the margin" category, and 4 to the "full sharing" category. The second is a dummy variable that takes the value 1 if the kibbutz is based on equal sharing ("full sharing") and zero otherwise.

B. Wealth

I employ five alternative measures of a kibbutz's postcrisis wealth:

Economic strength in 1994. As part of an attempt to resolve the crisis and to reach an agreement between the government, the banks, and the kibbutzim, kibbutzim were divided into four groups, reflecting how severely they were hit by the financial crisis. The first group contained 31 kibbutzim that remain strong and do not need assistance. The second group contained 42 kibbutzim that were somewhat hit, but did not need assistance. The third group contained 104 kibbutzim that were hit harder but were expected to eventually be able to repay their debts in full. The fourth group contained 27 kibbutzim that were hit badly and could not repay their debts without assistance.

Credit rating in 1995 and 2002. After the crisis (in 1995 and later in 2002), each kibbutz was assigned a credit rating by D&B. The credit rating was built to reflect how severely the kibbutz's economy was hit by the financial crisis and how wealthy the kibbutz is postcrisis. The credit rating was calculated by D&B in an attempt to evaluate the economic value of kibbutzim. It was based on the following parameters: economic strength, debt per member, ability to repay debt as reflected by economic forecasts of the kibbutz Arrangement Board, type and diversification of industries, and kibbutz's land value. I use two measures. The first is the credit rating that was assigned to kibbutzim by D&B in 1995 (a number from 1 to 4), and the second is the credit rating assigned in 2002 (a number from 1 to 100). The measure from 1995 is appropriate because it reflects the economic position of the kibbutz after the debt crisis but before major differential reforms were implemented. The 2002 credit rating is more elaborate, but might reflect in part the initial effect of differential reforms on credit rating, since the reforms had already been discussed by 2002.

This potential reverse causality might introduce a bias. However, the direction of the bias works against the hypothesis that I test. That is, the shift away from equal sharing by a kibbutz is designed to keep productive members inside, thus improving the kibbutz's credit rating. This makes it even more difficult to document a positive correlation between credit rating and degree of equality.

Fixed capital per member in 2000. This is a continuous measure of the postcrisis value of kibbutzim's fixed assets per member. The fixed capital was divided by a million for presentation purposes.

Assets per member in 2000. This is a continuous measure of the postcrisis value of kibbutzim's total assets per member. The assets were divided by a million for presentation purposes.

Wealth score. This is a weighted average variable of the above measures through factor analysis. There is a single dominant factor, which both builds equally on all four measures and accounts for 60% of the variation between them. The scoring coefficients are credit rating (1–4) 0.27, economic status 0.28, fixed capital per member 0.26, assets per member 0.27, and credit rating (1–100) 0.19.

C. *Ideology and Ideological Decline*

I employ four measures of a kibbutz's post-crisis ideology:

Movement affiliation. Kibbutzim are autonomous units but they belong to movements that coordinate their activities. There were three major movements. The biggest was the Takam (60% of kibbutzim), then the Artzi movement (32%). The religious movement accounts for 6% and was excluded from the analysis. The historiography of the kibbutz suggests that the various movements can be ranked according to their ideological attitudes toward equality. Kibbutzim affiliated with Artzi hold the most socialist ideology and have traditionally been considered more conservative in preserving kibbutz values. Even within the Takam, one can separate kibbutzim according to their ideology toward egalitarianism, as was revealed in an ideological split during the 1950s.

The main measure based on movement affiliation is a dummy variable that gets the value 1 if the kibbutz belongs to the most ideological movement—Artzi. A second

    measure assigns a dummy variable for each of the movements—the most socialist (Artzi), second-most socialist (Meuhad), and the least socialist (Ihud). The results of the latter are not presented in the paper, but they are available from the author upon request.

Percent of members voting for socialist parties in national elections in 1996. Data on voting were assembled from the Israeli Central Bureau of Statistics. Socialist parties consist of the labor party (Avoda), which is social-democratic party that officially supports equality, and, since the 1990s, has supported an economic policy of a free market "with a soul," and Meretz, which is a leftist party formed from Mapam (the Democratic Party for change) and Ratz parties.

Decline in percent of members voting for socialist parties between the 1984 and 2003 elections.

Ideology Score. This is a weighted average variable of the above measures through factor analysis.

D.   Other Variables

    These variables were collected from several central archives of kibbutzim as well as from the Israeli Central Bureau of Statistics. Each kibbutz reports annually its number of members, number of members who exit, and the distribution of ages within the kibbutz, and these reports are kept in central archives of the kibbutz movements. Average household size was assembled from data collected by the Central Bureau of Statistics on kibbutzim in 1995.

Group size. The number of members in 1984 (before the crisis).

Exit rate between 1987 and 2000. The exit rate is calculated with respect to 1987, that is, total exit in years 1987 to 2000 divided by the number of members in 1987. Exit was recorded differently by kibbutzim from the Artzi and Takam movements, as kibbutzim from Artzi counted the children of members who exit. Thus, exit rates cannot be compared meaningfully between kibbutzim of the two movements. I include a dummy for whether the kibbutz belong to the Artzi movement to account for this level of difference. In an online appendix, I report the estimation results of regressions run seperately for the Artzi and Takam movements.

> *Land per member.* Land refers to land leased to each kibbutz by the state of Israel. Land is measured in thousands of square meters.

> *Average household size* in 1995. The average number of people in the household.

> *Age distribution* in 1995. I use various alternative measures of age distribution, including the average age of members over 21, average age over 29, percent of members older than 40, percent of members older than 56, percent of members older than 60. The paper reports results with average age over 29, but results are unchanged when using the other measures.

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