

# The Limits of Equality: Insights From the Israeli Kibbutz

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## Abstract

What limits the capacity of society to redistribute and provide insurance? What determines the structure of compensation in organizations aiming at income equality? This paper investigates 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 differentially affected them. I find 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; (3) ideology contributes to income equality but it plays a lesser role than economic forces; (4) group size does not affect the degree of equality. Using a simple model, I show that these findings are consistent with an economic view of the kibbutz as providing optimal insurance without commitment to stay, namely when participation is at-will. More generally, these findings contribute to an understanding of the determinants of the sharing rule in other types of organizations, such as professional partnerships, cooperatives and labor-managed firms.

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# 1 Introduction

Throughout history, societies and organizations have engaged in redistribution.<sup>1</sup> 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 due to moral hazard and adverse selection. Specifically, why would an individual work hard if he gets an equal share regardless of his effort (moral hazard)? And, why would a productive individual be willing to share equally his income with a less productive one (adverse selection)?

Economists, thus, would predict that moral hazard and adverse selection problems limit the degree of equality, and that organizations that contractually mitigate them effectively maintain higher degrees of equality. For example, ex-ante homogeneity (i.e. contracting among individuals with similar prospects) and the use of contractual lock-in devices facilitate a high degree of insurance while avoiding adverse selection.<sup>2</sup> Sociologists and social psychologists, on the other hand, emphasize non-monetary factors such as ideology, norms, fairness, and other social factors in determining income equality.<sup>3</sup> Organizations with more egalitarian ideology and norms, thus, are expected to have a more equal sharing rule.

While sociologists and economists point to different factors that determine the degree of income equality in organizations, neither have attempted to test the relative importance of their conjectures. The main challenge is that such a test requires organization-level data on the degree of equality, ideology and norms,

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<sup>1</sup>Examples include the welfare state, and the former soviet union in particular; Soviet kolkhozes; group lending institutions such as the Grameen Bank in Bangladesh (Stiglitz 1990, Besley 1995); rotating savings institutions (Besley, Coate, and Loury 1993, Calomiris and Rajaraman 1998); risk-sharing arrangements in village economies in India (Rosenzweig 1988, Ligon 1993, Townsend 1994), Thailand (Townsend 1995), and Nigeria (Udry 1994); risk-sharing institutions in medieval English villages (McCloskey 1976, McCloskey 1991, Richardson 2005); sharecropping in late medieval Italy (Akerberg and Botticini 2000, Akerberg and Botticini 2002) and in early modern France (Hoffman 1984); credit cooperatives operated in Germany in the nineteenth and early twentieth centuries (Banerjee, Besley, and Guinnane 1994); nineteenth century American communes such as Amana and the Shakers (Murray 1995, Coşgel and Murray 1998); Orthodox Jews in Israel (Berman 2000); and professional partnerships of lawyers (Lang and Gordon 1995, Levin and Tadelis 2005, Garicano and Hubbard 2005) and physicians (Gaynor and Gertler 1995).

<sup>2</sup>See Harris and Holmstrom (1982) in the context of labor markets, Hendel and Lizzeri (2003) in the context of life insurance, and Ligon Ethan (2002) and Attanasio and Albarran (2003) in the context of villages in developing countries.

<sup>3</sup>For example, relative deprivation theory in sociology (Runciman 1966) and Adam's equity theory in social psychology (Adams 1963). Abell (1983) argues that cooperatives can only succeed when incentives such as ideology and solidarity are more important than economic incentives. Following sociologists, economists have incorporated social factors such as peer pressure, mutual monitoring, strategic sacrifices, fairness and morale. See, for example, Akerlof and Yellen (1990), Kandel and Lazear (1992), Prendergast (1999), Guinnane (2001), Bewley (2000), and Nagin, Rebitzer, Sanders, and Taylor (2002). Berman and Klinov (1997) and Berman (2000) show that economic considerations facilitate mutual insurance in the ultra-orthodox Jewish community.

and the degree of lock-in, as well as individual-level data that allow to test the nature of selection into such organizations. This paper addresses this challenge by assembling such data, and using them to determine the relative role of the sociological and economic conjectures in determining the degree of equality in organizations.

Specifically, this paper focuses on the Israeli kibbutzim (plural of kibbutz), which are voluntary communities that have provided their members with a high degree of income equality for almost a century. As such, kibbutzim have generated a great deal of interest by scholars and the popular press. Kibbutzim have often been invoked as proving that sociological factors such as ideology are more important than economic considerations in facilitating equal-sharing. Kibbutzim, thus, provide an upper bound for the relative importance of sociological versus economic forces. Traditionally, all kibbutzim were based on equal-sharing, as 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. Sociologists have attributed this shift to ideology - less ideological kibbutzim and those that saw a sharper decline in their ideology would choose a lower degree of equality.<sup>4</sup> This paper tests these claims against an economic view of kibbutzim.<sup>5</sup>

This study of the determinants of the sharing-rule 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.<sup>6</sup> Moreover, partly due to lack of data, the empirical literature focuses on the effects of revenue-sharing, but abstracts from its determinants.<sup>7</sup>

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<sup>4</sup>See, for example, Leviatan (1975), Rosner Menachem and Leviatan (1990), Don (1995), Simons and Ingram (1997), and Leviatan and Rosner (2000).

<sup>5</sup>Although kibbutzim have been the subject of a large body of research, few attempts have been made to provide a coherent explanation for their persistence. The current economic literature has speculated about the conditions required for the stability of the traditional kibbutz movement, but is silent about the recent shift away from equal-sharing. Moreover, the literature is based on stylized facts rather than on systematic data analysis, equal-sharing is assumed rather than derived, and the focus is placed on the kibbutz movement as a whole without accounting for the substantial heterogeneity across kibbutzim. See, for example, Satt (1991), Satt and Ginzburg (1992), Helman (1993), Satt (1996), and Keren, Levhari, and Byalsky (2000). Barkai (1977) is based on data collection, but assumes ideological factors and analyzes the kibbutz movement as a whole.

<sup>6</sup>Theoretical contributions include Ward (1958), Farrell and Scotchmer (1988), Kandel and Lazear (1992), Kremer (1997), and Levin and Tadelis (2005).

<sup>7</sup>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; Craig (1994) focus on a cooperative's response to shocks compared to conventional firms; Lamoreaux (1995) studies the choice between partnerships and other forms of organization in early 19th century American business; Garicano and Hubbard (2005) is a study of law firms' field boundaries.

I develop and evaluate the hypothesis that kibbutzim are means to provide insurance when individuals cannot legally commit to stay once their ability (productivity) is realized. A high degree of equality within a kibbutz provides insurance, but discourages participation of productive individuals (who can get a higher performance-based pay outside). This potential negative selection limits the degree of equality. To mitigate this adverse selection problem, entry is restricted to young individuals with similar prospects (ex-ante homogenous). Negative selection may still take place ex-post as those who realize they are the most productive might exit. To retain these productive individuals and maintain a high degree of equality, common ownership of assets serves as a “lock-in” device, because members who leave lose their share. Norms and ideology facilitate a high degree of equality, but they are not sufficient in retaining productive individuals.<sup>8</sup> Moral hazard is alleviated by social sanctions that are effective due to the small size and internal organization of these communities.

The theory provides a reinterpretation of kibbutzim. It is consistent with their creation, rules and internal organization, relatively small size, high restrictions on entry, demographic patterns, and the timing of the recent shift away from equal-sharing.

I build a model of a kibbutz to capture the trade-off between insurance (income-equality) and participation. The model highlights the role of common ownership of assets (wealth) that cannot be taken upon leaving in retaining productive individuals and facilitating a high degree of income equality. 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 a 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 might prefer to leave and earn a wage premium outside. Low equality reduces insurance but retains high-ability individuals.

The model yields two main testable predictions. First, under equal-sharing, higher wealth leads to less exit. Moreover, the propensity to leave is a function of productivity. Specifically, the most productive individuals have the highest propensity to exit. Second, the degree of equality is a function of the kibbutz’s

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<sup>8</sup>Kibbutzim have always been viewed by scholars and observers as purely driven by ideology and norms. See, for example, Talmon (1972), Don (1995), Rosner and Getz (1996), and Leviatan and Rosner (2000).

wealth. Specifically, the higher the wealth, the higher the degree of equality. These predictions differ from those of the sociological conjecture, which predicts that the more ideological kibbutzim, or those whose ideology-level remained stronger, will be more likely to maintain equal-sharing.

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

Events in the late 1980s provide the variation required to identify the effect of wealth on the degree of equality. Following a dramatic government anti-inflation program, different kibbutzim unexpectedly found themselves with less wealth and uneven wealth positions. At the same time, regulation was introduced to stop kibbutzim borrowing from one another. This essentially forced each kibbutz to base its decisions on its own wealth, rather than the common wealth.

The analysis lends support to 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 wealthier kibbutzim maintained higher degree of equality, that when kibbutzim were all based on equal-sharing, higher wealth lead to lower exit rates, and that individuals who left in this period were positively selected in their education and skill compared to stayers.

Furthermore, organizations with stronger ideology maintained a higher degree of equality. Specifically, the higher the socialist ideology, the higher the degree of equality, and the sharper the decline in socialist ideology, the lower the degree of equality. However, economic forces predominated. That is, wealth appears to explain more of the variation in the degree of equality than does ideology. Moreover, whereas wealth is an important determinant of exit rates, ideology is not. Interestingly, group size does not affect the degree of equality, suggesting that norms undermined by group size do not play a role in determining the degree of equality.

This paper proceeds as follows. The next section suggests that a kibbutz can be viewed as an insurance device with lack of commitment of members to stay once their ability is realized. I claim that kibbutzim are suitable to test models of insurance with lack of commitment and show that the key assumptions and ingredients of such models describe kibbutzim well. I provide a simple model that captures the trade-off

between insurance and participation that is inherent to equal-sharing arrangements. After describing the data and main identifying variation in section 3, section 4 tests the implications of the model that wealthier kibbutzim maintain a higher level of equality, that under equal-sharing higher wealth leads to more exit, and that the most productive members are more likely to exit. This section also analyzes the role of ideology in determining the degree of equality, and evaluates the relative roles of wealth and ideology in the degree of equality. Section 5 concludes and discusses the generality of the papers' insights.

## 2 Theoretical Framework and Background

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.<sup>9</sup> 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 would exit. Providing this consumption-level, however, would require a higher level of production than that produced by the group (does not satisfy the budget constraint). To restore balanced budget, assume that each individual makes a sunk contribution (before productivity is realized) that cannot be recovered upon exit. If this sunk contribution generates a sufficiently high return, then it allows full-insurance through equal-sharing.

The key ingredients of such a model are: insurance through a high degree of income equality; voluntary participation; sunk contributions; and ex-ante homogeneity in expected productivity. Sections 2.1-2.4 suggest that these ingredients describe kibbutzim well, and section 2.5 presents the model formally. Individuals make sunk contributions by giving up all their private property, which cannot be recovered upon exit. Common ownership of assets facilitates insurance. However, not all kibbutzim provide full insurance, suggesting that common wealth is not always sufficiently high to support full insurance. The comparative statics of common wealth on the degree of insurance will provide the main testable implication of the model.

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<sup>9</sup>The model adapts to kibbutzim a simplified version of the model by Hendel and Lizzeri (2003) (that described the life insurance market) that was built on Harris and Holmstrom (1982) (in the context of labor market).

## 2.1 The Rise and Fall of Equal-sharing

Initially, kibbutzim were primarily communal farms, but later shifted to industrial production. Kibbutzim were established mainly by young immigrants with socialist ideology from eastern Europe who wanted to create a new voluntary egalitarian way of life. The first kibbutz (called Degania) was established in 1910, but the majority of 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, 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.

Standard of living in kibbutzim was considered higher than the country's average (Barkai 1977), and virtually all of them were based on equal-sharing. Since the late-1980s, however, exit rates increased sharply. As presented later, over 20% of members left their kibbutz between 1983 and 1995. TABLE 1 shows that, overall, membership in kibbutzim grew continuously throughout the century until the mid-1980s, but has shrunk since then. Subsequently, many kibbutzim shifted away from equal-sharing by introducing various degrees of reforms. The reforms range from small deviations from equal-sharing to substantial reforms that essentially transformed those kibbutzim into capitalist neighborhoods.

## 2.2 Insurance through a high degree of equality

A 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.<sup>10</sup> Since an average kibbutz consists of four hundred members with different occupations and abilities, working in different industries, equal-sharing provided members and their families with valuable insurance against productivity shocks. Such productivity shocks could result from illness, unemployment, or disability.<sup>11</sup>

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<sup>10</sup>Equal-sharing reflected the Marxist principal "from each according to his ability to each according to his needs". In practice, kibbutzim used a few distribution techniques that both 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.

<sup>11</sup>In early days the newcomers often got sick with malaria and "as much as half of the work force could be idle because of illness on a given day" (Near 1992a). But even as insurance markets developed, equal-sharing provided kibbutz members with potentially valuable insurance against shocks to their human capital, which does not exist elsewhere (the only insurance markets available against shocks to human capital are life insurance and disability insurance).

Insurance is not only a by-product of equality, but is also a main objective of kibbutzim. First, mutual aid across members within a kibbutz and across kibbutzim have been fundamental principles.<sup>12</sup> Regardless of the source of risk, a kibbutz member knew that whatever her circumstances might be and whatever her ability and the income she would bring, she (and her family) will always be provided with an average income and be taken care of when necessary.<sup>13</sup> Second, surveys conducted in the past 40 years indicate that risk-sharing is an important aspect of kibbutzim.<sup>14</sup> The language used by kibbutzim to define their new status illustrates the importance of insurance. Kibbutzim that maintains equal-sharing are called *shitufim* (Hebrew for “full-sharing”) and even ones that shift away from equal-sharing are called “safety net”, to emphasize that even a widely reformed kibbutz would provide substantial insurance.

### **2.3 Ex-ante homogeneity, sunk contribution and voluntary participation**

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 share a comparatively long period of social, ideological, and vocational training.” (Talmon 1972, p. 2)

A key principle is 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

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<sup>12</sup>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” (Source: kibbutz’s bylaws).

<sup>13</sup>Itzhak Tabenkin, an early leader in the kibbutz, 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. . . .”

<sup>14</sup>In a survey conducted in late 1960s comprising over a thousand members of the first and second generations (Rosner Menachem and Leviatan 1990), the factors “guaranteeing full social security”, “freedom from economic concern and competition” and “guaranteeing an adequate standard of living” were ranked as important objectives of members. These three factors taken together were ranked second in importance only to “establishment of a just society”, which itself contains insurance elements. More respondents highlighted such economic concerns than ideological objectives such as “fostering fellowship among members”, “promotion of socialism”, “service to the country”, “absorption of immigrants”, etc. Even today, when many kibbutzim shift away from the traditional equal-sharing, surveys of public opinion conducted in the last two decades (by the Center for Kibbutz Studies) indicate that the vast majority of members view the mutual guarantee as a crucial element for the future of kibbutzim.



the kibbutz determines the member's job and takes care of all his needs including the needs of his dependents.<sup>15</sup>

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

Another key principal is voluntary participation. That is, each member can exit at will and earn a wage-premium for her ability outside the kibbutz (but she cannot take her share in the kibbutz upon exit).<sup>16</sup> Moreover, kibbutz-born individuals are, by and large, entitled to stay. Kibbutz-born individuals in young age can also be thought of as ex-ante the same. As they learn their productivity, they decide whether to leave. Indeed, the data suggest that members who leave their kibbutz are typically between 20 and 40 years old, and very few members leave before 20 or after 45 (see FIGURE 1).

Entry to kibbutzim from the outside, however, is restricted as kibbutzim are well aware of their attractiveness to low-ability individuals.<sup>17</sup> Other sources of entry prevalent before the 1970s were youth movements from Israel and abroad, and the army through a service as a unit called nahal. Those typically consisted of individuals who were young and similar in their expected productivity ("ex-ante homogenous").

## 2.4 Moral hazard (the free-rider problem)

Why would a member work hard if all she gets is  $1/N$  of the total income? To provide insurance while locking in productive members, the problem of moral hazard had to be addressed. Indeed, the internal organization of kibbutzim suggests an attempt to mitigate moral hazard through social sanctions such as peer pressure. These were feasible since kibbutzim are relatively small (between 50 and 1,000 individuals), privacy is limited, and gossip is rampant. Members lived among the same people they worked with, their children attended the same schools, and they ate in a communal dining hall. Members who were appreciated by their peers were promoted to leadership positions, which were held for only a few years to allow a reward

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<sup>15</sup>Furthermore, the bylaws state that "the property of the kibbutz cannot be distributed among members, both when the kibbutz persist 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, cannot get gifts from outside the kibbutz, and that the kibbutz can seize members' property."

<sup>16</sup>This voluntary aspect makes kibbutzim different than institutions like 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 always both influence and were influenced by it, makes the participation constraint an important consideration in kibbutzim.

<sup>17</sup>See Abramitzky (2007) for an analysis of entry into the kibbutz.

for other members. Kibbutzim, thus, had a comparative advantage over markets in providing insurance due to their ability to mitigate the free rider problem.

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 1992a, p. 38).

The model that follows will, thus, abstract from moral hazard. The empirical test, however, will control for group size, which is expected to affect negatively the degree of equality if moral hazard is less severe in small groups.

## 2.5 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 productivity level (human capital) is revealed over time. Agents can become either high-productivity types with an income of  $\theta_H$  or low-productivity types with an income of  $\theta_L$ , where  $\theta_H > \theta_L$ .<sup>18</sup>

At  $t = 0$ , the planner (kibbutz) offers a contract  $(c_L^*, c_H^*)$ , which is a mapping from  $(\theta_L, \theta_H)$  to consumption. Agents, before knowing their types, decide whether to accept the contract (join the kibbutz), 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 (don’t 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 can then 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 only 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-types and  $u(\theta_L)$  if they are low-types.

The planner is subject to a budget constraint ( $BC$ ),  $\frac{1}{2}c_H + \frac{1}{2}c_L \leq \frac{1}{2}\theta_H + \frac{1}{2}\theta_L + K$ , i.e. he cannot provide members with more than the sum of their income and assets. The planner is also subject to an

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<sup>18</sup>A model that accounts for the possibility of residual uncertainty, whereby individuals get imperfect signals on their productivity is presented in Appendix A.

ex-ante participation constraint,  $\frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \geq \frac{1}{2}u(\theta_H + K) + \frac{1}{2}u(\theta_L + K)$  and to ex-post participation constraints,  $u(c_H) \geq u(\theta_H)$  and  $u(c_L) \geq u(\theta_L)$ , i.e. agents will only accept the contract if it provides them at least their expected outside option.

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

$$\begin{aligned} & \max_{c_L, c_H} \frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \\ & \text{subject to:} \\ & (BC) : \frac{1}{2}c_H + \frac{1}{2}c_L \leq \frac{1}{2}\theta_H + \frac{1}{2}\theta_L + K \\ & \text{ex-ante } (PC) : \frac{1}{2}u(c_H) + \frac{1}{2}u(c_L) \geq \frac{1}{2}u(\theta_H + K) + \frac{1}{2}u(\theta_L + K) \\ & \text{ex-post } (PCs) : u(c_H) \geq u(\theta_H) \text{ and } u(c_L) \geq u(\theta_L) \end{aligned}$$

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.<sup>19</sup> Second, the ex-ante participation constraint is not binding. That is, before knowing their productivity, agents will always contribute their assets to the planner (join the kibbutz). This property highlights the role of ex-ante homogeneity and lack of private property in kibbutzim. Last, in the absence of participation constraints, the optimal contract satisfies equal-sharing due to the concavity of the objective function.<sup>20</sup> With participation constraints, the high-productivity type has a higher propensity to reject the contract and get his marginal productivity  $\theta_H$ . The optimal contract would reflect this propensity.

**Proposition 1** *The higher the wealth ( $K$ ), the higher the degree of equality (i.e. the lower is  $c_H^* - c_L^*$ ).*

**Proof.** If  $K \geq \theta_H - \frac{(\theta_L + \theta_H)}{2}$ , then the participation constraints do not bind. Thus, the optimal contract satisfies equal-sharing  $c_H^* = c_L^* = E[\theta] + K = \frac{(\theta_L + \theta_H)}{2} + K$ . If  $K < \theta_H - \frac{(\theta_L + \theta_H)}{2}$ , then the

<sup>19</sup>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  $PC$ , which increases the objective function. Such an increase implies that  $c_H^*, c_L^*$  are not optimal, which is a contradiction.

<sup>20</sup>Specifically, the optimal contract satisfies  $c_H^* = c_L^* = E[\theta] + K = \frac{(\theta_L + \theta_H)}{2} + K$ . This is a straightforward implication of the fact that the  $BC$  is binding and the concavity of the planner's objective function.

optimal contract increases with  $K$  and satisfies  $c_H^* = \theta_H$  and  $c_L^* = \theta_L + 2K$ . To see this, note that the 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  $K < \theta_H - \frac{(\theta_L + \theta_H)}{2}$  can be rewritten as  $\theta_L + 2K < \theta_H$ , which means 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. ■

Since equal-sharing was practiced in all kibbutzim for a long time, it is important for the empirical analysis to characterize it:

**Proposition 2** (A). *An equal-sharing contract, which is a contract that does not depend on productivity, can be optimal (contract equivalence). (B). Under an equal-sharing contract, high-productivity individuals might exit. (C). Under an equal-sharing contract, higher wealth will pool more productive individuals.*

**Proof.** This proof is based on Hendel and Lizzeri (2003). When  $K > \theta_H - \frac{(\theta_L + \theta_H)}{2}$ , then  $c_H^* = c_L^* = E[\theta] + K = \frac{(\theta_L + \theta_H)}{2} + K$  (this is equivalent to the case described above in which the participation constraints do not bind). I need to prove that when  $K < \theta_H - \frac{(\theta_L + \theta_H)}{2}$ , the equal-sharing (non-contingent) contract is equivalent to the optimal contingent contract that satisfies  $c_H^* = \theta_H$  and  $c_L^* = \theta_L + 2K$ . Consider the equal-sharing contract  $c_H^* = c_L^* = \theta_L + 2K$ . Under this contract, high-productivity individuals will exit and get their outside option  $\theta_H$ , 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). An equal-sharing contract with exit of high-productivity individuals is, thus, equivalent to the optimal contract described in proposition 1. Notice that the *BC* and *PCs* are satisfied, and the objective function is maximized. Notice also that the equal-sharing contract involves exit of high-productivity types when  $K < \theta_H - \frac{(\theta_L + \theta_H)}{2}$ , but no exit when  $K > \theta_H - \frac{(\theta_L + \theta_H)}{2}$ . That is, under an equal-sharing contract higher wealth will pool more productive individuals. ■

To summarize, the model has the following predictions:

- Optimal contracts involve giving up assets (wealth) to the planner.
- Under equal-sharing, high-productivity individuals might exit.
- Higher wealth pools more productive individuals. That is, higher wealth involves less exit.

- The higher the wealth, the higher the degree of equality.

### 3 Data and Identification

#### 3.1 Data

The data set contains information on 184 kibbutzim (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 they are religious kibbutzim (16 kibbutzim), which are different in their nature and with respect to which there is insufficient quantitative information.<sup>21</sup>

The data contain kibbutz-level information on: the degree of income equality; five measures of wealth; four measures of socialist ideology; year established; and demographic information such as the group size (number of members), age distribution and average household size. Appendix B provides definitions of the variables.

Members’ earnings go to their kibbutz and each member receive a budget according to the compensation scheme used. Some kibbutzim maintain equal-sharing, whereby all members receive an equal budget. In other kibbutzim, a 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 definition is the rank of kibbutzim from a low (1) to a high (4) degree of equality. Specifically, I assign 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 B for definitions). The second definition is a dummy variable that takes the value 1 if the kibbutz is based on equal-sharing (“full-sharing”) and zero otherwise.

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<sup>21</sup>In any case, religious kibbutzim provide an interesting comparison group, as they did not experience a financial crisis, and, as predicted, many of them still maintain equal-sharing. Excluding them, thus, works against the hypothesis that I am testing.

Since there is no single ideal measure of a kibbutz's wealth, I use several measures - the fixed capital as reflected in balance sheets, a credit rating (1-4) assigned by D&B company, 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 these measures through factor analysis. There is a single dominant factor, which both builds equally on all the four measures and accounts for 65% of the variation between them. I call this (standard deviation - normalized) measure "wealth score" and use it as a fifth measure of wealth.<sup>22</sup>

I employ four measures of a kibbutz's ideology and ideological decline, acknowledging that ideology is more complex than can be captured by observable measures. The first measure is a dummy variable for whether the kibbutz belong to the Artzi movement, which is a standard measure of ideology used by sociologists of kibbutzim.<sup>23</sup> Artzi is viewed as a more ideological movement than the Takam movement, and as more conservative in preserving kibbutz values.<sup>24</sup> On the other hand, movement affiliation has no practical implication on life in kibbutzim ((Near 1992b)). The second measure is the percentage of members voting to 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 variable of all these measures through factor component analysis. There is a single dominant factor, which builds equally on all the ideology measures and accounts for 70% of the variation between 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 also allows me to test the sociological conjecture that more ideological organizations (or those whose ideology declined less) will maintain a higher degree of equality, and to

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<sup>22</sup>The scoring coefficients are: credit rating (1-4): 0.340, economic status: 0.349, fixed capital 0.283 and credit rating (1-100): 0.255.

<sup>23</sup>See, for example, Rosner and Tannenbaum (1987), Rosner and Getz (1996) and Simons and Ingram (1997). 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).

<sup>24</sup>A more refined measure (but less commonly used among sociologists) exploits the variation in ideology within the less ideological Takam movement, as was revealed in an ideological split during the 1950s into two sub-movements. In the early 1950s Meuhad movement was divided into Meuhad (around 2/3) and Ihud (1/3). Ihud continued to support Mapai. Meuhad supported the leftist Mapam, was pro-Soviet during the cold war (and 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. See Near (1992a, pp. 210-215). Results are available from the author.

evaluate the relative importance of economic and sociological forces.

Variables used in the kibbutz-level analysis are further described in Appendix B, and descriptive statistics are presented in TABLE 2.

### 3.2 Identifying variation in kibbutzim’s wealth

Before the crisis, members of all kibbutzim had very similar living standards, based on their movements’ recommended per-member expenditure. To support an equal living standards across kibbutzim, assets and corporations were shared, and a system of mutual guarantees was in place.<sup>25</sup> In other words, the relevant variable for each kibbutz was the total wealth of kibbutzim. Two events in the late 1980s and 1990s created exogenous variation in kibbutzim’s wealth.

The first was an unexpected crisis (known as “the kibbutzim crisis”) that reduced the wealth of some kibbutzim more than others. The crisis was largely a matter of luck, timing, and whether the financial officers made decisions that turned out well given the unexpected features of the government stabilization program. Specifically, in the decade prior to the crisis, kibbutzim had been borrowing on a large scale to enlarge members’ apartments to facilitate the move of their children home (prior to that, children used to live in separate residences) and to improve the dining halls, swimming pools, theaters, etc. At first, loans were not linked to the cost-of-living index and they 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 the exact timing of their loans.<sup>26</sup> There were a few other contributors for the crisis. 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 1992a, p. 346)

The system of mutual guarantees could have made each kibbutz liable to the wealth of all kibbutzim.

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<sup>25</sup>See, for example, Near (1992b), Rosner and Getz (1996) 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.

<sup>26</sup>Many other businesses went bankrupt and the cooperative Moshav villages were also hit severely.

However, a regulation dissolved this mutual guarantee, essentially leaving each kibbutz with a different level of wealth as determined by the crisis.<sup>27</sup> Kibbutzim suddenly had to face their own wealth constraint and to reduce their living standards to various degrees.

To sum up, kibbutzim had similar wealth before the crisis. The crisis hit kibbutzim asymmetrically, and subsequent regulation disallowed the system of mutual guarantee, making the variation in kibbutzim's post-crisis wealth largely exogenous. This led to the shift from identical equal-sharing across all kibbutzim.

## 4 The determinants of equality

### 4.1 Higher wealth leads to a higher degree of equality

This section tests the prediction that wealthier kibbutzim maintain a higher degree of equality. The analysis also controls for group size, to test whether smaller groups, where monitoring and peer pressure is easier, better alleviate moral hazard and maintain a higher degree of equality.

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 partly shared equally, but contains a large percentage based on her own earnings. To test the determinants of the degree of equality, I perform the following regression of the degree of equality on the kibbutz’s wealth and a set of controls:

$$Equality_i = \alpha + \delta_1 Wealth_i + \beta' X_i + \varepsilon_i,$$

where  $Equality_i$  is kibbutz  $i$ 's degree of income equality,  $Wealth_i$  is the post-crisis wealth of kibbutz  $i$ , and  $X_i$  are other variables that may affect the degree of equality such as socialist ideology, group size, year of establishment, average household size, land per-member, and age distribution.<sup>28</sup>

As mentioned, I use two definitions of the degree of equality. The first dependent variable is discrete and can be ranked from high (4) to low (1), so I perform an Ordered Probit regression analysis (in addition to OLS regression analysis) to test the determinants of the degree of income equality.<sup>29</sup> The second is a

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<sup>27</sup>Regulations followed complex negotiations between the movements, the banks and the government starting in 1989, when the government, the banks and the kibbutzim established an independent Kibbutz Arrangement Board, which dissolved the mutual aid across and forced each kibbutz to deal with its own circumstances.

<sup>28</sup>Notice that the *degree* of equality also represents the *change* in the degree of equality, as all kibbutzim were previously based on equal-sharing.

<sup>29</sup>The Ordered Probit regression treats outcomes as ordinal rather than cardinal. Whereas multinomial discrete choice



dummy variable that equals 1 if the kibbutz implements equal-sharing, so I perform a Probit regression analysis (in addition to OLS regression analysis) to test the determinants of equal-sharing.

The following are the main findings of the regressions:

**Result 1** *The higher the wealth, the higher the degree of equality*

FIGURE 2 illustrates the unconditional relationship between wealth and the degree of equality.<sup>30</sup> The figure shows that higher wealth is associated with a higher degree of equality.

TABLE 3 investigates the relationship between the degree of equality and a kibbutz’s wealth.<sup>31</sup> Each of columns (1)-(5) reports an Ordered Probit regression using a different measure of wealth, and a similar set of controls including group size, year established, average household size, land per-member and members’ average age. 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 measure increases the probability of equal-sharing by almost 90% (from 13.58% to 25.8%), increases the probability of a medium/high degree of equality by almost 40% (from 10.1% to 14.9%), increases the probability of medium/low degree of equality by over 20% (from 19.3% to 23.8%), and decreases the probability of the lowest degree of equality by over 35% (from 56.8% to 35.6%).

Column (6) reports an Ordered Probit regression using the wealth score measure without additional controls. This reduces the wealth coefficient, but it remains large and significant. Columns (7) and (8) investigate the association between equal-sharing and wealth. Columns (7) reports the marginal coefficients from a Probit regression using the wealth score measure and controls. The wealth score is strongly and

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models ignore the ordinal nature of the level of equality, OLS regression would attach a cardinal meaning for the four levels of equality. A kibbutz is assumed to have its “preferred” degree of equality  $D_{2i}^*$  and choose the equality-level category *Equality<sub>i</sub>* closest to its preferences. Let  $D_{2i}^*$  be the (unobserved) preferred level of equality of kibbutz  $i$ .

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

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

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

<sup>30</sup>For presentation purposes, FIGURE 2 presents only the three non-continuous measures of wealth.

<sup>31</sup>The marginal effects in the Ordered Probit regression are  $\frac{\partial Prob(D_2=1)}{\partial x_1} = -\Phi(-\beta'x_1)$ ,  $\frac{\partial Prob(D_2=2)}{\partial x_1} = [\Phi(-\beta'x_1) - \Phi(\mu_2 - \beta'x_1)]\beta$ ,  $\frac{\partial Prob(D_2=3)}{\partial x_1} = [\Phi(\mu_2 - \beta'x_1) - \Phi(\mu_3 - \beta'x_1)]\beta$ ,  $\frac{\partial Prob(D_2=4)}{\partial x_1} = \Phi(\mu_3 - \beta'x_1)\beta$ .

significantly associated with equal-sharing. An increase of one standard deviation in the wealth score increases the likelihood of maintaining equal-sharing from 12.1% to 23.8%. Column (8) reports the Probit regression without additional controls. The results are very similar. An increase of one standard deviation in the wealth score increases the likelihood of maintaining equal-sharing from 14.8% to 25.8%. Overall, TABLE 3 suggests that the degree of equality is positively and significantly correlated with a kibbutz's wealth.

TABLE C1 in Appendix C presents the marginal effects (described above) using the wealth score measure.<sup>32</sup> Table C2 in Appendix C present similar regressions using linear probabilities (OLS) instead of Ordered Probit and Probit. The results are similar - TABLE C2 suggests that, for all measures of wealth, higher wealth is associated with more equality.

**Result 2** *Group size does not have a significant effect on a kibbutz's degree of equality.*

Smaller groups might be expected to be more effective in peer pressure and mutual monitoring, thus better at alleviating moral hazard. The empirical analysis, however, reflects no effect of group size on equality. Specifically, TABLE 3 suggests that group size is not correlated with equality. This probably reflects the fact that even large kibbutzim are small enough to make social sanctions effective, and thus moral hazard in kibbutzim is mitigated symmetrically in groups of all sizes.

Differences in group size in kibbutzim largely reflect the historical decisions by the movements at the time of founding the kibbutz. A possible endogeneity, however, is due to the high exit since the late-1980s and 1990s. To account for it, I repeat all the regressions with an historical group size - in the year before the crisis (1984), when exit was low. The results when using the 1984 group size are similar and they are presented in TABLE C3 of Appendix C. The table suggests that group size is not correlated with equality.

I control for average household size to capture the conjecture that larger households may face higher exit costs, and they may also benefit more from the kibbutz's local public goods due to their non-exclusive nature. Therefore, kibbutzim whose households are bigger are expected to maintain a higher degree of equality.<sup>33</sup> Nevertheless, average household size does not affect the degree of equality.

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<sup>32</sup>The marginal effects are very similar when using any of the other measures of wealth - regressions available from author.

<sup>33</sup>In the past, when children used to live in special residences outside parents' homes, most households consisted of only the parents. Nowadays, children live with their parents.

I control for the size (in square meters) of land per member to capture the conjecture that a larger area per member might make it more costly for members to exit, thus making it easier to maintain a high degree of equality. Nevertheless, area per member does not affect the degree of equality.

An important determinant of equality appears to be the age distribution of the population. The age distribution proxies for the different incentives of individuals at different ages. Old individuals might lose from the reforms as they no longer work and would thus earn less under pay-for-performance than under equal-sharing. At the same time, the older generation may be more ideological and committed to kibbutz values of equality. These factors are expected to make kibbutzim with more older individuals more likely to implement a higher degree of equality. On the other hand, old individuals are “locked-in” in their kibbutz, and their compensation largely depends on the younger members. Old members would therefore lose more from high exit rates. This factor makes kibbutzim with more 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.<sup>34</sup>

## 4.2 The role of ideology in determining the degree of equality

This section evaluates the sociological conjecture that more ideological kibbutzim will maintain a higher degree of equality. Specifically, I include in the analysis measures of socialist ideology and run the following regressions:

$$Equality_i = \alpha + \gamma_1 Ideology_i + \gamma_2 Wealth_i + \beta' X_i + \varepsilon_i,$$

where  $Equality_i$  is kibbutz  $i$ 's degree of income equality,  $Ideology_i$  is the level of socialist ideology (or the decline kibbutz  $i$ 's socialist ideology),  $Wealth_i$  is the post-crisis 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. As before, I will use an Ordered Probit regression when the dependent variable is ordered and a Probit when the dependent variable is binary (whether equal-sharing).

I find that:

**Result 3** *The stronger the ideology, the higher the degree of equality.*

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<sup>34</sup>The regressions presented in this paper use the average age of members who are above 29, but the same negative effect holds when instead using: average age above 21; % of members over 40, % members above 56; % of members above 60.

TABLE 4 presents the regression results. Each of columns (1)-(4) reports an Ordered Probit regression using a different measure of ideology, and columns (5)-(8) reports the regression results when controls for group size, year established, average household size, land per-member and members' average age are added. The coefficients with and without controls are very similar. The ideology measures in all regressions are strongly positively and significantly associated with a higher degree of equality.<sup>35</sup> For example, belonging to the most socialist movement (Artzi) increases the probability of equal-sharing by 70% (from 13.5% to 23%), and decreases the probability of the lowest degree of equality ("safety-net" category) by about 25% (from 56.8% to 40.8%). Similarly, a 10% increase in voting to socialist parties increases the probability of equal-sharing from 12.1% to 20.1%, and decreases the probability of a low degree of equality from 58.2% to 42.2%. Columns (3) and (7) suggest that kibbutzim that experienced a sharper decline in voting to socialist parties maintain a lower degree of equality. A 10% increase in the decline in voting to socialist parties decreases the probability of equal-sharing from 12.1% to 4.1%, decreases the probability of medium/high degree of equality from 9.6% to 4.6%, decreases the probability of medium/low degree of equality from 20.7% to 16.7%, and increases the probability of a low degree of equality from 57.6% to 73.6%.

Columns (9)-(12) investigate the association between equal-sharing and ideology. Columns (9) and (10) report the marginal coefficients from a Probit regression using alternative measures of ideology. Similar to the Ordered Probit regressions, the ideology measures are strongly and significantly associated with equal-sharing (besides the percentage of voting to socialist parties, which is not significant). For example, an increase of one standard deviation in the ideology score increases the probability of equal-sharing from 12.1% to 23.4%. Overall, TABLE 4 suggests that the degree of equality is positively and significantly correlated with a kibbutz's ideology.

TABLES C4-C7 of Appendix C report the marginal coefficients (described above) from the Ordered Probit regressions using alternative measures of ideology. TABLE C7 reports the marginal coefficients using the ideology score. A one standard-deviation increase in the ideology score increases the probability of equal-sharing from 12.1% to 19.2%, increases the probability of a medium/high degree of equality from

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<sup>35</sup>In regressions that use as wealth measures the credit rating or the economic strength measures alone, belonging to the most socialist movement did not have a statistically significant effect on a kibbutz's degree of equality. The wealth measures, on the other hand, are statistically significant at 1% regardless of ideology measure used.

9.7% to 13%, increases the probability of a medium/low degree of equality from 20.6% to 24.1%, and reduces the probability of a low degree of equality from 57.6% to 43.7%.

**Result 4** *Wealth is more important than ideology in determining the degree of equality*

One rough way to quantify the relative importance of wealth (economics) and ideology (sociology) is to ask how much of the variation in the degree of equality can be explained by wealth alone, how much of the variation can be explained by ideology alone, and how much of the variation can be explained by both. Specifically, I run an OLS regression of the degree of equality on the wealth score and ideology score and examine their relative contribution to R-squared.

The analysis, presented in TABLE 5A, suggests that economic factors are more important than sociological factors. Columns (1)-(3) report the results from OLS regressions of the degree of equality on either the wealth score, or the ideology score, or both. Columns (4)-(7) report the regression results when control variables are added. The regressions without controls suggest that when the wealth and ideology scores are both put in the regression (column 1), they explain 17% of the variation in the degree of equality (R-squared is equal to 0.17). When the ideology score is taken out of the regression (column 2), the wealth score explains 14% of the variation in equality. When, instead, the wealth score is removed from the regression (column 3), the ideology score explains 6% of the variation in the degree of equality. The regressions with controls suggest that when the wealth and ideology scores are both put into the same regression (column 4), they together explain 23% of the variation in the degree of equality. When the ideology score is taken out of the regression (column 5), the wealth score alone explains 20% of the variation in equality. When, instead, the wealth score is removed from the regression (column 6), the ideology score alone explains 13% of the variation in the degree of equality. The control variables alone explain 6% of the variation (column 7).

Columns (8)-(10) report the coefficients from a linear probability regression (OLS) of equal-sharing on either the wealth score, or the ideology score, or both. The regressions suggest that when the wealth and ideology scores are both put into the same regression (column 8), they together explain 14% of the variation in equal-sharing. When the ideology score is taken out of the regression (column 9), the wealth

score alone explains 14% of the variation in equal-sharing. When, instead, the wealth score is removed from the regression (column 10), the ideology score alone explains 7% of the variation in equal-sharing.

A similar two-step procedure to quantify the relative importance of wealth and ideology is to: (1) Run an OLS regression of the degree of equality on the wealth score and (2) Run an OLS regression of the residuals from the first regression on the ideology score. The R-squared of the first regression indicates how much of the variation in the degree of equality is due to wealth, and the R-squared of the second regression indicate how much of the remaining variation (not due to wealth) is due to ideology. I repeat the same 2-step procedure reversing the order of ideology and wealth, that is, running OLS regression of equality on ideology and then running an OLS regression of the residuals on wealth.

The analysis is presented in TABLE 5B. Panel A reports the first-stage regression results (equality on wealth or ideology) and Panel B reports the second-stage results (residuals from stage-one on ideology or wealth). Columns (1)-(4) have the degree of equality as a dependent variable and columns (5)-(8) have a dummy variable for equal-sharing as the dependent variable. Column (1) suggests that the wealth score alone explains 14% of the variation in the degree of equality, and the ideology score explains 3% of the remaining variation in equality. Column (2) suggests that ideology alone explains 6% of the variation in equality, and that wealth explains 10% of the remaining variation in equality. Columns (3) and (4) repeat the same exercise when control variables are added to both stage 1 and stage 2. The results are similar to the ones without controls. Column (3) suggests that the wealth score and the controls account for 20% of the variation in the degree of equality, and that the ideology score account for 4% of the remaining variation. Column (4) suggest that the ideology score and the controls together account for 13% of the variation in equality, and that wealth accounts for 11% of the remaining variation. Columns (5)-(8) report similar results from a linear probability regression (OLS) of equal-sharing on either the wealth score, or the ideology score, or both. Overall, the exercise reported in TABLE 5A and TABLE 5B suggest that wealth is more important than ideology in determining the degree of equality in kibbutzim.

### 4.3 Under equal-sharing, higher wealth reduces exit rates

This section employs the organization-level data to test the prediction that, under equal-sharing, wealthier kibbutzim experience lower exit rates. FIGURE 3 illustrates that under equal-sharing, higher post-crisis wealth leads to less exit.

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

$$Exit - rate_i = \alpha + \beta_1 Wealth_i + \beta_2 Ideology_i + \gamma' X_i + \varepsilon_i,$$

where  $Exit - rate_i$  is kibbutz  $i$ 's exit rate,  $Wealth_i$  is the post-crisis 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. Since Artzi and Takam recorded exit rates differently, I control for Artzi in all regressions. Hence, unlike the previous regressions, Artzi cannot be interpreted here as a measure of ideology.

The regression results, presented in TABLE 6, suggest that when kibbutzim all practiced equal-sharing, wealthier kibbutzim experienced lower exit rates. Each of columns (1)-(12) reports the coefficients from an OLS regression using a different measure of wealth. Columns (1) and (3) reports the results from a regression with a set of controls and columns (2) and (4) reports the results from a regression without controls. Column (1) and (2) suggest that when credit rating increases by one unit, exit rates decline by 0.57 percentage points with controls and 0.89 percentage points without controls. Column (3) and (4) suggest that when a kibbutz's economic strength measure increases by one unit, exit rates decline by 0.32 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 to socialist parties, does not play a role in determining the degree of equality. Also, a decline in voting to socialist parties is not correlated with exit rates. Bigger groups experience lower exit rates and higher average age is associated with less exit.

Similarly, a straightforward comparative static of the model is that an increase in expected productivity

would lead to more exit.<sup>36</sup> Unfortunately, I do not have data on exit before the 1980s. However, FIGURE 4 illustrates that membership in the kibbutz has been roughly countercyclical in the period 1966–2000. The correlation between kibbutz membership and the growth of GDP per capita in that period is  $-0.22$ .<sup>37</sup> For the period 1922–1947, the correlation between kibbutz membership and the growth of NNP is  $-0.14$ .<sup>38</sup>

#### 4.4 High-productivity types are more likely to leave equal-sharing: individual-level analysis

Another implication of the model is that exit is not random; more productive individuals are more likely to exit under equal-sharing. The analysis in Abramitzky (2007) shows that this is indeed the case.<sup>39</sup>

The data set is a 4% random representative sample of the Israeli population, including kibbutz members who are linked between the 1983 and the 1995 Israeli Censuses of Population (the link was done by the Israeli Central Bureau of Statistics).<sup>40</sup> This is a period in which all kibbutzim were based on equal-sharing and the reforms had not yet been implemented. This data set allows me to compare the education and occupation of kibbutz-to-city migrants with those of kibbutz members who stayed in the kibbutz, and to compare the earnings in the city labor market of those kibbutz-to-city migrants with the earnings of city natives. The data also allow me to compare the education, occupation and earnings of city-to-kibbutz entrants with those of non-entrants.

I find that individuals who left kibbutzim are more educated and more skilled than individuals who stayed. Specifically, a Probit analysis of exit suggests that having at least a high school education increases the exit rate by 9.8 percentage points, that individuals with high-skill occupations are over 8 percentage points more likely to leave the kibbutz, and that low-skill individuals are over 9 percentage points less likely to exit. Moreover, I show that once in the city individuals who left kibbutzim earned higher wages

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<sup>36</sup>An increase in expected productivity can be interpreted in the model as an increase of  $\theta_H$  and  $\theta_L$ . Such an increase makes equal-sharing with exit (as opposed to equal-sharing without exit) an equilibrium for more values of  $K$ . That is,  $K < \theta_H - \frac{(\theta_L + \theta_H)}{2}$  for more values of  $K$ .

<sup>37</sup>I do not have demographic information on kibbutzim for the period 1948–1966. I do not have consistent data on exit before the 1980s. Note that changes in membership size reflects mostly exit, since entry is relatively low.

<sup>38</sup>The data on Israel’s NNP in this period is taken from Metzger (1998).

<sup>39</sup>In that paper, I employ the census individual-level dataset to test Borjas’ selection hypothesis that migrants’ self-selection depends on the difference in earnings inequality between the origin and the destination.

<sup>40</sup>Individuals in the sample 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.



than observably similar city natives.

An implicit assumption of the model is that there is no entry at a stage in which productivity is already known, to avoid adverse selection. This assumption fits kibbutzim, as entry from the outside (as opposed to kibbutz-born individuals who stay) is low. Allowing such entry is expected to result in adverse selection, whereby only low-productivity individuals will enter. Thus, kibbutzim limit entry from the outside and screen applicants to make sure that they could earn no less than the average member.<sup>41</sup> Despite the screening efforts of kibbutzim and the resulting low entry, entrants to kibbutzim (city-to-kibbutz migrants) are negatively selected compared to non-entrants. *Ceteris paribus*, I find that entrants earned a lower wage prior to entry compared to non-entrants, they had lower wealth and they worked fewer hours on their jobs.

Unfortunately, the two data sets cannot be combined since the individual-level data do not provide information on the name of kibbutz in which individuals reside (because of confidentiality concerns of the Israeli Central Bureau of Statistics).

## 5 Conclusion

This paper provides an economic interpretation of kibbutzim. The analysis suggests that while both economics and sociological factors play a role in determining compensation pay, economic forces dominate. Because kibbutzim have a strong ideological bent, this analysis is likely to provide a lower bound to the role of economic forces in determining the sharing rules in organizations.

I show that kibbutzim fit the predictions of an optimal insurance model without commitment. *Ceteris paribus*, 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. The theory is also consistent with the creation of these organizations, their rules and internal organization, their relatively small size, the 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* homogenous in their expected productivity, and who came to a new land full of uncertainties. They wanted insurance, but must

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<sup>41</sup>Levin and Tadelis (2005) show that partnerships only admit new partners who are better than the average partner.

have realized that members who would turn out to be 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. The lack of privacy that is a by-product of the monitoring may explain why not everyone wishes to live in a kibbutz and why kibbutzim account for a small share of the population.

Kibbutzim were all based on equal-sharing as long as they were rich enough relative to the general population. The wealth shock of the late-1980s and regulation that forced kibbutzim to rely on their own assets, however, asymmetrically reduced kibbutzim's wealth.<sup>42</sup> This led to exit of productive individuals, while wealthier kibbutzim maintained a higher degree of equality and experienced less of a "brain drain." The vast majority of kibbutzim maintain some level insurance, and even kibbutzim that shifted substantially away from equal-sharing are called "safety net kibbutzim."

I expect that kibbutzim that shifted away from equal-sharing would experience a decline in exit rates (compared with immediately before the shift). While it is still too early to test whether this is the case, anecdotal evidence and official reports suggest that the shift away from equality seems to be successful in keeping members inside.<sup>43</sup> The (few) kibbutzim that shifted away from equal-sharing earlier (mid-1990s) experienced a decline in exit rates following the shift.

The findings of this paper contribute to our understanding of contracts, as limited commitment has been shown to play an important role and to limit the degree of insurance in the markets for life insurance ((Hendel and Lizzeri 2003)) and health insurance ((Crocker and Moran 2003)), as well as in informal risk-sharing arrangements in village economies.<sup>44</sup>

The insights of this paper also contribute to our understanding of other organizations such as cooperatives, labor-managed firms and professional partnerships. Despite the many differences between kibbutzim

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<sup>42</sup>Also, the technology-oriented growth of Israel in the 1990s increased the returns to skill outside the kibbutz, which made it more difficult to maintain a high degree of equality. The change in outside option, however, affected all kibbutzim similarly (as Israel is a very small country) and cannot account for the variation in the degree of equality across kibbutzim.

<sup>43</sup>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 one has left (the kibbutz)*" (Source: the Israeli newspaper Yedioth Aharonot of 5/22/02).

<sup>44</sup>Examples include Coate and Ravallion (1993), Ligon (1993), Ligon Ethan (2002), and Attanasio and Albarran (2003).

and professional partnerships, there are also remarkable similarities. Like kibbutzim, professional partnerships are often based on revenue-sharing, which is claimed to provide valuable insurance for partners.<sup>45</sup> Like a kibbutz's members, partners have outside options and they 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 moral hazard and supporting a high degree of equality. Indeed, recent trends in law firms suggest that senior partners are often attracted to leave the firm to corporations. At the same time, law firms seem to be shifting away from seniority-based revenue-sharing.<sup>46</sup> These trends are consistent with the theory and evidence provided in this paper.

Finally, why did kibbutzim persist where many other communes in history did not? One answer is that kibbutzim, despite facing competition from the outside world, have always been flexible. Other communes with radical and rigid belief systems placing them at the margin of society dissolved in response to changes. The kibbutzim's flexibility may be a key factor that will allow them to continue to survive in a changing economic environment, even if in an altered form.

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<sup>45</sup>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 (2005) suggest that risk-sharing is not a main consideration in law firms.

<sup>46</sup>Levin and Tadelis (2005).

## References

- ABELL, P. (1983): “The Viability of Industrial Producer Cooperation,” in *International Yearbook of Organizational Democracy*, ed. by C. Crouch, and F. Heller, vol. 1, pp. 73–103. John Wiley & Sons.
- ABRAMITZKY, R. (2007): “Testing Selection in Migration: Evidence from the Israeli Kibbutz,” Stanford mimeo.
- ACKERBERG, D., AND M. BOTTICINI (2000): “The Choice of Agrarian Contracts in Early Renaissance Tuscany: Risk Sharing, Moral Hazard, or Capital Market Imperfections?,” *Explorations in Economic History*, 37(3), 241–257.
- (2002): “Endogenous Matching and the Empirical Determinants of Contract Form,” *Journal of Political Economy*, 110:3, 564–92.
- ADAMS, S. (1963): “Toward an Understanding of Inequity,” *Journal of Abnormal and Social Psychology*, 67, 422–436.
- AKERLOF, G., AND J. YELLEN (1990): “The Fair Wage-Effort Hypothesis and Unemployment,” *Quarterly Journal of Economics*, CV, 255–283.
- ATTANASIO, O., AND P. ALBARRAN (2003): “Limited Commitment and Crowding Out of Private Transfers: Evidence from a Randomized Experiment,” *Economic Journal*, 113, c77–c85.
- BANERJEE, A., T. BESLEY, AND T. GUINNANE (1994): “Thy Neighbor’s Keeper: The Design of a Credit Cooperative with Theory and a Test,” *Quarterly Journal of Economics*, 109(2), 491–515.
- BARKAI, H. (1977): *Growth Patterns of the Kibbutz Economy*. North-Holland Pub. Co., Amsterdam; New York.
- BERMAN, E. (2000): “Sect, Subsidy, and Sacrifice: An Economist’s View of Ultra-Orthodox Jews,” *Quarterly Journal of Economics*, 115(3), 905–953.
- BERMAN, E., AND R. KLINOV (1997): “Human Capital Investment and Nonparticipation: Evidence from a Sample with Infinite Horizons,” *Falk Institute Discussion Paper*.

- BESLEY, T. (1995): “Nonmarket Institutions for Credit and Risk Sharing in Low-Income Countries,” *Journal of Economic Perspectives*, 9(3), 115–127.
- BESLEY, T., S. COATE, AND G. LOURY (1993): “The Economics of Rotating Savings and Credit Associations,” *American Economic Review*, 83(4), 792–810.
- BEWLEY, T. F. (2000): *Why Wages Don't Fall During a Recession*. Harvard University Press.
- CALOMIRIS, C., AND I. RAJARAMAN (1998): “The Role of ROSCAs: Lumpy Durables or Event Insurance?,” *Journal of Development Economics*, 56(1), 207–216.
- COATE, S., AND M. RAVALLION (1993): “Reciprocity Without Commitment : Characterization and Performance of Informal Insurance Arrangements,” *Journal of Development Economics*, 40, 1–24.
- COŞGEL, M. M., AND J. MURRAY (1998): “Productivity of a Commune: The Shakers, 1850–80,” *Journal of Economic History*, 58(2), 494–510.
- CRAIG, B. (1994): “The empirical Performance of Orthodox Models of the Firm and worker Cooperatives,” *Journal of Political Economy*, 102:4, 718–744.
- CRAIG, B., AND J. PENCAVEL (1992): “The Behavior of Worker Cooperatives: The Plywood Companies of the Pacific Northwest,” *American Economic Review*, 82(5), 1083–1105.
- CROCKER, K., AND J. MORAN (2003): “Contracting with Limited Commitment: Evidence from Employment-Based Health Insurance Contracts,” *RAND Journal of Economics*, 34, 694–718.
- DON, Y. (1995): “Altruism and Cooperative Survival,” in *Advances in the Economic Analysis of Participatory and Labor Managed Firms*, ed. by D. C. Jones, and J. Svejnar, vol. 5, pp. 185–204.
- FARRELL, J., AND S. SCOTCHMER (1988): “Partnerships,” *Quarterly Journal of Economics*, 103(2), 279–297.
- GARICANO, L., AND T. N. HUBBARD (2005): “Specialization, Firms, and Markets: The Division of Labor Within and Between Law Firms,” .

- GAVISH, Y. (2003): "Different Models of Changes in Kibbutzim," a report.
- GAVRON, D. (2000): *The Kibbutz: Awaking from Utopia*. Rowman & Littlefield Publishers, Lanham, MD.
- GAYNOR, M., AND P. GERTLER (1995): "Moral Hazard and Risk Spreading in Partnerships," *RAND Journal of Economics*, 26(4), 591–613.
- GETZ, S. (1990–2000): "Surveys of Changes in Kibbutzim," Discussion paper, The Institute for Research of the Kibbutz and the Cooperative Idea, University of Haifa.
- GUINNANE, T. (2001): "Cooperatives as Information Machines: German Rural Credit Cooperatives, 1883–1914," *Journal of Economic History*, 61(2), 366–389.
- HARRIS, M., AND B. HOLMSTROM (1982): "A Theory of Wage Dynamics," *The Review of Economic Studies*, 49, 315–333.
- HELMAN, A. (1993): "Privatization, Efficiency and the Kibbutz System," *Economic Quarterly*, 40(1), 48–57, In Hebrew.
- HENDEL, AND LIZZERI (2003): "The role of Commitment in Dynamic Contracts: Evidence from Life Insurance," *Quarterly Journal of Economics*, 118:1, 299–327.
- HOFFMAN, P. T. (1984): "The Economic Theory of Sharecropping in Early Modern France," *Journal of Economic History*, 44, 37–55.
- KANDEL, E., AND E. LAZEAR (1992): "Peer Pressure and Partnerships," *Journal of political economy*, 100:4, 801–817.
- KEREN, M., D. LEVHARI, AND M. BYALSKY (2000): *On the Stability of Co-operatives: The Kibbutz as an Example*.
- KREMER, M. (1997): "Why are Worker Cooperatives So Rare?," NBER Working Papers 6118, National Bureau of Economic Research, Cambridge, MA.

- LAMOREAUX, N. (1995): “Constructing Firms: Partnerships and Alternative Contractual Arrangements in Early-Nineteenth-Century American Business,” *Business and Economic History*, 24:2, 43–71.
- LANG, K., AND P.-J. GORDON (1995): “Partnerships as Insurance Devices: Theory and Evidence,” *RAND Journal of Economics*, 26(4), 614–629.
- LEVIATAN, U. (1975): “Factors Connecting Kibbutz Children to their Kibbutz and Reasons for their Exodus,” Discussion paper, The Institute for Study and Research of the Kibbutz, University of Haifa, In Hebrew.
- LEVIATAN, U., AND M. ROSNER (2000): “Belief in Values and Change in Values Among Kibbutz Members,” Discussion paper, The Institute for Study and Research of the Kibbutz, University of Haifa, In Hebrew.
- LEVIN, J., AND S. TADELIS (2005): “Profit Sharing and the Role of Professional Partnerships,” *Quarterly Journal of Economics*, 120(1), 131–171.
- LIGON, E. (1993): “Risk Sharing Under Varying Information Regimes: Theory and Measurement in Village Economies,” Working paper.
- LIGON ETHAN, JONATHAN P. THOMAS, T. W. (2002): “Informal Insurance Arrangements with Limited Commitment: Theory and Evidence from Village Economies,” *The Review of Economic Studies*, Vol. 69:1, 209–244.
- MCCLOSKEY, D. (1976): “English Open Fields as Behavior Towards Risk,” *Research in Economic History*, 1, 124–170.
- (1991): “The Prudent Peasant: New Findings on Open Fields,” *Journal of Economic History*, 51(2), 343–355.
- METZER, J. (1998): *The Divided Economy of Mandatory Palestine*. Cambridge University Press, Cambridge.
- MURRAY, J. E. (1995): “Human Capital in Religious Communes: Literacy and Selection of Nineteenth Century Shakers,” *Explorations in Economic History*, 32(2), 217–235.

- NAGIN, D., J. REBITZER, S. SANDERS, AND L. TAYLOR (2002): “Monitoring, Motivation, and management: The Determinants of Opportunistic Behavior in a Field Experiment,” *American economic Review*, 92:4, 850–873.
- NEAR, H. (1992a): *The Kibbutz Movement: A History*. Oxford University Press.
- (1992b): *The Kibbutz Movement: A History*, vol. 2. Oxford University Press, Oxford.
- PRENDERGAST, C. (1999): “The Provision of Incentives in Firms,” *Journal of economic Literature*, 37:1, 7–63.
- RICHARDSON, G. (2005): “The Prudent Village: Risk Pooling Institutions in Medieval English Agriculture,” *Journal of Economic History*, 65(2), 386–413.
- ROSENZWEIG, M. R. (1988): “Risk, Implicit Contracts and the Family in Rural Areas of Low-Income Countries,” *Economic Journal*, 98(393), 1148–1170.
- ROSNER, M., AND S. GETZ (1996): *The Kibbutz in the Era of Changes*. Hakibbutz Hameuchad and University of Haifa Publishing House, Haifa, Israel.
- ROSNER, M., AND A. TANNENBAUM (1987): “Organizational Efficiency and Egalitarian Democracy in an Intentional Communal Society: The Kibbutz,” *British Journal of Sociology*, 38, 521–545.
- ROSNER MENACHEM, ITZHAK BEN DAVID, A. A. N. C., AND U. LEVIATAN (1990): *The Second Generation: Continuity and Change in the Kibbutz*. Greenwood press.
- RUNCIMAN, W. (1966): *Relative deprivation and social justice: study attitudes social inequality in 20th century England*. Routledge.
- SATT, E. (1991): “Reward for Contribution in the Kibbutz—The Lessons of the LMF Model,” *Economic Quarterly*, 37(143), 372–386, In Hebrew.
- (1996): “Relative Deprivation in the Kibbutz Economy: An Exploration of the Concepts of Equality and Equity,” *Economica*, 63(250), S87–101.



- SATT, E., AND H. GINZBURG (1992): "On the Dynamic Effects of Using Hired Labor in the Kibbutz—Theory and Case Studies," *Journal of Comparative Economics*, 16(4), 688–700.
- SIMONS, T., AND P. INGRAM (1997): "Organization and Ideology: Kibbutzim and Hired Labor, 1951-1965," *Administrative Science Quarterly*, 42, 784–813.
- STIGLITZ, J. E. (1990): "Peer Monitoring and Credit Markets," *World Bank Economic Review*, 4(3), 351–366.
- TALMON, Y. (1972): *Family and Community in the Kibbutz*. Harvard University Press, Cambridge, MA.
- TOWNSEND, R. M. (1994): "Risk and Insurance in Village India," *Econometrica*, 63(2), 539–591.
- (1995): "Financial System in Northern Thai Villages," *Quarterly Journal of Economics*, 110(4), 1011–1046.
- UDRY, C. (1994): "Risk and Insurance in Rural Credit Market: An Empirical Investigation in Northern Nigeria," *Review of Economic Studies*, 61(3), 495–526.
- WARD, B. (1958): "The Firm in Illyria: Market Syndicalism," *American Economic Review*, 48(3), 566–589.

# APPENDICES FOR THE REFEREES, AND NOT NECESSARILY FOR PUBLICATION

## Appendix A: A Model with imperfect signals

The economy is a planned endowment economy with a single consumption good. Agents' utility  $u(c)$  is strictly increasing and strictly concave function of consumption  $c$ .

The timing of events is as follow. There are two dates  $t = 0, 1$  and there is a continuum of ex ante identical agents with a unit mass. At  $t = 0$ , the kibbutz offers a contract  $(c_L, c_H)$  to be given for a low income level  $\theta_L$  or a high income level  $\theta_H$ , respectively. Kibbutz members contribute their private property to the Kibbutz, which builds common wealth (local public goods) worth  $K$  units for each member.<sup>47</sup> At  $t = 1$ , individuals receive a signal  $p \in [0, 1]$ , which is the probability of earning a high income level  $\theta_H$  (as opposed to a low income level  $\theta_L$ ).<sup>48</sup> Individuals then decide whether to stay in the Kibbutz and enjoy  $pu(c_H + K) + (1 - p)u(c_L + K)$ , or leave, in which case they forgo the Kibbutz's common wealth  $K$  and enjoy  $pu(\theta_H) + (1 - p)u(\theta_L)$ .

The Kibbutz is subject to a budget constraint ( $BC$ ),  $\int_{p \in P} [pc_H + (1 - p)c_L] dF(p) \leq \int_{p \in P} [p\theta_H + (1 - p)\theta_L] dF(p)$ , i.e. it cannot provide members with more than the sum of their production, where  $P$  is the set of individuals who remain in the Kibbutz and  $F(p)$  is the distribution of signals of those who stay. The Kibbutz is also subject to an ex-post participation constraint ( $PC$ ),  $pu(c_H + K) + (1 - p)u(c_L + K) \geq pu(\theta_H) + (1 - p)u(\theta_L)$  iff  $p \in P$ .

The social planner problem is, thus, to choose a contract  $(c_L, c_H)$  that maximizes the sum of members expected utilities, subject to a budget constraint and a participation constraint. The set of members that stays in the Kibbutz ( $P$ ) is determined by the contract  $(c_L, c_H)$ . Formally, the Kibbutz solves:

$$\begin{aligned} \max_{c_L, c_H, P} & \int_{p \in P} [pu(c_H + K) + (1 - p)u(c_L + K)] dF(p) + \int_{p \notin P} [pu(\theta_H) + (1 - p)u(\theta_L)] dF(p) & (3) \\ \text{subject to} & \quad BC : \int_{p \in P} [pc_H + (1 - p)c_L] dF(p) \leq \int_{p \in P} [p\theta_H + (1 - p)\theta_L] dF(p) \\ & \quad PC : pu(c_H + K) + (1 - p)u(c_L + K) \geq pu(\theta_H) + (1 - p)u(\theta_L) \text{ iff } p \in P \end{aligned}$$

<sup>47</sup>The model is very similar in the private good case, as long as members cannot take it upon leaving. In the private good case,  $\frac{K}{F(p)}$  replaces  $K$ , when  $F(p)$  is the fraction of members who stay in the Kibbutz. In the case of a private good, the central planner has an additional incentive to let members leave, since those who stay have more private goods for themselves.

<sup>48</sup>For simplicity, income levels  $\theta_L$  and  $\theta_H$  are assumed to be equal inside and outside the Kibbutz.

The assumption of ex ante identical agents is natural for the founders of the Kibbutz, who are described in the literature as young individuals, unattached from their families and homogenous in their ideology and training.<sup>49</sup> In later generations, the model is meant to describe the exit decision by Kibbutz-born individuals rather than the entry decision from outside, since the latter has been a marginal factor in the last five decades (more on this later). Kibbutz-born individuals in young age (who are entitled to become members regardless of their ability) can also be thought of as ex ante the same. As they get signals about their types and as long as they still have a long time horizon to rebuild their wealth outside, they decide whether to stay in their Kibbutz.

**Claim 1** *The budget constraint (BC) binds.*

**Proof.** Suppose  $BC$  is not binding and that  $(c_H^*, c_L^*)$  is the equilibrium contract. Then, the Kibbutz can increase  $c_H$  and  $c_L$  and still satisfy  $BC$  and  $PC$ , which increases the objective function. Such an increase implies that  $(c_H^*, c_L^*)$  is not optimal, which is a contradiction. ■

The first-best contract is the contract a social planner would choose if he could force people to stay once their type is realized. Such a contract would provide full insurance and all members would stay. Formally,

**Claim 2** *The first best contract provides full insurance  $c_L^{FB} = c_H^{FB} = E[\theta]$  and all members stay in the Kibbutz.*

**Proof.** In the first best contract, the social planner need not satisfy the participation constraint  $PC$ . Thus, it follows that all members  $p \in [0, 1]$  stay in the Kibbutz, regardless of  $(c_L, c_H)$ . Since the objective function is concave, the first best contract satisfies  $c_L^{FB} = c_H^{FB} = E[E[\theta/p]] = E[\theta]$  ■

Outside the first-best world, the Kibbutz faces a trade-off, since keeping a high level of income equality improves the insurance but might result in adverse selection, as members who realize they are high types might forgo the insurance and leave, leaving the Kibbutz with only low types. Thus, the Kibbutz has to find optimal levels of income equality, which might involve adverse selection. This is illustrated in Claims 3 and 4.<sup>50</sup>

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<sup>49</sup>Talmon (1972, p. 2).

<sup>50</sup>There are two reasons that the social planner wants people to belong to the Kibbutz. First, there is insurance. Second, there is the public good generation, as staying leads to a public good consumption of  $K$ .

The model illustrates a fundamental feature of the Kibbutz, namely that the optimal Kibbutz contract is more egalitarian than in the capitalist city:

**Claim 3** *The optimal contract satisfies  $\theta_L \leq c_L^* \leq c_H^* \leq \theta_H$ .*

**Proof.** Assume in contradiction that  $c_L^* < \theta_L$ . Then, since  $(BC)$  binds, we have that  $c_H^* > \theta_H$ . Since the objective function of the Kibbutz is concave, the Kibbutz can increase the set  $P$  and the objective function by offering  $c_L = \theta_L$  and  $c_H = \theta_H$ . This contradicts the optimality of  $(c_H^*, c_L^*)$ . Assume in contradiction that  $c_L^* > c_H^*$ . Since the objective function is concave, the Kibbutz can increase  $P$  and the objective function by offering  $c_L = c_H$ , contradicting the optimality of  $(c_H^*, c_L^*)$ . ■

The model reveals a tendency for adverse selection from the Kibbutz, i.e. higher types are more likely to leave. Formally,

**Claim 4** *If  $p \in P$ , then  $p' < p$  implies that  $p' \in P$ .*

**Proof.** I need to prove that if the  $(PC)$  is satisfied for a certain  $p$ , it is satisfied for every  $p' < p$ . In other words, I need to prove that  $pu(c_H) + (1-p)u(c_L) - pu(\theta_H) - (1-p)u(\theta_L)$  is non-increasing in  $p$ , i.e. that  $\frac{\partial(pu(c_H)+(1-p)u(c_L)-pu(\theta_H)-(1-p)u(\theta_L))}{\partial p} = u(c_H) - u(c_L) - u(\theta_H) + u(\theta_L) \leq 0$ . This follows from Claim 2 and the concavity of  $u$ . ■

Claim 4 suggests that there is a threshold  $p' \in [0, 1]$  below which a member stays in the Kibbutz and above which she leaves. Therefore, given an optimal level of  $(c_H^*, c_L^*)$ , the  $PC$  uniquely defines  $p'$ .<sup>51</sup>

The model highlights an important trade-off faced by the Kibbutz. The Kibbutz can “increase the pie” either by increasing total consumption or by smoothing consumption across individuals. High types increase total consumption, but at the same time they force the Kibbutz to reduce the level of insurance for other members. Given a wealth level, a Kibbutz has to choose between a contract with a high level of

<sup>51</sup>The Kibbutz problem can, thus, be simplified and rewritten as follows:

$$\begin{aligned} \max_{c_L, c_H} \int_{p=0}^{p'} [pu(c_H + K) + (1-p)u(c_L + K)] dF(p) + \int_{p=p'}^1 [pu(\theta_H) + (1-p)u(\theta_L)] dF(p) & \quad (4) \\ \text{subject to} \quad BC : \int_{p=0}^{p'} [pc_H + (1-p)c_L] dF(p) = \int_{p=0}^{p'} [p\theta_H + (1-p)\theta_L] dF(p) & \\ PC : \quad pu(c_H + K) + (1-p)u(c_L + K) \geq pu(\theta_H) + (1-p)u(\theta_L) \text{ iff } p \leq p' & \end{aligned}$$

equality but lower membership (since high types are excluded), and a contract with a lower level of equality but a higher membership (when high types are included). The challenge of this trade-off has been faced in recent years in many kibbutzim, which struggle to find the optimal level of equality that will provide insurance on the one hand, and keep enough high types on the other hand.

Proposition 1 suggests that the optimal level of insurance is (at least gradually) increasing in the Kibbutz's common wealth,  $K$ .<sup>52</sup> The underlying reason is that for a high enough  $K$ , full equality can be implemented without losing high ability members, and as  $K$  increases the level of equality gradually approaches to full income equality. Formally,

**Proposition 3** *For any  $k'$  in which the level of insurance is partial (i.e.  $c_H - c_L > 0$ ), there exists  $\underline{K} > k'$  (that depends on  $k'$ ) above which the level of insurance is higher (i.e.  $c_H - c_L$  is smaller) than in  $k'$ . Moreover, there exist  $\overline{\overline{K}} \geq \overline{K} \geq \underline{K}$  such that for all  $k \in (\underline{K}, \overline{K})$  the contract provides partial insurance (i.e.  $c_H - c_L > 0$ ) and for all  $k \geq \overline{\overline{K}}$  the contract provides full insurance (i.e.  $c_H - c_L = 0$ ).*

**Proof.** Define  $c_H^*(k)$  and  $c_L^*(k)$  as the optimal level of insurance for a fixed  $k \geq 0$ . Also, let  $\Delta(k) = c_H^*(k) - c_L^*(k)$ . Finally, let  $\overline{K} = \inf \{k \geq 0 : c_H^*(k) - c_L^*(k) = 0\}$ , and  $\underline{K} = \sup \{k \geq 0 : c_H^*(k) - c_L^*(k) \geq \Delta(k')\}$ . It can be shown that  $c_H = c_L$  is the solution for a large enough  $k$ . More specifically, when  $k \geq \overline{\overline{K}} = \theta_H$ , then the first best contract in which  $c_H = c_L$  can be implemented. Since  $k'$  attains partial insurance, i.e.  $\Delta(k') > 0$  and the solution is continuous in  $k$ , the interval  $(\underline{K}, \overline{K})$  is not empty and  $\overline{\overline{K}}$  exists. ■

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<sup>52</sup>Depending on the functional forms of  $u(c)$  and  $F(p)$ , a Kibbutz whose post-crisis value of  $K$  is low, should either reduce the level of equality, or reduce its membership, or both.

## Appendix B: Variables Used in the Analysis

The following are the variables used in the regression:

### 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 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. The measure of degree of equality in kibbutzim classifies these compensation schemes into a few categories:<sup>53</sup>:

- “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 previous category, with a higher fraction of a member’s budget based on her earnings.
- “Safety-net ” (110 kibbutzim). Similar to the previous category, with a higher fraction of a member’s budget based on her earnings. 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,

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<sup>53</sup>About 40 kibbutzim are still debating their status.

as long as it keeps 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 "safety net." Only 3 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" 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.

## Wealth

I employ five alternative measures of either a kibbutz's post-crisis 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 4 groups, reflecting how severely they were hit by the financial crisis. The first group contained kibbutzim that remain strong and do not need assistance (31 kibbutzim). The second group contained kibbutzim that were somewhat hit, but did not need assistance (42 kibbutzim). The third group contained kibbutzim that were hit harder but were expected to eventually be able to repay their debts in full (104 Kibbutzim). The fourth group contained kibbutzim that were hit badly and could not repay their debts without assistance (27 kibbutzim).<sup>54</sup>

**Credit rating** in 1995 and 2002. After the crisis (in 1995 and later in 2002), each kibbutz was assigned a credit rating by Dunn and Bradstreet (D&B) Company. The credit rating was built to reflect how severely the Kibbutz's economy was hit by the financial crisis and how wealthy the kibbutz

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<sup>54</sup>Debts that were beyond the kibbutz's ability to ever repay were erased, but not in a way that would move a kibbutz to a higher category.

is post-crisis. 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: debt per member, ability to repay debt as reflected by economic forecasts of the kibbutz Arrangement Board; type and diversification of industries; kibbutz's land value.<sup>55</sup> I use two measures. The first is the credit rating that was assigned to kibbutzim by D&B Company in 1995 (a number from 1–4), and the second is the credit rating assigned in 2002 (a number from 1–100). The measure from 1995 is appropriate as 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** in 2000.<sup>56</sup> This is a continuous measure of the post-crisis value of kibbutzim's common assets. The fixed capital was divided by a million for presentation purposes. The results are the same when using an alternative measure of fixed capital per-member.

**Wealth score** A weighted average variable of the above measures through factor analysis. There is a single dominant factor, which both builds equally on all the four measures and accounts for 65% of the variation between them. The scoring coefficients are: credit rating (1-4): 0.340, economic status: 0.349, fixed capital 0.283 and credit rating (1-100): 0.255.

## Ideology and ideological-decline

**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%).<sup>57</sup> The historiography of the kibbutz suggests that the various

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<sup>55</sup>D&B did not rate kibbutzim before the crisis. This is not coincidental, as kibbutzim were then much more homogenous in their living standards and this was further ensured by the mutual guarantee across kibbutzim (that was dissolved post-crisis).

<sup>56</sup>Unfortunately, I have no systematic balance sheets that are available for other years.

<sup>57</sup>The religious Movement accounts for 6% and was excluded from the analysis.



movements can be ranked according to their ideological attitudes towards equality. Kibbutz Artzi holds the most socialist ideology and has traditionally been considered more conservative in preserving kibbutz values.<sup>58</sup> Even within the Takam, one can separate kibbutzim according to their ideology towards egalitarianism, as was revealed in an ideological split during the 1950s.<sup>59</sup>

I employ two measures of ideology based on movement affiliation. The first is a dummy variable that gets the value 1 if the kibbutz belongs to the most ideological movement - Artzi. The 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.

**% 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 1990's, 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 % of members voting for socialist parties** between the 1984 and 2003 elections.

### 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. The number of members in each kibbutz was also collected by the Israeli Central Bureau of Statistics in 1995, so I use this year as the preferred year to measure group size. Average household size was also assembled from data collected by the Central Bureau of Statistics on kibbutzim in 1995.

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<sup>58</sup>Kibbutz Artzi 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).

<sup>59</sup>In the early 1950s Meuhad movement was divided into Meuhad (around 2/3) and Ihud (1/3). Ihud continued to support Mapai. Meuhad supported the leftist Mapam, was pro-Soviet during the cold war (and 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. See Near (1992a, pp. 210-215).

**Group size** The number of members in 1995. Appendix C presents the results with the number of members in 1984, which is the year before the crisis and the high exit rates.

**Exit rate** between 1987–2000. The exit rate is calculated with respect to 1987, that is, number of members exit in 1987 divided by number of members in 1987 + exit 1988/members 1987 + exit 1989/members 1987 + exit 1990/members 1987 + exit 1991/members 1987 + exit 1992/members 1987 + exit 1993/members 1987 + exit 1994/members 1987 + exit 1995/members 1987 + exit 1996/members 1987 + exit 1997/members 1987 + exit 1998/members 1987 + exit 1999/members 1987 + exit 2000/members 1987. Exit was recorded differently by kibbutzim from Artzi and Takam movements, as kibbutzim from Artzi counted the children of members who exit. This creates a level difference between kibbutzim from Takam and Artzi. Exit rates, thus, cannot be compared meaningfully between kibbutzim of the two movements. I include a dummy for whether the kibbutz belong to Artzi movement to account for this level difference.

**Land per-member** Land referred to land leased to each kibbutz by the state of Israel. Land is measured in 1000 square meters.

**Average household size** in 1995: the number people in the household.<sup>60</sup>

**Age distribution** in 1995. I use various alternative measures of age distribution, including the average age of members over 21; average age over 29; % of members older than 40; % of members older than 56; % 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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<sup>60</sup>In the past, when children used to live in special residences outside parents' homes, most households in the kibbutz consisted of only the parents. In the sample-period, children lived with their parents.

Appendix C: Additional Tables

TABLE C1  
The determinants of the degree of equality (Ordered Probit, marginal effects)

Variable	(1)	(2)	(3)	(4)
	$\partial \text{Pr}(\text{equality} = \text{low})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{medium} / \text{low})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{medium} / \text{high})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{equal} - \text{sharing})$ $\partial X$
<b>Wealth:</b>				
Wealth score	-0.212*** (0.048)	0.045*** (0.017)	0.048*** (0.018)	0.120*** (0.029)
<b>Controls:</b>				
Group size	0.0003 (0.0004)	-0.00007 (0.00008)	-0.00008 (0.00009)	-0.0002 (0.0002)
Year established	-0.0007 (0.006)	0.0002 (0.001)	0.0002 (0.001)	0.0004 (0.003)
Average household size	0.367 (0.243)	-0.078 (0.057)	-0.083 (0.060)	-0.206 (0.138)
Land per member	-0.004 (0.004)	0.0008 (0.0009)	0.0009 (0.0009)	0.002 (0.002)
Members' average age	0.021 (0.014)	-0.004 (0.003)	-0.005 (0.004)	-0.012 (0.008)
Pr(equality=low)	0.568			
Pr(equality=medium/low)		0.193		
Pr(equality=med/medium/high)			0.101	
Pr(equality=equal-sharing)				0.138
Observations	140	140	140	140

Notes: the dependent variable is the degree of equality. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE C2  
The determinants of the degree of equality - OLS regression analysis

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal-sharing	Equal-sharing
<b>Wealth:</b>								
Credit rating (1-4)	0.407*** (0.109)							
Economic strength (1-4)		0.396*** (0.099)						
Credit rating (1-100)			0.016*** (0.005)					
Fixed capital				0.016*** (0.005)				
Wealth score					0.482*** (0.104)	0.419*** (0.093)	0.127*** (0.035)	0.116*** (0.031)
<b>Controls:</b>								
Group size	0.0008 (0.0007)	0.0008 (0.0007)	0.001* (0.0007)	-0.0006 (0.0009)	-0.0002 (0.0008)		-0.0002 (0.0003)	
Year established	-0.005 (0.011)	-0.005 (0.011)	-0.012 (0.011)	-0.012 (0.012)	0.0006 (0.012)		-0.004 (0.004)	
Average household size	-0.436 (0.501)	-0.428 (0.499)	-0.418 (0.497)	-0.355 (0.552)	-0.678 (0.555)		-0.054 (0.185)	
Land per member	0.011 (0.008)	0.008 (0.008)	0.010 (0.008)	0.01 (0.008)	0.007 (0.009)		0.0002 (0.003)	
Members' average age	-0.072** (0.028)	-0.067** (0.028)	-0.077*** (0.028)	-0.064** (0.031)	-0.054* (0.032)		-0.021** (0.010)	
Observations	179	179	174	150	140	145	140	145
R-squared	0.15	0.16	0.14	0.14	0.19	0.12	0.16	0.09

Notes: the dependent variable in columns 1-6 is the kibbutz's degree of equality, and in columns 7-8 it is a dummy that equals 1 for equal-sharing. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE C3  
The determinants of the degree of equality - using historically determined group size

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Probit	Probit
	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal-sharing	Equal-sharing
<b>Wealth:</b>								
Credit rating (1-4)	0.435*** (0.116)							
Economic strength (1-4)		0.422*** (0.106)						
Credit rating (1-100)			0.019*** (0.005)					
Fixed capital				0.014*** (0.004)				
Wealth score					0.503*** (0.115)		0.105*** (0.031)	
<b>Controls:</b>								
Pre-crisis group size	0.0005 (0.0007)	0.0003 (0.0007)	0.0004 (0.0007)	-0.0003 (0.0008)	-0.0002 (0.0008)	-0.0001 (0.0006)	0.00006 (0.0002)	-0.0001 (0.0002)
Year established	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Average household size	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Land per member	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Members' average age	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Observations	179	179	174	150	140	184	140	184

*Notes:* the dependent variable in columns 1-6 is the kibbutz's degree of equality, and in column 7-8 it is a dummy that equals 1 for equal-sharing. Marginal coefficients are reported in the probit regression in column 7-8. These regressions use pre-crisis (1984) group size. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE C4

The determinants of the degree of equality (Ordered Probit, marginal effects)

Variable	(1)	(2)	(3)	(4)
	$\frac{\partial \Pr(\text{equality} = \text{low})}{\partial X}$	$\frac{\partial \Pr(\text{equality} = \text{medium} / \text{low})}{\partial X}$	$\frac{\partial \Pr(\text{equality} = \text{medium} / \text{high})}{\partial X}$	$\frac{\partial \Pr(\text{equality} = \text{equal} - \text{sharing})}{\partial X}$
<b>Wealth score</b>	-0.202*** (0.048)	0.044*** (0.017)	0.047*** (0.017)	0.116*** (0.029)
<b>Ideology:</b>				
Most socialist (Artzi)	-0.160* (0.086)	0.029* (0.016)	0.036* (0.021)	0.095* (0.056)
<b>Controls:</b>				
Group size	0.0002 (0.0004)	-0.00005 (0.00008)	-0.00006 (0.00009)	-0.0001 (0.0002)
Year established	1.00E-05 (0.0001)	-2.83E-06 (0.00003)	-3.06E-06 (0.00003)	-7.26E-06 (0.00007)
Average household size	0.331 (0.244)	-0.071 (0.057)	-0.077 (0.060)	-0.183 (0.136)
Land per member	-0.004 (0.004)	0.0008 (0.0009)	0.0009 (0.0009)	0.002 (0.002)
Members' average age	0.025** (0.012)	-0.005* (0.003)	-0.006* (0.003)	-0.014** (0.007)
Pr(equality=low)	0.568			
Pr(equality=medium/low)		0.195		
Pr(equality=med/medium/high)			0.102	
Pr(equality=equal-sharing)				0.135
Observations	140	140	140	140

Notes: the dependent variable is the kibbutz's degree of equality (4-categories of equality described in appendix).

The omitted ideology category is the less socialist movement (Takam, which contains Ihud and Meuhad)

t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE C5

The determinants of the degree of equality (Ordered Probit, marginal effects) - voting as measure of ideology

Variable	(1)	(2)	(3)	(4)
	$\partial \Pr(\text{equality} = \text{low})$ $\partial X$	$\partial \Pr(\text{equality} = \text{medium} / \text{low})$ $\partial X$	$\partial \Pr(\text{equality} = \text{medium} / \text{high})$ $\partial X$	$\partial \Pr(\text{equality} = \text{equal} - \text{sharing})$ $\partial X$
<b>Wealth score</b>	-0.213*** (0.050)	0.054*** (0.020)	0.050*** (0.018)	0.110*** (0.028)
<i>degree of socialist ideology:</i>				
% votes to socialist parties	-0.016* (0.09)	-0.004 (0.003)	-0.004 (0.02)	0.008* (0.005)
<b>Controls:</b>				
Group size	0.0005 (0.0004)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0003 (0.0002)
Year established	Yes	Yes	Yes	Yes
Average household size	Yes	Yes	Yes	Yes
Land per member	Yes	Yes	Yes	Yes
Members' average age	Yes	Yes	Yes	Yes
Pr(equality=low)	0.582			
Pr(equality=medium/low)		0.203		
Pr(equality=med/medium/high)			0.094	
Pr(equality=equal-sharing)				0.121
Observations	134	134	134	134

Notes: the dependent variable is the kibbutz's degree of equality (4-categories of equality described in appendix).

t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE C6

The determinants of the degree of equality (Ordered Probit, marginal effects) - decline in ideology

Variable	(1)	(2)	(3)	(4)
	$\partial \Pr(\text{equality} = \text{low})$ $\partial X$	$\partial \Pr(\text{equality} = \text{medium} / \text{low})$ $\partial X$	$\partial \Pr(\text{equality} = \text{medium} / \text{high})$ $\partial X$	$\partial \Pr(\text{equality} = \text{equal} - \text{sharing})$ $\partial X$
<b>Wealth score</b>	-0.208*** (0.050)	0.052*** (0.020)	0.049*** (0.019)	0.107*** (0.028)
<i>ideological decline:</i> decline in % votes for socialist	0.016*** (0.006)	-0.004** (0.002)	-0.004** (0.002)	-0.008** (0.003)
<i>Controls:</i> Group size	0.0006 (0.0004)	-0.0002 (0.0001)	-0.0001 (0.0001)	-0.0003 (0.0002)
Year established	Yes	Yes	Yes	Yes
Average household size	Yes	Yes	Yes	Yes
Land per member	Yes	Yes	Yes	Yes
Members' average age	Yes	Yes	Yes	Yes
Pr(equality=low)	0.576			
Pr(equality=medium/low)		0.207		
Pr(equality=med/medium/high)			0.096	
Pr(equality=equal-sharing)				0.121
Observations	134	134	134	134

Notes: the dependent variable is the kibbutz's degree of equality (4-categories of equality described in appendix).

t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

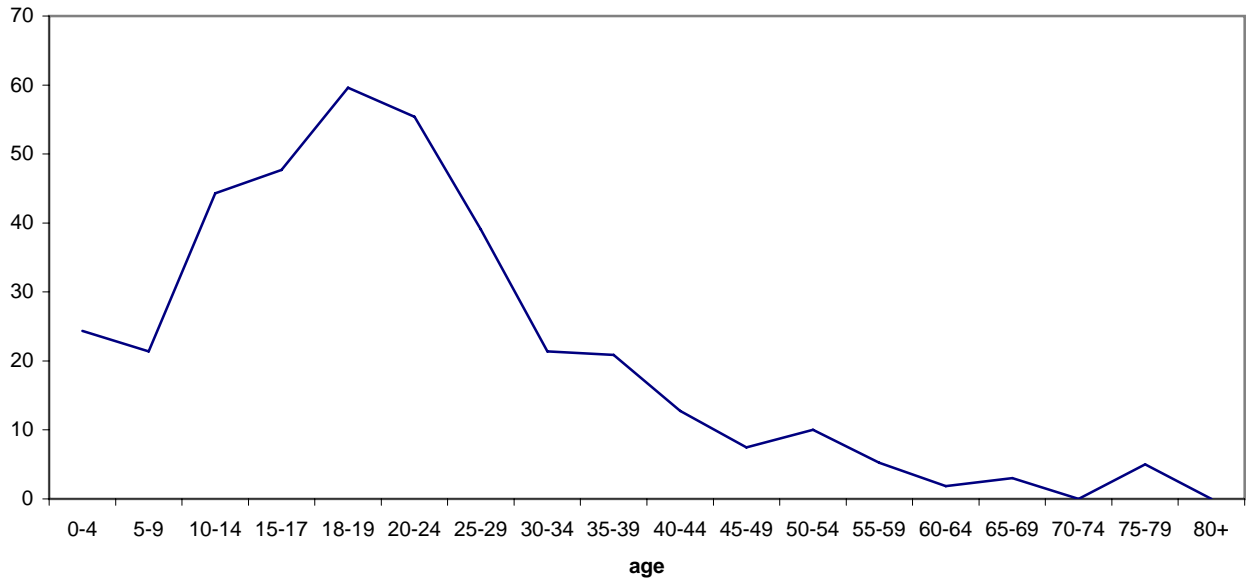


TABLE C7  
The determinants of the degree of equality (Ordered Probit, marginal effects)

Variable	(1)	(2)	(3)	(4)
	$\partial \text{Pr}(\text{equality} = \text{low})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{medium} / \text{low})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{medium} / \text{high})$ $\partial X$	$\partial \text{Pr}(\text{equality} = \text{equal} - \text{sharing})$ $\partial X$
<b>Wealth score</b>	-0.203*** (0.051)	0.050*** (0.020)	0.048*** (0.018)	0.104*** (0.028)
<b>Ideology score</b>	-0.139*** (0.052)	0.035*** (0.016)	0.033** (0.016)	0.071** (0.028)
<b>Controls:</b>				
Group size	0.0005 (0.0004)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0002 (0.0002)
Year established	-0.0006 (0.006)	0.0001 (0.001)	0.0001 (0.001)	0.0003 (0.003)
Average household size	0.287 (0.248)	-0.071 (0.066)	-0.068 (0.062)	-0.147 (0.128)
Land per member	-0.004 (0.004)	0.0008 (0.001)	0.001 (0.001)	0.002 (0.002)
Members' average age	0.019 (0.015)	-0.005 (0.004)	-0.005 (0.004)	-0.010 (0.008)
Pr(equality=low)	0.576			
Pr(equality=medium/low)		0.206		
Pr(equality=med/medium/high)			0.097	
Pr(equality=equal-sharing)				0.121
Observations	134	134	134	134

Notes : the dependent variable is the degree of equality. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

FIGURE 1:  
Exit from kibbutzim by age, 1983-1995.

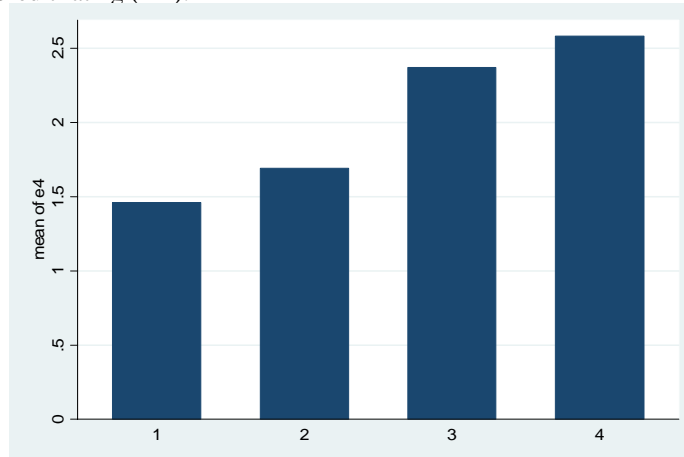


*Notes* : the number of members exiting between 1983 and 1995 (Y) by age (X). The data source is the linked census of population 1983-1995. The data is a 4% representative sample of the population.

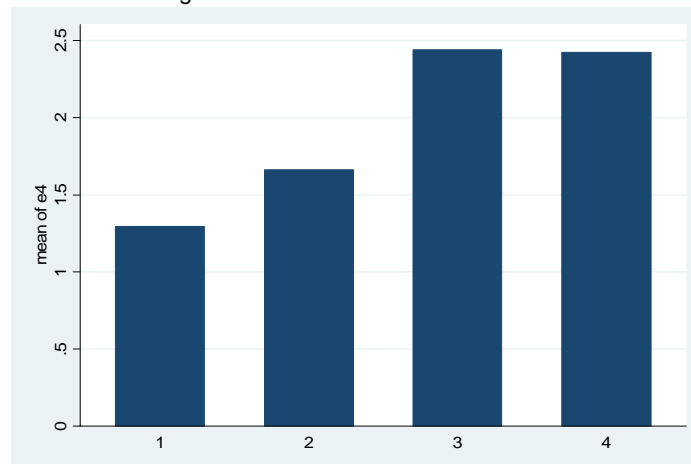
FIGURE 2:

**Higher wealth is associated with more equality**

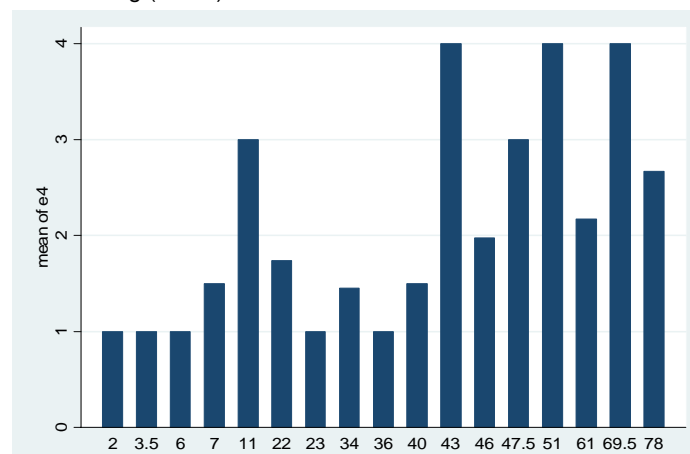
Credit rating (1-4):



"Economic strength":



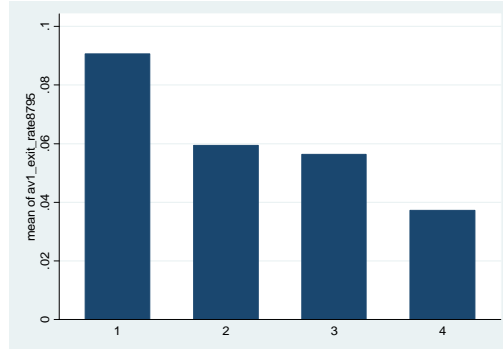
Credit rating (1-100):



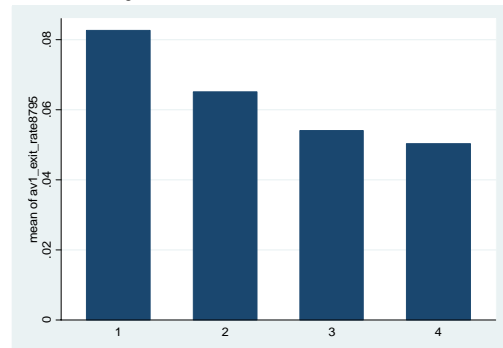
Notes : Each graph draws the mean degree of equality (Y) by each of the (discrete) wealth measures. The first graph uses the credit rating (1-4), the second uses the economic strength (1-4), and the third uses the credit rating (1-100). The degree of equality and the wealth measures are defined in Appendix B.

FIGURE 3

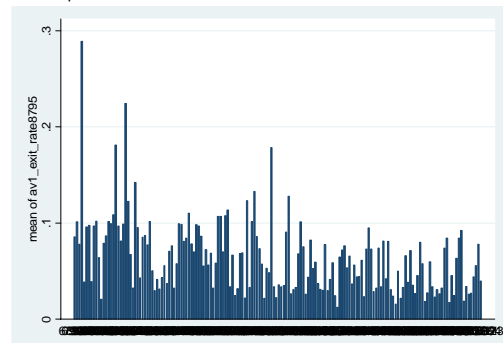
Under equal-sharing, higher wealth is associated with lower exit rates  
Credit rating:



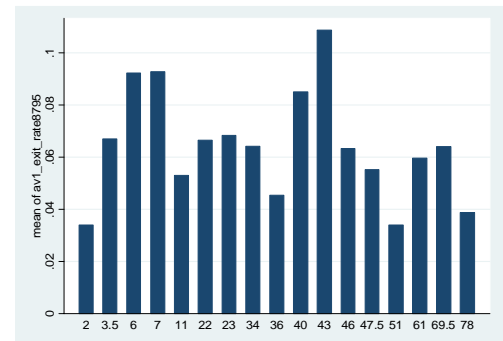
Economic strength:



fixed capital:



Credit rating (1-100):



Notes : Each graph draws the mean exit rate (Y) by a different wealth measure. The first graph uses the credit rating (1-4), the second uses the economic strength (1-4), the third uses the fixed capital, and the fourth uses the credit rating (1-100). The exit rate and the wealth measures are defined in Appendix B. All graphs are drawn for kibbutzim in Artzi

TABLE 1  
**Kibbutzim's population, 1910-1999**

Year	Number of kibbutzim	Population
1910	1	
1920	12	805
1930	29	3,877
1940	82	26,554
1950	214	66,708
1960	229	77,955
1970	229	85,100
1980	255	111,200
1987	268	127,000
1990	270	125,100
1999	267	117,400

*Source* : Pavin, The Kibbutz Movement:  
Facts and Figures (2001).

TABLE 2  
Descriptive statistics

<b>Variable</b>	<b>Mean</b>	<b>Std. dev</b>	<b>Min</b>	<b>Max</b>
Degree of equality	1.871	1.156	1	4
<b>Wealth:</b>				
Credit rating (1-4)	2.143	0.853	1	4
	2.336	0.934	1	4
Credit rating (1-100)	39.675	18.09	2	78
Fixed capital	33.579	22.14	6.907	155.994
Wealth score (factor component)	-0.080	0.987	-1.824	2.505
<b>Ideology:</b>				
Most socialist movement (Artzi)	0.329	0.471	0	1
Medium ideology (Meuhad)	0.286	0.453	0	1
Low ideology (Ihud)	0.379	0.487	0	1
% votes for socialist parties	90.135	7.896	24.8	98.4
<b>Ideological decline:</b>				
Decline in % votes to socialist parties	16.74	6.891	0.126	36.483
Ideology score (factor component)				
<b>Other:</b>				
Group size	317.264	150.328	51	1007
Year established	1941.906	9.734	1915	1969
Average household size	2.138	0.209	1.7	2.8
Land per member	19.852	12.598	2.01	68.702
Members' average age (over 29)	52.048	4.486	41.4	60.4
Exit rates (%)	6.142	2.811	1.368	19.592

*Notes* : Summary statistics calculated for the sample of 140 kibbutzim for which data on all measures of wealth is available. Summary statistics for % of votes for socialist parties calculated for the sample of 134 kibbutzim for which data on voting are available.

TABLE 3:  
The higher the wealth, the higher the degree of equality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation Method	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Probit	Probit
Dependent Variable	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal- sharing	Equal- sharing
<b>Wealth:</b>								
Credit rating (1-4)	0.408*** (0.119)							
Economic strength (1-4)		0.401*** (0.109)						
Credit rating (1-100)			0.018*** (0.005)					
Fixed capital				0.016*** (0.005)				
Wealth score					0.540*** (0.123)	0.417*** (0.102)	0.117*** (0.033)	0.110*** (0.030)
<b>Controls:</b>								
Group size	0.0008 (0.0008)	0.0007 (0.0008)	0.001* (0.0007)	-0.0009 (0.001)	-0.0009 (0.001)		-0.0002 (0.0003)	
Year established	-0.004 (0.012)	-0.004 (0.012)	-0.011 (0.012)	-0.011 (0.013)	0.002 (0.014)		-0.005 (0.004)	
Average household size	-0.712 (0.558)	-0.724 (0.559)	-0.596 (0.546)	-0.52 (0.589)	-0.933 (0.618)		-0.028 (0.160)	
Land per member	0.013 (0.009)	0.011 (0.009)	0.012 (0.009)	0.012 (0.009)	0.01 (0.010)		0.0001 (0.003)	
Members' average age	-0.073** (0.032)	-0.069** (0.032)	-0.074** (0.031)	-0.060* (0.033)	-0.054 (0.036)		-0.021** (0.010)	
Observations	179	179	174	150	140	145	140	145

Notes : the dependent variable in columns 1-6 is the kibbutz's degree of equality, and in column 7 it is a dummy that equals 1 for equal-sharing. Marginal coefficients are reported in the probit regression in column 7. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE 4  
The role of ideology in determining the degree of equality

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Probit	Probit	Probit	Probit
	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal-sharing	Equal-sharing	Equal-sharing	Equal-sharing
<b>Ideology:</b>												
Most socialist movement (Artzi)	0.401** (0.204)				0.405* (0.220)				0.147** (0.072)			
% votes to socialist parties		0.040* (0.021)				0.041* (0.024)				0.009 (0.006)		
<b>Ideological decline:</b>												
decline in % votes to socialist parties			-0.044*** (0.015)				-0.041** (0.015)				-0.016*** (0.005)	
<b>Ideology score</b>												
				0.387*** (0.125)				0.354*** (0.133)				0.113** (0.037)
<b>Controls:</b>												
Wealth score	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Group size	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Year established	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Average household size	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Land per member	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Members' average age	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Observations	145	137	137	137	140	134	134	134	145	137	137	137

Notes : the dependent variable is the kibbutz's degree of equality. In the probit regressions in columns 9-12, the marginal coefficients are presented. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.



TABLE 5A

## The determinants of the degree of equality - wealth vs. ideology

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal-sharing	Equal-sharing	Equal-sharing
<b>Wealth score</b>	0.387*** (0.096)	0.437*** (0.094)		0.432*** (0.106)	0.488*** (0.106)			0.105*** (0.032)	0.123*** (0.031)	
<b>Ideology score</b>	0.140** (0.113)		0.352*** (0.115)	0.276** (0.113)		0.375*** (0.116)		0.086** (0.037)		0.117*** (0.037)
<i>Controls:</i>										
Group size										
Year established	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Average household size	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Land per member	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Members' average age	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Observations	137	137	137	134	134	134	134	140	137	145
<b>R-squared</b>	<b>0.17</b>	<b>0.14</b>	<b>0.06</b>	<b>0.23</b>	<b>0.20</b>	<b>0.13</b>	<b>0.06</b>	<b>0.14</b>	<b>0.10</b>	<b>0.07</b>

Notes : the dependent variable in columns 1-6 is the kibbutz's degree of equality, and in column 7-10 it is a dummy that equals 1 for equal-sharing. **Wealth score** is based on a factor component analysis of all the wealth measures. **Ideology score** is based on a factor component analysis of all the ideology and ideological decline measures. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE 5B

## The determinants of the degree of equality - wealth vs. ideology

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	Degree of equality	Degree of equality	Degree of equality	Degree of equality	Equal-sharing	Equal-sharing	Equal-sharing	Equal-sharing
<i>Panel A</i>								
Wealth score	0.437*** (0.094)		0.488*** (0.106)		0.123*** (0.031)		0.123*** (0.035)	
Ideology score		0.352*** (0.115)		0.375*** (0.116)		0.117*** (0.037)		0.124*** (0.038)
<b>R-squared</b>	<b>0.14</b>	<b>0.06</b>	<b>0.20</b>	<b>0.13</b>	<b>0.10</b>	<b>0.07</b>	<b>0.16</b>	<b>0.15</b>
<i>Panel B</i>								
Wealth score		0.363*** (0.093)		0.412*** (0.103)		0.098*** (0.031)		0.098*** (0.034)
Ideology score	0.225** (0.109)		0.263** (0.110)		0.081** (0.036)		0.096*** (0.036)	
<i>Controls:</i>								
Group size								
Year established	No	No	Yes	Yes	No	No	Yes	Yes
Average household size	No	No	Yes	Yes	No	No	Yes	Yes
Land per member	No	No	Yes	Yes	No	No	Yes	Yes
Members' average age	No	No	Yes	Yes	No	No	Yes	Yes
Observations	137	137	134	134	137	137	134	134
<b>R-squared</b>	<b>0.03</b>	<b>0.10</b>	<b>0.04</b>	<b>0.11</b>	<b>0.04</b>	<b>0.07</b>	<b>0.05</b>	<b>0.06</b>

*Notes:* the dependent variable in columns 1-4 is the kibbutz's degree of equality, and in column 5-8 it is a dummy that equals 1 for equal-sharing. **Wealth score** is based on a factor component analysis of all the wealth measures. **Ideology score** is based on a factor component analysis of all the ideology and ideological decline measures. All columns report "two-stage" results. *Panel A* reports the coefficient from an OLS regression of the degree of equality on the wealth score (or ideology score). *Panel B* reports the coefficient from an OLS regression of the residuals from the first regression on the ideology score (or the wealth score). t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.

TABLE 6:  
The higher the wealth, the lower the exit rates

Estimation Method	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates	Exit rates
<b>Wealth:</b>												
Credit rating (1-4)	-0.571*** (0.186)	-0.887*** (0.179)			-0.536*** (0.194)	-0.773*** (0.179)			-0.512*** (0.197)	-0.731*** (0.193)		
Economic strength (1-4)			-0.317* (0.167)	-0.558* (0.168)			-0.317* (0.167)	-0.435** (0.176)			-0.237* (0.178)	-0.379** (0.181)
<b>Ideology:</b>												
% votes for socialist parties					-0.014 (0.015)	-0.019 (0.016)	-0.015 (0.015)	-0.022 (0.017)				
<b>Ideological decline:</b>												
decline in % votes for socialist parties									0.033 (0.022)	0.041* (0.023)	0.037 (0.022)	0.05 (0.024)
<b>Controls:</b>												
Artzi Movement	-3.734*** (0.287)	-3.727*** (0.307)	-3.814*** (0.289)	-3.818*** (0.317)	-3.670*** (0.302)	-3.723*** (0.319)	-3.748*** (0.305)	-3.380*** (0.328)	-3.561*** (0.319)	-3.610*** (0.331)	-0.362*** (0.322)	-3.652*** (0.340)
Group size	-0.003** (0.001)	No	-0.003** (0.001)	No	-0.003** (0.001)	No	-0.003** (0.001)	No	-0.002* (0.001)	No	-0.003** (0.001)	No
Year established	-0.027** (0.017)	No	-0.023 (0.017)	No	-0.027 (0.017)	No	-0.022 (0.018)	No	-0.026 (0.017)	No	-0.020 (0.018)	No
Average household size	-0.666 (0.870)	No	-0.83 (0.881)	No	-0.55 (0.898)	No	-0.721 (0.910)	No	-0.504 (0.894)	No	-0.671 (0.904)	No
Land per member	0.040*** (0.014)	No	0.044*** (0.014)	No	0.041*** (0.014)	No	0.045*** (0.014)	No	0.041*** (0.014)	No	0.045*** (0.014)	No
Members' average age	-0.147*** (0.050)	No	-0.143*** (0.051)	No	-0.141*** (0.051)	No	-0.135** (0.051)	No	-0.145*** (0.051)	No	-0.139*** (0.052)	No
Observations	183	187	183	187	177	180	177	180	176	179	176	179
R-squared	0.61	0.50	0.59	0.46	0.60	0.50	0.59	0.47	0.60	0.51	0.59	0.48

Notes : the dependent variable is exit rates (in %). Since exit rates are recorded differently in Artzi and Takam movements, a dummy variable for Artzi is included. t-test of difference in means significant at \*\*\*1% \*\*5% \*10%. Standard errors in parentheses.