# The Limits of Equality: An Economic Analysis of the Israeli Kibbutz
# Job Market Paper 1

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## Abstract

The Israeli Kibbutz movement is a voluntary cooperative based on equality, mutual assistance, partnership, and common ownership of property. It is one of the last socialist experiments that successfully survived for most of the twentieth century. How did a voluntary egalitarian institution exist in a more capitalist environment? What level of equality can be sustained as an equilibrium? I study the Kibbutz movement as a risk-sharing, self-enforcing institution, whose redistributive ability is limited by adverse selection. I build a simple model of the Kibbutz movement and test it using new micro-level data sets I assemble from primary sources. The predictions of the model are consistent with the Kibbutz's equal income distribution, the relative quality of migrants from the Kibbutz, its membership patterns, the shift away from full equality, and the substantial heterogeneity across Kibbutzes with respect to the magnitude of the differential reforms.

# 1  Introduction

Throughout history, non-market institutions in both developed and developing countries have engaged in redistribution to provide their members with insurance.[1]  Nevertheless, few institutions are as explicitly and genuinely based on equality across members as the Israeli Kibbutz, which is a communal movement that consists today of 120,000 members living in 268 Kibbutzes located throughout Israel who account for 2.6% of the country's Jewish population.  While sharing output equally across individuals provides valuable insurance, equal distribution encourages shirking (moral hazard) and discourages the participation of productive individuals, as they may refuse to share their income with those who are less productive (adverse selection).  As a result, attempts to implement full equality either failed or were based on coercion (Russian Kolkhozes).  Egalitarian communes that survived over long periods of time were often small religious sects (e.g., the Hutterite communes, Amana and the Shakers) with radically distinct belief systems, such as celibacy, that placed them at the margin of society.  The socialist experiment of the Kibbutz presents a puzzle for economists, since it is both voluntary and egalitarian, yet it persisted successfully for most of the twentieth century.  It is one of the largest communal movements in history, and its members, instead of being marginalized, have always been at the center of society.

In this paper, I study how Kibbutzes implemented income equality while mitigating adverse selection, and delve into the determinants of the Kibbutzes' organizational form.  More specifically, I address the following questions.  What are the factors that allow the voluntary egalitarian Kibbutz movement to coexist with a capitalistic environment?  What level of income equality can be sustained considering the tendency of high-ability members to leave?  The hypothesis advanced in this paper is that Kibbutzes are self-enforcing insurance devices.  The communal ownership of all property (that cannot be taken along upon

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[1] Example of institutions that engage redistribution include group lending institutions such as the Grameen Bank in Bangladesh (Stiglitz (1990), Varian (1990) and Besley and Coate (1995)); rotating savings institutions (see Besley, Coate and Loury (1993) and Calomiris and Rajaraman (1993)); risk-sharing arrangements in village economies in India (Rosenzweig (1988), Ligon (1993), Townsend (1995)), Thailand (Townsend (1995)), and Nigeria (Udry (1994)); risk-sharing institutions in medieval English villages (McCloskey (1976, 1991) under the open field system, and Richardson (2003) for Fraternities and the customary poor law as a risk-sharing institution); sharecropping in late medieval Italy (Ackerberg and Botticini (2000)) and in early modern France (Hoffman (1984)); credit cooperatives operated in Germany in the nineteenth and early twenteeth centuries (Banerjee, Besley, and Guinnane (1994)); nineteenth century American communes such as Amana and the Shakers (Murray (1995), Cosgel and Murray(1998)); Soviet Kolkhozes; Orthodox Jews in Israel (Berman (2000)); and professional partnerships of lawyers (Lang and Gordon (1995)) and physicians (Gaynor and Gertler (1995)). The welfare state is another example.

leaving), makes it costly for members to leave and, therefore, alleviates adverse selection. Thus, Kibbutzes whose property is more valuable will implement a higher degree of equality.

Recent developments in Israel provide a unique "experiment" that allows me to test my hypothesis. For over half a century, membership in the Kibbutz movement grew continuously, the standards of living were considered higher than the country's average (e.g., Barkai (1977)), and virtually all of the Kibbutzes were based on full equality. An unexpected debt crisis in the mid-1980s hit some Kibbutzes more severely than others and triggered a high wave of net emigration. Certain Kibbutzes remained traditional egalitarian communes, while others introduced various degrees of differential reforms, ranging from small deviations from the egalitarian model to substantial reforms that essentially transformed those Kibbutzes into capitalist neighborhoods. The heterogenous responses of Kibbutzes with different characteristics allow me to shed light on the role economic forces play in the Kibbutzes.

I construct a simple theoretical model to capture the trade-off faced by Kibbutzes, which would like to split output equally to insure members against idiosyncratic income shocks but, in doing so, might lose high-ability members who find it optimal to leave the commune. The equilibrium contract is shown to provide members with insurance; thus, income distribution inside a Kibbutz is more equal than outside. The crisis of the mid-1980s can be interpreted as a negative shock to the Kibbutzes' wealth (or common property). Comparative statics yield predictions on the relative quality of migrants, membership patterns, the shift away from full equality, and the substantial heterogeneity across Kibbutzes with respect to the magnitude of the differential reforms. In particular, the model yields three main predictions. First, the Kibbutz contract defines an optimal degree of adverse selection, so that migrants from the Kibbutz movement are expected to be favorably selected relative to stayers. Second, wealthier Kibbutzes are expected to maintain a higher degree of equality. Third, the Kibbutz contract provides more income equality when the members' switching costs are higher.

I have assembled two unique micro-level data sets, which form the most systematic data on the Kibbutz movement to date and enable me to test the model's predictions with both individual and Kibbutz level data. In this paper, I test the model's predictions at the Kibbutz-level, employing a new data set constructed from primary sources. This data set contains elaborate demographic and economic data on each

Kibbutz, as well as data on recently undertaken differential reforms. I show that a Kibbutz's post-crisis wealth substantially affects the level of income equality it chooses, and that this result is robust for various measures of a Kibbutz's wealth. Similarly, the members' switching costs (proxied for by average family size and land size) are shown to have a positive effect on a Kibbutz's choice of the level of income equality. A Kibbutz's ideology (proxied for by its movement affiliation) does not seem to affect its level of income equality. Moreover, I show that membership in the Kibbutz movement is countercyclical, and that exit rates increased (and membership decreased) dramatically following the crisis, but that membership has stabilized as a result of the recent differential reforms.

The model's prediction of adverse selection is tested in Abramitzky (2003), who employs a longitudinal data set of 3,769 individuals linked across the 1983 and 1995 population censuses, and shows that there is adverse selection both in exit from and in entry into the Kibbutz. More specifically, migrants from the Kibbutz movement are shown to be favorably selected from the Kibbutz population both in their observable and unobservable characteristics, and entrants into the Kibbutz are shown to be negatively selected from the city population in their characteristics that are unobservable to the Kibbutz movement.

The study of Kibbutzes sheds light on organizations such as partnerships, cooperatives and labor managed firms, in which similar issues arise. Despite a large theoretical literature, few empirical works have investigated these forms of organization. Moreover, current empirical work takes the organizational form (in particular, the level of equality) as a given, and focuses on its effect on productivity (Lang and Gordon (1995), Gaynor and Gertler (1995), Craig and Pencavel (1992)) and on a cooperative's response to shocks compared to conventional firms (Craig and Pencavel (1994)). In contrast, this paper provides a theoretical and empirical analysis of partnerships by investigating their organizational form and focusing on their heterogenous responses to idiosyncratic shocks.

The study of the Kibbutz movement is also important in its own right. The Kibbutz movement has played a major role in Israel's history, and it is a unique attempt to explore an egalitarian way of life. The Kibbutz movement also serves as an example of how voluntary egalitarian institutions can exist for a long time and how they adapt to changes in the economic environment, making it relevant to the new

institutional economic literature.[2] Nevertheless, although the thought-provoking institution of the Kibbutz has been the subject of a large body of research, few attempts have been made to provide a coherent explanation for both the long persistence of and the recent change in the Kibbutzes. The sociological literature points to ideological factors in the success, and recent decline, of the traditional Kibbutz.[3] The failure of the traditional Kibbutz is viewed as the result of a disappearance of collectivist values and a rise of individualism among Kibbutz members.[4] According to these claims, members are no longer ideological socialists and they lack the "pioneering spirit," the solidarity and the altruism that characterized members in the past. Ideology-based explanations fail to account for the timing of the recent shift away from equality and for differences in the equality levels across Kibbutzes. The current economic literature on the Kibbutz movement has speculated about the conditions required for the stability of the traditional Kibbutz movement, but is so far silent about the recent shift away from full equality. Moreover, the literature is based on stylized facts rather than on systematic data analysis, full equality in distribution of income is assumed rather than derived, and the focus is placed on the Kibbutz movement as a whole without accounting for the substantial heterogeneity across Kibbutzes.[5]

## 2　The Kibbutz as a Self-Enforcing Institution

In this section, I describe how the Kibbutz movement has maintained a high level of equality while mitigating moral hazard and adverse selection. I suggest that equality provides Kibbutz members with insurance against idiosyncratic shocks and that insurance has been a main objective of the kibbutz movement. I claim that moral hazard was solved by mutual monitoring and peer pressure, and adverse selection was alleviated by members commitment to own "no private property" and by the Kibbutz's high provision of local public goods that cannot be taken upon leaving, both of which make it costly for members to leave .

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[2] See, for example, North and Thomas (1973), Greif (1989), Greif, Milgrom and Weingast (1994), and the survey by Williamson (2000).

[3] See, for example, Talmon (1970), Don (1995), Getz and Rosner (1996), Rosolio (1999), and Leviathan and Rosner (2000).

[4] Abel (1983) argues that cooperatives can only succeed when incentives such as ideology and solidarity are more important than economic incentives.

[5] See, for example, Satt (1991), Satt and Ginzburg (1992), Helman (1993), Satt (1995), 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.

## 2.1 Insurance in the Kibbutz

First, insurance is an important consequence of full equality across members. Kibbutzes's bylaws guaranteed "equality and cooperation in production, consumption and education", which meant that income of all members and profits from all operations of an individual were pooled by the Kibbutz and distributed equally.[6] Since an average Kibbutz consists of four hundred members with different occupations and abilities, and who work in different industries, equality guarantees full insurance against a worker's type and against other idiosyncratic shocks to an individual's income. Such income shocks might result from illness, unemployment, disability and a shock to one's industry or productivity. 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 1990, p. 39). As Israel developed and more people acquired higher education, full equality also provided Kibbutz members with insurance against shocks to their human capital.

Yet, insurance is not only a by-product of equality, but is also a main objective of the Kibbutz. In particular, mutual aid across members within a Kibbutz and across Kibbutzes are fundamental features of the commune. The Kibbutz movement 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 Kibbutzes and rural villages" (Source: Kibbutz's bylaws). Regardless of the source of risk, a Kibbutz member knows that whatever her circumstances might be and whatever her ability and the income she brings to the Kibbutz, she will always be provided with an average income and be taken care of when necessary.[7]

Insurance has always been an important reason for members to live in a Kibbutz. In a survey conducted in late 1960s comprising over a thousand members of the first and second generations (Rosner et al (1990)), "guaranteeing full social security", "freedom from economic concern and competiton" and "guaranteeing

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[6]In practice, Kibbutzes 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.

[7]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...".

an adequate standard of living" were ranked as important objectives for Kibbutz members. These three objectives 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 Kibbutzes go through differential reforms, surveys of public opinion conducted in Kibbutzes 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 the Kibbutz.

The language used by Kibbutzes today in defining their new status illustrates the importance of insurance and mutual aid. A Kibbutz that remains fully egalitarian is called *Shitufi* (Hebrew for "sharing") and even one that shifts away from full equality is called a "safety net" Kibbutz, to emphasize that even a widely reformed Kibbutz will provide insurance and never let members starve.

## 2.2   Mitigating Moral Hazard and Adverse Selection

Like all institutions providing insurance of some kind, the Kibbutz faces inevitable problems of adverse selection and moral hazard. Moral hazard has typically been alleviated in the Kibbutz by mutual monitoring and peer pressure, which were supported by the establishment of a general meeting, communal dining hall and other social gathering places, and an information transmission mechanism based on gossip. A veteran of the first Kibbutz (*Degania*) describes how peer pressure was implemented when a member shirked: "nobody said a word to him. But in the evening, in the dining hall, the atmosphere around him was such that the following morning he got up and left the *Kvutza* [Kibbutz]" (Near (1992). p. 38). The rest of the paper assumes that moral hazard is solved in the Kibbutz by mutual monitoring and peer pressure. Appendix A provides a more detailed discussion of moral hazard in the Kibbutz, surveys the related kibbutz literature and suggests a possible test for the severity of moral hazard in the Kibbutz.

Adverse selection might be more difficult to solve. Members who realize they have high abilities might forgo the insurance and leave, leaving the Kibbutz with only low-ability members. However, the Kibbutz movement is based on a principle of "no private property" and on a high provision of local public goods,

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which make it costly for members to leave.

In particular, one identifying feature of Kibbutzes is high provision of local public goods, such as swimming pools, green public areas, a pollution-free environment, tennis courts, cultural center, etc. Naturally, the local public goods can only be enjoyed by Kibbutz members.

Another key principle of Kibbutzes is communal ownership of all property, i.e. Kibbutz members own no private property. A Kibbutz member does not even own his house, and can enjoy his share in the Kibbutz enterprises only as long as he stays in the commune. The importance of this principle is revealed in the Kibbutzes's bylaws, which suggest that

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

The high dependence of members on their Kibbutz are illustrated throughout the bylaws, which 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". Another part of the document stresses that "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."

Even today, surveys of public opinions highlight the importance of common ownership, as 80% of respondents mention it as an important element for the future of the Kibbutz.

These principles ensure a high dependence of members on their Kibbutz and serve as a commitment among members to make exit costly and to allow the Kibbutz to maintain a high level of equality.

Yet, many questions should be addressed. What level of equality can be sustained as an equilibrium? Will all members stay in their Kibbutz? What is the quality of Kibbutz members? Is the study of the Kibbutz as an economic institution consistent with historical observations? Can predictions be generated and confronted with the data? The next section presents an economic model of the Kibbutz movement

designed to capture the main problem faced by Kibbutzes and to highlight the main trade-off they face. Predictions of the model are then derived and tested in the data in Section 6 and Section 7. The hypothesis is further substantiated in Section 8.

# 3 A Model of Kibbutz

My thesis is that Kibbutzes are risk-sharing organizations. More specifically, it is a self-enforcing institution, whose level of equality is endogenous and limited by members' outside options. My model illustrates how the Kibbutz might mitigate the adverse selection problem while providing members with insurance. First, common ownership of enterprises serves as a bond that makes it costly for members to leave. Second, the Kibbutz contract may allow for some optimal degree of adverse selection in order to provide more insurance for those members who stay. Such an economic approach to the study of the Kibbutz sheds new light on its creation, peculiar features and self-sustainability.

This paper suggests that the Kibbutz movement's long persistence and recent change is consistent with rational behavior of selfish agents. Although this does not mean that ideology has no role to play in the Kibbutz, the analysis that follows suggests that economic factors, rather than ideological ones, are the driving force behind members' migration decisions and Kibbutzes's contract choices.

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 post a "bond" and contribute their one unit of private property to the Kibbutz, which provide common property (local public goods) worth $K$ units for each member. At $t = 1$, individuals receive a signal $p \in [0, 1]$, which is a probability to earn a high income level $\theta_H$ (as opposed to a low income level $\theta_L$).[8] 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 property $K$ and enjoy $pu(\theta_H) + (1 - p)u(\theta_L)$. The parameter $K$ represents the Kibbutz's wealth,

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[8]For simplicity, income levels $\theta_L$ and $\theta_H$ are assumed to be equal inside and outside the Kibbutz.

which a member has to give up upon leaving the Kibbutz. These include the amenities, goods and services offered by the Kibbutz, the local public goods, an equal share of the Kibbutz assets, a house and pension. $K$ may also include members' ideology and preferences to live in a Kibbutz. Nevertheless, the empirical analysis that follows suggests that the economic elements of $K$ are the driving force in both individuals and Kibbutes's decisions.

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 a participation constraint $(PC)$, $pu(c_H + K) + (1-p)u(c_L + K) \geq pu(\theta_H - s) + (1-p)u(\theta_L - s)$ 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:

$$\underset{c_L, c_H, \, P}{Max} \int_{p \in P} [pu(c_H + K) + (1-p)u(c_L + K)] \, dF(p) + \int_{p \notin P} [pu(\theta_H) + (1-p)u(\theta_L)] \, dF(p) \qquad (1)$$

$$s.t$$

$$BC : \int_{p \in P} [pc_H + (1-p)c_L] \, dF(p) \leq \int_{p \in P} [p\theta_H + (1-p)\theta_L] \, dF(p)$$

$$PC : pu(c_H + K) + (1-p)u(c_L + K) \geq pu(\theta_H) + (1-p)u(\theta_L) \text{ iff } p \in P$$

The model concentrates on members decision to stay, rahter than on their decision to join the Kibbutz from the first place. The reason is that the main source of population growth in the last fifty years has been internal: Kibbutz-born individuals staying in their Kibbutz rather than net migration to the Kibbutz.[9] Kibbutz-born individuals are entitled to become members, but can decide to leave and forgo their share in the communal property.

The model can be extended to include members' decision to join. Since members are assumed to be ex ante homogenous and risk averse, everyone will join the Kibbutz at $t = 0$ and give up all private property,

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[9]Data come from Barkai for the period before 1970 and my data for the period after.

in order to build collective property $K$, as a commitment to make subsequent exit costly.[10] [11]

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.[12] Later generations of members are assumed to be in the relevant age to make a migration decision. It is reasonable to believe that from a certain age, members are "locked in" and would not leave even if they are high types and their Kibbutz is based on full equality. In fact, the data suggests that members who leave their Kibbutz are typically in the age range of 20-40 and very few members leave the Kibbutz after the age of 45 (see FIGURE 3). Individuals between 20-40 may still face uncertainty about their type and their future income. Although the model is static and abstracts from dynamic considerations, $t = 0$ can be thought of as a period where a member still learns about his type and makes sunk contributions to the Kibbutz.

Notice that $K$ units worth of consumption disappear every time a member leaves the Kibbutz, since $K$ is a local public goods that cannot be taken along upon leaving. The choice of $K$ as a public good, rather than a private good, was made since public goods are prevalent in the Kibbutz and for simplicity. Nevertheless, the model is very similar in the private good case, as long as members cannot take it upon leaving.[13]

**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. ∎

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 first-best contract is the contract a social planner would choose if he were maximizing the sum

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[10] This raises the question of why the Kibbutz is not a more wide spread phenomenon, which is addressed in Appendix B.

[11] Therefore, $K$ also include a member's labor income produced when he is still uncertain about his type.

[12] Talmon (1972), p.2.

[13] 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.

of everyone's utilities and could force people to stay. 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 needs 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 insurance 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 insurance and adverse selection, which is illustrated in Claim 3 and Proposition 1.

The model illustrates a fundamental feature of the Kibbutz, namely that the optimal Kibbutz contract is more egalitarian than in the capitalistic 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 sheds light on other identifying features of the Kibbutz. First, it highlights the importance of insurance and common ownership in the Kibbutz. The Kibbutz wants to provide insurance to members, but needs to make it costly for them to leave ex post. This is consistent with Kibbutz values such as equality and mutual aid across members and across Kibbutzes, and with the abolishment of all private property (the explicit commitment to "bring to the possession of the Kibbutz his full working power and any income and assets he owns and/or receives from any source"), high provision of local public goods, and the high investment of the Kibbutz in physical capital that can not be taken by movers.

## 3.1 Testable Implications: Adverse Selection and the Determinants of Equality

The model yields three testable implications. First, the model reveals a tendency of adverse selection from the Kibbutz, i.e. higher types are more likely to leave. Formally,

**Proposition 1** *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 $u$. ∎

Proposition 1 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 $p'$. The Kibbutz problem can, thus, be simplified and rewritten as follows:

$$Max_{c_L, c_H} \int_{p=0}^{p'} \left[ pu(c_H + K) + (1-p)u(c_L + K) \right] dF(p) + \int_{p=p'}^{1} \left[ pu(\theta_H) + (1-p)u(\theta_L) \right] dF(p) \qquad (2)$$

$$s.t$$

$$BC : \int_{p=0}^{p'} \left[ pc_H + (1-p)c_L \right] dF(p) = \int_{p=0}^{p'} \left[ p\theta_H + (1-p)\theta_L \right] dF(p)$$

$$PC : pu(c_H + K) + (1-p)u(c_L + K) \geq pu(\theta_H) + (1-p)u(\theta_L) \text{ iff } p \leq p'$$

Second, 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. The Kibbutz has to choose between a contract with a high level of 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 Kibbutzes, who 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.

Second, the optimal level of insurance is (at least gradually) increasing in the value of the Kibbutz's common propert, $K$.[14] The underlying reason is that for a high enough $K$, full equality can be implemented, and as $K$ increases the level of equality gradually approaches to full equality. Formally,

**Proposition 2** *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 $k \in \left(\underline{K}, \overline{K}\right)$ 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 $\left(\underline{K}, \overline{K}\right)$ is not empty and $\overline{\overline{K}}$ exists. ■

# 4 "Experiment": Crisis and Reform

A negative shock to Kibbutzes in the late-1980s provides a unique experiment that allows me to test the model's predictions and to access the factors at the center of Kibbutzes' long success and recent change. Many Kibbutzes experienced a debt-crisis that reduced their economic value substantially and forced them to reduce the amenities provided to members.

Like many other businesses in Israel in the late 1970s, the major Kibbutz movements (Takam movement and the Kibbutz Artzi movement) had borrowed large sums of money, which had been easier to repay in the presence of high inflation in the early 1980s.[15] But Kibbutzes depended more than others on credit, in part since their agriculture was capital intensive and since they had to finance the move of children from special residences to their parents' homes. When inflation reached 400% in 1984, the Israeli government took action to stop it and maintain excessively high interest rates. The government's stabilization program

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[14] 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.

[15] There are three major Kibbutz movements that are coordinating the activities of individual Kibbutzes.

left many Kibbutzes with a huge repayment burden. Another contributing factor to the crisis was the decline in world prices of agriculture, which has always been a major source of income for Kibbutzes.[16]

A complicating factor was the system of mutual guarantees across Kibbutzes. All Kibbutzes were members of their movement funds, such that each Kibbutz was liable for the movement's total debt in addition to its private one. By 1989 the crisis involved many Kibbutzes. The government, the banks and the Kibbutzes established an independent Kibbutz Arrangement Board, which dissolved the mutual guarantees across Kibbutzes and forced each Kibbutz to deal with its own economic circumstances. Agreements between the government, the banks and the Kibbutzes were signed in 1989, 1996 and 1999 and brought the debt crisis under control.[17]

Nevertheless, by the early 1990s it was evident that Kibbutzes were in crisis and they had to reduce the amenities, goods and services provided to their members. This corresponds in the model to a negative shock to the value of the Kibbutz $K$. Depending on the timing of their loan and the capital intensity of their industries, some Kibbutzes were hit by the shock more severely than others. A few years later, Kibbutzes introduced various degrees of differential reforms. The different magnitude of the negative shock and the heterogeneous responses across Kibbutzes, provide the necessary variation to test the model's predictions.

# 5    Data Sources

A data-collection effort over several years has resulted in two large and unique micro-level data sets of individuals and Kibbutzes. The first is a longitudinal data set of individuals linked across the 1983 and 1995 Israeli censuses of population, which allows me to observe in both years whether an individual lives inside or outside a Kibbutz movement. During this period, all Kibbutzes were still based on full equality and major reforms were not yet implemented. The sample is representative and accounts for 4% of the population. This data set is described in more details in Abramitzky (2003).

The second data set is a sample of almost all 268 Kibbutzes that contains elaborate demographic and economic information for the period 1930-2002, as well as data on recent reforms undertaken. I collected

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[16] Besides the deterioration of world prices of agriculture deteriorated, the government recovery plan left interest rates high, which played against the Kibbutz, since its agriculture is capital intensive.

[17] Part of the debt was canceled and other parts rescheduled.

from various archives and institutions in Israel annual demographic information on each Kibbutz, such as the size of the population and its status in the Kibbutz (members, candidates, soldiers, etc.); the number of members and candidates exiting and entering; the age distribution of the population; average household size; the ideology level (as measured by their movement's affiliation); information of recent reforms undertaken, including the level of equality chosen by each Kibbutz. For the early period (before 1947), I collected various economic indicators such as income, expenses and profits. Unfortunately, Kibbutzes did not make such economic data available in later periods. Therefore, I collected economic data from two different sources: a credit rating company (Dunn and Bradstreet) and an elaborate report on the "economic condition" of the Kibbutzes conducted in the mid-1990s by a large accounting firm. I collected economic variables such the size and value of the Kibbutz's land and the Kibbutz credit rating that reflects its general economic condition, ability to repay its debt, risk of default, etc. This paper only uses part of the data collected. Section **??** describes the part of the data set that is used in this paper.

# 6    Adverse Selection in the Kibbutz: Individual-Level Analysis

Despite the fact that a member cannot take his share of the Kibbutz's assets upon leaving, some members have always left their Kibbutz. Kibbutz observers and scholars have always suspected that the "best" members are always the first to leave (Bettelheim (1969), Talmon (1970), Helman (1982), Leviathan (1993)), as predicted by the model.

In Abramitzky (2003), I employ a data set of 3769 individuals linked across the 1983 and 1995 Israeli censuses of population to test the adverse selection hypothesis. I find strong evidence that Kibbutz members who left the Kibbutz movement are favorably selected from the Kibbutz population in terms of both their observable and unobservable characteristics. More specifically, movers were more educated, more skilled, more able and more likely to earn a high wage outside the Kibbutz, compared to those who stayed behind. The words of a secretary of Kibbutz Givat Brenner in 2001 summarize the negative process[18]:

> "I don't want to shout it out loud, but there is a negative selection process at work here. We
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> have lost some of the best and brightest of our young adults....We do not have enough members

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[18]Gavron [2001, p. 68].

in the twenty-five to forty age group, and frankly, those who have stayed are not the best."

Once in the city, low-skilled former Kibbutz members are shown to outperform individuals with similar characteristics and high-skilled former Kibbutz members under perform individuals with similar characteristics.

Abramitzky (2003) also finds direct evidence for adverse selection in entering a Kibbutz. Controlling for publicly observable information, entrants to the Kibbutz movement are shown to be adversely selected from the city population in terms of their privately observable pre-entry wage and wealth. Although entry to the Kibbutz movement is not directly modelled in the current paper, adverse selection in entry is consistent with the Kibbutz movement being an insurance organization. Moreover, the fact that very few individuals enter the Kibbutz movement from the outside (only 67 individuals entered a Kibbutz out of over 10,000 individuals in the sample), indicates that entry is much less important in the Kibbutz movement and justifies the model's focus on Kibbutz members deciding whether or not to leave.

# 7    The Determinants of Equality: Kibbutz-Level Analysis

For over half a century, the Kibbutz movement was based on full equality in the distribution of income. In recent years, for the first time in Kibbutz history, differential reforms are being implemented.[19] By 2003, many Kibbutzes have shifted away from equality and are introducing various degrees of reforms, ranging from adjustments "in the margin" to substantial reductions of equality.

Nevertheless, and as predicted by the model, Kibbutzes that even after the crisis remained wealthy (i.e. with high $K$), such as Hatzerim, Maagan Michael and Mishmar Haeemek, often still function as traditional communes. This illustrates that for certain Kibbutzes full equality remains feasible and does not result in the exodus of the most productive members. Hatzerim, for example, is an economic success even today. Yet, Hatzerim is still a traditional commune. Members do not own their houses nor do they have their own bank accounts and Hatzerim is a strong opponent to the reforms. One of the Kibbutz members claims that "in the final analysis, our ideology protected our economic interests". An economic interpretation of

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[19] There is one notable exception to this statement. In the mid-1980s, Kibbutz Beit Oren almost collapsed, as most of its members abandoned it and its older members were left alone with no one to take care of them. The United Kibbutz Movement allowed a group of young individuals to change the Kibbutz fundamentaly.

the Kibbutz suggests the opposite - the economic success of Hatzerim is what keeps its egalitarian nature. The rest of the section is a formal test of this claim.

The predictions are that a Kibbutz should remain more egalitarian when its economic value $(K)$ is higher and when its members have high switching costs $s$. These predictions are tested in the data using an Ordered Probit regression and are shown to play an important role in determining a Kibbutz's degree of equality. Other factors shown to affect the equality level chosen by a Kibbutz are the number of members who left and joined the Kibbutz in the years before reforms were undertaken. More specifically, I study the determinants of the level of equality chosen by a Kibbutz by performing the following regression analysis:

$$Equality_i = \alpha + \beta' X_i + \delta_1 K_i + \varepsilon_i$$

where $K_i$ is the post-crisis wealth of Kibbutz $i$ and $X_i$ are control variables that may affect a Kibbutz's level of equality such as the its level of ideological comittment to equality, its membership size and its exit and entry rates. The following are the variables used in the regression:

## 7.1 Variables

### 7.1.1 Equality $(c_H^* - c_L^*)$

In 2003, a general Kibbutz convention redefined the concept of a Kibbutz to include various models of Kibbutzes.[20] Kibbutzes self categorized themselves into one of five categories that can be ranked by their degree of equality and sharing. The categories, from high equality to low equality, are "cooperative Kibbutz" (*Kibbutz Shitufi*) (39 Kibbutzes), "differences-in-margin Kibbutz" (29 Kibbutzes), "combined (equality and differential) model" (35 Kibbutzes), "safety-net model "(110 Kibbutzes) and "community settlement" (*Yeshuv Kehilati*).

"cooperative Kibbutzes" still function as traditional communes and are based on full equality in the distribution of income. At the other extreme, Kibbutzes that adpoted the "community settlement" model essentially dissolved the partnership between members and became similar to regular neighborhoods that are as (in)egalitarian as the rest of Israel. The majority of Kibbutzes have chosen a middle way, ranging

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[20] A public committee was formed by the government to examine the question of "what is a Kibbutz today?." The committee advised that each Kibbutz should be free to choose its distinctive way and its level of sharing, as long as it keeps minimal level of mutual guarantee among members. The government accepted the committee's recommendations, making both "traditional Kibbutzes" and "renewed Kibbutzes" accepted forms of the Kibbutz.

from a high, albeit not full, level of equality in the distribution of income ("differences-in-margin" and "combined model"), to a low, albeit substantial, level of equality that provides low-ability members with "safety net".[21]   Kibbutzes in the category of  "differences-in-margin" are claimed to be closer to the fully egalitarian category than the "combined model" category, but the difference between them is not as apparent as between the other categories. Therefore, I use two alternative specifications, one that treat them as two different categories and one that treat both of them as the same category.

Since only 3 Kibbutzes became communal villages and abandoned equality altogether, I dropped them from the analysis, although this does not affect the results.

The level of equality chosen by a Kibbutz is my dependent variable. Since this is a discrete variable that can be ranked from high to low, I employ an Ordered Probit regression, as discussed in more details below.

### 7.1.2   Communal Wealth ($K$)

The variable $K$ in the model represents the Kibbutz's communal wealth, such as its enterprises, capital, local public goods and all other property that cannot take along upon leaving. Since Kibbutzes did not make their economic information publically available for most of the recent period, and since there is no single variable that fully captures $K$, I employ alternative measures that capture various aspects of the Kibbutz's economic value. The model predicts that wealthier Kibbutzes will maintain a higher degree of equality.

"ECONOMIC STATUS" IN 1989 AND 1994 (first measure of $K$): Following the debt crisis, as part of an attempt to resolve the crisis and to reach an agreement between the government, the banks and the Kibbutz movement, Kibbutzes were divided into 4 groups, reflecting the economic strength of each Kibbutz. Thirty one Kibbutzes were defined as "strong Kibbutzes that can assist other Kibbutzes", 42 Kibbutzes were determined to be in a relatively strong economic position, 104 Kibbutzes were defined as Kibbutzes that could eventually return their loans but "could use assistance" and 27 Kibbutzes were in a bad economic position and "could not repay their debt without assistance."

CREDIT RATING IN 1995 AND 2002 (second and third measures of $K$): As one of the measures of

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[21]About 40 Kibbutzes are still debating their status.

the post-crisis value of the Kibbutz, $K$, I use credit rating of Kibbutzes assigned by Dunn and Bradstreet (D&B) Company. The credit rating is calculated by D&B based on the following parameters: ability to repay debt as reflected by economic forecasts of the Kibbutz Arrangement Board; type of industries; diversification of industries; income; debt per member; Kibbutz's land value.

The credit rating was assigned to Kibbutzes by D&B Company both in 1995, as a number from 1-4, and in 2002, as a number from 1-100. The measure from 1995 reflects the economic position of the Kibbutz after the debt crisis but before major differential reforms were implemented. Thus, the regression that uses the 1995 credit rating tests the effect of ex ante credit rating on ex post differntial reforms. The 2002 credit rating is more elaborate, but might potentially reflect the effect of differential reforms on credit rating, since the diffential reforms had already been discussed for several years by 2002. This might introduce a bias due to reverse causality problem. However, the direction of the bias works against the hypothesis that I test. That is, the differential reforms by a Kibbutz are expected to keep productive members inside, thus improving the Kibbutz's credit rating. This makes it even more difficult to document a positive correlation between a Kibbutz 2002 credit rating and its degree of equality (i.e. a negative correlation between the credit rating and the differential reforms).

FIXED CAPITAL IN 2001 (fourth measure of $K$):[22] This is a continuous measure of $K$ that captures the value of the Kibbutz's common property. The fixed capital was rescaled and divided by a million for presentation purposes.

### 7.1.3 Ideology

MOVEMENT AFFILIATION (proxy for level of ideology): Kibbutzes are autonomous units but they belong to movements that coordinate their activities. There are three major Kibbutz movements today. The biggest is the Takam Movement (60% of Kibbutzes), then the Kibbutz Artzi Movement (32%) and the religious Kibbutz Movement (6%). The historiography of the Kibbutz suggests that the various movements differ in their approach towards equality. Kibbutz Artzi holds the most left wing ideology and has traditionally been considered more conservative in preserving Kibbutz values.[23] Even within the Takam,

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[22] Unfortunately, there are no systematic balance sheets that are available for earlier years.

[23] 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).

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one can separate Kibbutzes according to their ideology towards egalitarianism, as was revealed in the ideological split of the 1950s.[24] I employ two specifications of movement affiliation. The first specification is a dummy variable for Kibbutz Artzi Movement and the second is a variable from 1-3 that gives a value of 1 to Kibbutzes that are affiliated with the traditionally less ideological group of the Takam Movement, a value of 2 to ones affiliated with the more ideological group of the Takam, and a value of 3 to Kibbutzes of Kibbutz Artzi. The regression results are robust to the two alternative definitions of ideology.

If ideology plays a role in a Kibbutz decision of whether or not to reduce the level of equality, a Kibbutz affiliated with a more ideological movement will tend to remain more egalitarian. However, ideology is more complex and is not fully captured by movement affiliation. Since I do not have enough information on the 16 religious Kibbutzes, they are excluded from the analysis. The religious Kibbutzes did not suffer in general from the financial crisis and, as predicted by the model, many of them remain egalitarian.

### 7.1.4 Control Varibles

NUMBER OF MEMBERS AND CANDIDATES in 1995: This variable serves as a control in the regression. The results are the same when using membership instead of members and candidates, and they are robust for the choice of the year.

A bigger Kibbutz may be able to provide better insurance, as there is more diversity in members' occupations and industries. That is, pooling income among 500 members may subject each individual to less idiosyncratic risk than pooling income among 50 individuals. To the extent that a bigger Kibbutz is more useful in providing insurance, it is expected to choose a higher degree of equality. On the other hand, moral hazard might get worse with size since peer pressure is less effective, making bigger Kibbutzes less prone to choose a high degree of equality.

NUMBER OF MEMBERS EXITING THE KIBBUTZ IN 1987-1995: This variable is meant to capture the severity of the adverse selection from the kibbutz in the crisis period, before differential reforms were implemented. Again, results are robust to the exact definition of the period.

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[24]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 (1997), pp.210-215.

If when choosing the level of redistribution, the Kibbutz is responding to undesired post-crisis adverse selection, one expects a positive effect of previous exit on the level of equality chosen.

NUMBER OF INDIVIDUALS JOINING FROM OUTSIDE THE KIBBUTZ IN 1987-1995: This variable is meant to capture a Kibbutz's "attractiveness" in the pre-reform period. The assumption is that the more members who joined the Kibbutz, the more attractive is the Kibbutz. The period 1987-1995 was chosen to reflect the value of the Kibbutz in the crisis period, but before major differential reforms were undertaken. The results are robust to the exact definition of post-crisis and pre-reform period. More specifically, the results remain the same when defining the variable as the "number of individuals joining from outside the Kibbutz in 198X-199Y" for all X and Y between 0 and 9.

LAND SIZE: Holding constant the population size, a larger common land area means that on average each member has more land inside the Kibbutz, which is expected to make it more costly for members to exit the Kibbutz. Thus, the model predict that the more land a Kibbutz owns, the higher the level of equality it can maintain.

HOUSEHOLD SIZE in 1995 (a proxy for switching costs $s$): Larger households may face higher switching costs upon exiting the Kibbutz, and they may benefit more from the Kibbutz local public goods due to their non-exclusive nature. Therefore, the model predicts that Kibbutzes whose households are bigger will implement a higher level of equality.[25]

## 7.2   Ordered Probit Analysis

Whereas multinomial discrete choice models ignore the ordinal nature of equality levels, OLS regression would attach a cardinal meaning for the five levels of equality.[26] Therefore, I employ an ordered Probit model, which treats outcomes as ordinal rather than cardinal. A Kibbutz is assumed to have its "preferred" equality level and choose the equality level category closest to its preferences. Let $x_{1i}$ be a vector of characteristics of Kibbutz $i$, including a Kibbutz credit rate; movement affiliation; average age of population; average household size; population size (number of members and candidates); land size number of individuals joining in 1987-1995; number of members exiting in 1987-1995. Let $D_{2i}^*$ be the (unobserved) preferred

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[25] In the past, when children used to live in special residences outside parents' homes, most households in the Kibbutz consisted of only the parents. Nowadays, children live with their parents in most Kibbutzes.

[26] See Greene (1997), p.926.

degree of equality of Kibbutz $i$.

$$D_{2i}^* = \beta' x_{1i} + \varepsilon_i \tag{3}$$

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

$$
\begin{aligned}
D_{2i} &= 1 \text{ if } D_{2i}^* \leq 0 \tag{4}\\
&= 2 \text{ if } 0 \leq D_{2i}^* \leq \mu_2\\
&= 3 \text{ if } \mu_2 \leq D_{2i}^* \leq \mu_3\\
&= 4 \text{ if } \mu_3 \leq D_{2i}^* \leq \mu_4\\
&= 5 \text{ if } \mu_4 \leq D_{2i}^*
\end{aligned}
$$

therefore, $Prob(D_2 = 1) = \Phi(-\beta'x_1)$, $Prob(D_2 = 2) = \Phi(\mu_2 - \beta'x_1) - \Phi(-\beta'x_1)$, $Prob(D_2 = 3) = \Phi(\mu_3 - \beta'x_1) - \Phi(\mu_2 - \beta'x_1)$, $Prob(D_2 = 4) = \Phi(\mu_4 - \beta'x_1) - \Phi(\mu_3 - \beta'x_1)$, $Prob(D_2 = 5) = 1 - \Phi(\mu_3 - \beta'x_1)$. Summary statistics are presented in TABLE 2 and the Ordered Probit regression results are presented in TABLE 3. Nevertheless, the coefficients in the Ordered Probit model do not have a clear interpretation.[27] Therefore, I calculate the marginal effects of changes in $x_1$ for the probability of each equality level. The marginal effects are $\frac{\partial Prob(D_2=1)}{\partial x_1} = -\Phi(-\beta'x_1)$, $\frac{\partial Prob(D_2=2)}{\partial x_1} = \left[\Phi(-\beta'x_1) - \Phi(\mu_2 - \beta'x_1)\right]\beta$, $\frac{\partial Prob(D_2=3)}{\partial x_1} = \left[\Phi(\mu_2 - \beta'x_1) - \Phi(\mu_3 - \beta'x_1)\right]\beta$, $\frac{\partial Prob(D_2=4)}{\partial x_1} = \left[\Phi(\mu_3 - \beta'x_1) - \Phi(\mu_4 - \beta'x_1)\right]\beta$, $\frac{\partial Prob(D_2=5)}{\partial x_1} = \Phi(\mu_4 - \beta'x_1)\beta$ and they are presented in TABLE 4 for the specification with 3 categories of equality, and in TABLE 5 for the 4-category specification. The following are the main findings of the regressions:

**Result 1** *The wealthier the Kibbutz, the more income equality it implements:*

As predicted by the theory, wealthier Kibbutz (those with higher $K$) are more likely to maintain a high degree of income equality, and relatively poor Kibbutzes are more likely to choose a low degree of income equality. This is illustrated in FIGURE 4 and FIGURE 5 for the first measure of K (a Kibbutz's economic status in 1989).

Nevertheless, this result is general and holds for all the measures of $K$ discussed above, as illustrated by TABLE 6 (for 3-categories of equality) and TABLE 7 (for the case of 4-categories of equality). The

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[27]See Greene (1997) pp. 926-929 and Amemiya (1985) pp. 292-293.

tables presents the relevant coefficient from nine regressions and shows the marginal effects of the different measures of K on a Kibbutz's degree of income equality. The stronger the Kibbutz is economically, as measured by the its economic status, credit rating in 1995 and 2002, fixed capital and the number of members who joined it, the more likely it is to maintain a higher degree of income equality. For example, an increase in one unit in an average Kibbutz's credit rating increases the probability that it remains fully egalitarian by 30% (from 13.6% to 18.3%). Similarly, the probability that a Kibbutz maintain full income equality increase by over 20% (from 13.6% to 16.6%) when 10 individuals joined it from outside in the previous decade. On the contrary, the probability that an average Kibbutz chooses a relatively low level of equality ("safety net") is estimated to be 57%, which decreases by about 12% points with a unit increase in credit rating and by about 9% points when 10 individuals joined from outside in the previous decade.

**Result 2** *The higher the members' switching costs, the higher the degree of income equality the Kibbutz maintains:*

An increase of 1000 square meters in a Kibbutz's land size increases its probability to choose full equality by 3% points (from 13.6% to 16.6%), but decreases the probability the Kibbutz chooses a low level of equality by 5% points (from 57% to 52%). Nevertheless, household size does not seem to affect a Kibbutz's degree of equality.

**Result 3** *No effect of ideology on equality:*

A Kibbutz that is affiliated with a more ideological movement does not seem to maintain a higher degree of equality. On the contrary, under certain specifications, Kibbutzes from a more ideological movement choose a lower level of equality.

**Result 4** *More exit in the pre-reform period induces a lower level of equality:*

As implied by the model, Kibbutzes seem to respond to the increased exit and adverse selection (that resulted from the crisis), by reducing their degree of equality. 10 more members who left a Kibbutz in the period 1987-1995 decrease the probability that a Kibbutz will maintain full equality by 0.9% points and increase the probability it will choose a low level of equality by 1.7%.

Membership size does not have a significant effect on a Kibbutz's degree of equality.

# 8 Further Tests

## 8.1 Demographic Patterns and Adverse Selection

Although the model predicts that the Kibbutz should adjust its contracts after a shock to $K$, in reality such fundamental reforms did not happen instantaneously. It took Kibbutzes over a decade to "digest" the economic shock and to adjust the contracts accordingly. Failing to reduce the level of equality in the face of a lower $K$ would result in higher exit rates and brain drain of productive members, who now prefer to forgo their sunk investment in the Kibbutz and earn a premium for their ability outside the Kibbutz. Formally,

**Proposition 3** *Fixing the level of $c_H$ and $c_L$, the lower the value of the Kibbutz $K$, the smaller the Kibbutz membership and the more adverse selection. More specifically, membership shrinks from $[0, p']$ to $[0, p'']$, where $p'' < p'$ and an additional fraction $p' - p''$ leave the Kibbutz.*

**Proof.** Define the $p$ for which the $PC$ holds in equality (for a given $K'$ and $c_H - c_L$) as $p'$, i.e. $p'u(c_H + K') + (1-p')u(c_L + K') = p'u(\theta_H - s) + (1-p')u(\theta_L - s)$. For a given $K'$, $c_L$, $c_H$, $p \in [0, p']$ stay in the Kibbutz, and $p \in [p', 1]$ leave. For a lower level of $K$, $K_J < K'$, $p'u(c_H + K'') + (1-p')u(c_L + K'') < p'u(\theta_H - s) + (1-p')u(\theta_L - s)$. Since $pu(c_H) + (1-p)u(c_L) - pu(\theta_H - s) - (1-p)u(\theta_L - s)$ is non-increasing in $p$, a fraction $p' - p''$ leaves the kibbutz and the Kibbutz membership becomes $[0, p'']$, where $p'' < p'$ and $p_J$ is implicitly defined by $p''u(c_H + K') + (1-p'')u(c_L + K') = p''u(\theta_H - s) + (1-p'')u(\theta_L - s)$. ∎

### 8.1.1 Aggregate Level

The data is consistent with this prediction and suggest a decline in the Kibbutz movement membership and in its members average quality. TABLE 1 and FIGURE 1 show that the number of Kibbutzes and the Kibbutz population rose until the mid-1980s, but shrank since then. FIGURE 2 suggests that exit rates were relatively low before the late-1980s, but rose substantially afterwards. Moreover, as already discussed, Abramitzky (2003) shows that movers in this period (between 1983 and 1995) were favorably selected from the Kibbutz movement population.

### 8.1.2 Kibbutz Level

Proposition 5 suggests that Kibbutzes with a low value of $K$ that did not reduce their level of equality are expected to experience high exit rates. FIGURE 2 suggests that this was the case in the aggregate level, and a similar pattern holds for most Kibbutzes in the post-crisis and pre-reform period. Moreover, exit rates are expected to decline in Kibbutzes that eventually introduce differential reforms.

Since most Kibbutzes introduced differential reforms only recently, a formal test of the effect of the reforms on exit rates can only be conducted in a few years. Nevertheless, a few Kibbutzes had started to discuss reforms in the mid-1990s. FIGURE 7 shows membership over time in an average such Kibbutz. The figure suggests that membership increased continuously before 1985, then decreased dramatically and in 1993 reached its 1967 level. The Kibbutz then started introducing differential reforms and since then membership has not suffered a further decline and remained constant. Anecdotes of Kibbutz members suggest that the differential reforms are successful in keeping high-ability members inside. As David Koren, a former member of the Knesset (Israeli parliament) and an 85 year old member of Kibbutz *Gesher Haziv*, puts it: "*Since we started with the privatization, no one has left (the Kibbutz)*".[28]

Moreover, Kibbutzes whose value of $K$ remained high even after the debt-crisis are not expected to experience high exit rates even while maintaining high level of equality. FIGURE 6 presents membership over time of Kibbutzes with a high credit rating that maintain full equality throughout the century. The figure suggests that membership has grown continuously in these Kibbutzes.

## 8.2 Counter-Cyclical Net Migration

**Proposition 4** *In the traditional Kibbutz (i.e. as long as $c_H - c_L$ is constant), membership is counter-cyclical. That is, fixing $c_H - c_L$ and $\theta_H - \theta_L$, the higher $\theta_H + \theta_L$, the lower the Kibbutz membership.*

**Proof.** Similar to Proposition 3. ∎

An insurance interpretation of the Kibbutz movement predicts that living in the Kibbutz and splitting total output equally is more attractive in times of recessions than in times of expansion. FIGURE 8 illustrates that membership in the Kibbutz has been roughly countercyclical in the period 1966-2000. The

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[28]Source: the Israeli newspaper Yedioth Aharonot of 5/22/02.

correlation between Kibbutz membership and the growth of GDP per capita in that period is -0.22.[29] For the period 1922-1947, the correlation between Kibbutz membership and the growth of NNP is -0.14 (the data on Israel's NNP in this period is Taken from Metzer (1998)).

## 8.3  "Lock In" Devices

The Kibbutz objective function is increasing in $K$. Thus, the Kibbutz has incentives to have members highly-dependent and to increase their perception of K, to make it costly for them to leave. When thinking of the Kibbutz movement as an economic institution, some of its peculiar features can be interpreted as intending to serve such "lock in" devices.

First, the Kibbutz movement was based, for most of its existence, on self-labor. This "locked in" members because it might have made it more difficult for a Kibbutz member to compare his worth inside the Kibbutz with his opportunity cost. In terms of the model, this violated the assumption that incomes inside and outside the Kibbutz are the same and served as an additional commitment to stay in the Kibbutz.

Second, Kibbutzes overinvested in physical capital and in public goods and allowed no private savings (as it was for many years a non-cash economy). From the Kibbutz's perspective, this made sense since (as already discussed) members who defect could not take their share of the Kibbutz assets with them, and this may have prevented productive members from leaving.

Third, Kibbutzes typically had members acquire human capital that is specific and is more useful inside the Kibbutz than it is outside. In fact, the large agriculture base of the Kibbutz, although rooted in the founders' belief that only Jewish agriculture would buy the Jews the rights to the land of Palestine, also served as a "lock in" device, long after such ideology was gone. For many years, the Kibbutz movement opposed to higher education and only financed members who studied a "required occupation" such as agronomy, which is more useful in the Kibbutz. This issue of the Kibbutz incentive to invest in human capital is left for another paper.

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[29] I do not have demographic information on Kibbutzes for the period 1948-1966.

# 9    Kibbutz History Reinterpreted

An economic approach to the study of the Kibbutz movement sheds new light on its creation, peculiar features and self-sustainability. My model highlights the importance of equality and common ownership of property in providing insurance and mitigating adverse selection. The model is consistent with the observed patterns in the Kibbutz movement membership and exit rates over time, as well as the direction and magnitude of recent reforms undertaken.

The Kibbutz movement was founded by individuals who can be regarded as *ex ante* homogenous in their ability and potential income, and who came to a new land full of uncertainties. The literature emphasizes that one of the "main characteristic of the Kibbutzes (at the outset was) homogeneity. Kibbutzes were established by young unattached individuals who share a comparatively long period of social, ideological, and vocational training." (Talmon (1972), p. 2). In order to enjoy full insurance, they posted a bond and committed to "bring to the possession of the Kibbutz his full working power and any income and assets he owns and/or receives from any source" (source: Kibbutz movement's bylaws). A member could not take his share in the Kibbutz property upon leaving. This strong commitment ensured that only a small fraction of exceptionally high types left the commune, which is efficient since including them would mean a reduction of the insurance level for other members. This bonding in the ex ante stage enabled the creation of Kibbutzes. Once common ownership of enterprises was established and Kibbutz-born individuals made the decision of whether to stay, Kibbutzes were self-sustained and could maintain a high level of equality and alleviate adverse selection.

As long as Kibbutz property is highly valuable, full equality is an equilibrium and does not result in strong adverse selection. When Kibbutz property becomes less valuable, the bonding weakens and the Kibbutz can only provide members with partial insurance if it were to keep productive members inside.

Moral hazard was alleviated by mutual monitoring and peer pressure, which were supported by institutions such as the communal dining hall and an information transmission mechanism based on gossip.

The fully egalitarian Kibbutz of 1910 to the mid-1980s constituted an equilibrium, under which members were fully insured against idiosyncratic shocks and a small fraction of exceptionally productive individuals left the Kibbutz. The insurance equilibrium was self-enforcing for more than half a century and adverse

selection was relatively low because for each member of the Kibbutz it was costly to defect - since she could only take his human capital with him. His equal share of the physical assets of the Kibbutz served as a "bond" that made it costly for him to leave, even if he had high abilities and could earn high income outside the Kibbutz. These constituted the "traditional Kibbutz" equilibrium.

The debt-crisis that struck many Kibbutzes in the mid-1980s, combined with technology oriented growth in Israel that dramatically increased the premium high ability workers could earn for their labor in cities, that made the implementation of full risk sharing infeasible. Failing to shift away from full equality resulted in the exodus of productive individuals, who now preferred to forgo the insurance and their sunk investment in the Kibbutz and earn a premium for their ability outside the Kibbutz.

Only a reduction in the level of equality, which allows productive members to receive a premium for their ability, could now keep them inside, and in fact many Kibbutzes have departed from full equality and are now introducing various degrees of differential reforms. The wealthier the Kibbutz is, the more egalitarian it chooses to be. Nevertheless, the vast majority of Kibbutzes maintain some level insurance and provide at least a "safety net" for their members.[30] Moreover, preliminary evidence suggests that adverse selection is alleviated as a result of the differential reforms.

## 10 Conclusion

How, then, could the voluntary egalitarian Kibbutz movement exist inside a capitalist environment for almost a century? The first candidate that comes to mind may be ideology. After all, economic theory, which expects moral hazard and adverse selection in an egalitarian commune, assumes that people are rational and pursuing self-interests. But everyone familiar with the Kibbutz knows that its pioneers were ideological Zionists and Socialists devoted to ideals of equality and partnership and wanted to create a 'new human being', who is the opposite of the homo economicus that cares only about himself.

This paper suggests that the kibbutz movement is consistent with the behavior of selfish individuals. An economic interpretation of Kibbutzes is consistent with the relative quality of migrants, membership

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[30] Surveys of Public Opinion conducted in Kibbutzes in the period 1990-2002 indicate that although most members support differential reforms, members still want to have some level of equality and more than 70% object to wages that are as differentiated as in the city. When asked for their most preferable way of life when abstracting from any practical consideration, it appears that whereas most members do not want to live in a traditional Kibbutz, they also do not want to live in a city. Most of them prefer something in the middle.

patterns, the shift away from full equality, and the substantial heterogeneity in Kibbutzes' choice of organizational form. Moreover, I show that economic, rather than ideological, forces are the driving force of both individuals migration decisions and a Kibbutz's organizational reform decision. This does not mean, of course, that ideology played no role in the Kibbutz movement. But, whereas ideology might have an important role in the creation of the Kibbutz movement, economic factors were at the heart of its self sustainability and recent organizational change.[31]

The Kibbutz movement survived because it could provide members with benefits that were impossible or more costly to acquire outside the Kibbutz, while mitigating moral hazard and adverse selection. Full equality and a mutual aid across members and across Kibbutzes provided members with valuable insurance. An insurance market for one's human capital, for instance, does not exist outside the Kibbutz movement and income and health insurance are more limited outside the commune. The common ownership of Kibbutz property served as a bond that made it costly for members to leave, even if they had high ability.

Why do many Kibbutzes go through fundamental changes? And, what determines a Kibbutz's organizational form? I claim that the voluntary nature of the commune limits the equilibrium level of equality a Kibbutz could implement. That is, members had an outside option and could always leave the Kibbutz in favor of an Israeli city and earn a premium for their ability. The more valuable the Kibbutz common property is, the higher the level of equality that can be provided without losing productive members.

Up until the 1980s, the value of Kibbutz property was high and full insurance with relatively low adverse selection was an equilibrium. The financial crisis of the mid-1980s was a negative shock to the Kibbutz's property and wealth, and resulted in an increased adverse selection. Full equality was no longer an equilibrium. In the following decade, many Kibbutzes went through fundamental reforms that reduced the level of equality and constituted a partial insurance equilibrium. Kibbutzes that have remained wealthy and maintained their egalitarian nature stand as evidence that a voluntary egalitarian institution can still exist under certain conditions even in the 21st century.

Yet, many questions still need to be addressed. How severe is moral hazard in the Kibbutz movement? How do members who stay in their Kibbutz respond to the differential reforms in terms of occupational

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[31]Besides, members' ideology seems to have weakened long before Kibbutzes introduced differential reforms.

choice and effort? Why is the Kibbutz such a rare phenomenon? These questions are left for future research.

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# APPENDIX A: How Was Moral Hazard Alleviated?

Moral hazard is expected to arise in an egalitarian environment. To illustrate this, assume there are $N$ members $i = 1, ..., n$. Each member can choose an effort level $a_i \in A_i = [0, \infty)$ with a private cost of $v_i$, where $v_i : A_i \rightarrow R$ is strictly convex, differentiable, increasing and $v_i(0) = 0$. The effort level a member chooses is either not publiclally observable or it is observable but cannot be verified (by a court for example). Assume that the members' actions determine a joint monetary outcome $X : A \rightarrow R$, which is allocated equally among the members. $X$ is strictly increasing, concave, differentiable and $X(0) = 0$. Utility is $u_i(m_i, a_i) = m_i - v_i(a_i)$, that is, $u_i$ is additively separable in money and effort and linear in money.

**Theorem 1** *If all output is distributed equally, the free-rider problem would arise (this is a special case of Holmstrom (1982)).*

**Proof.** We will show that the Nash Equilibrium (NE) in the noncooperative game is never the Pareto Optimal one and the choice of effort made by individuals in the NE will always be smaller than the Pareto optimal effort level.

Assume by contradiction that there is NE, $a^*$, which is Pareto optimal, i.e solves:

$$Max_{a \in A} \ X(A) - \sum_{i=1}^{n} v_i(a_i)$$

$a^*$ solves the F.O.C:

$$\frac{dX}{da_i} = \frac{dv_i}{da_i} \ \forall i = 1, ..., n$$

The payoffs of each agent from this game is $\frac{1}{N} * X(a) - v_i(a_i)$. Since $a^*$ is NE, it also solves:

$$\frac{1}{N} * \frac{dX}{da_i} = \frac{dv_i}{da_i} \forall i = 1, ..., n$$

For N>1, the above two equations contradict each other. We can see that in the NE, $a_i < a_{pareto}$. In other words, people will free ride, anticipating others do so as well. As a result, everyone is worse off than in the case where everyone decides not to shirk. ∎

Nevertheless, despite the fact that the potential problem of "parasites" has bothered Kibbutz members for many years, moral hazard was believed to be on a small scale. Researchers of the Kibbutz movement have even found that Kibbutz members tend to have higher motivation levels than non-members (e.g. Tannenbaum et al (1974), Palgi (1984), Rosner and Tannenbaum (1987), and Shimoni et al (1994)).

Moral hazard was alleviated for a combination of two factors. First, effort in the Kibutz is (imperfectly) observable, since most members work inside their Kibbutz, a member's colleagues are also his neighbours and members interact repeatedly. The high proximity of members ensures information tranmission and mutual monitoring among them. Supporting organizations such as the general meeting, the communal dining hall, the weekly newspaper, intensive gossip and other social gathering places, facilitated information transmission among Kibbutz members. Although members are rarely expelled from the Kibbutz, tight monitoring and peer pressure can make the life of a shirker unbearable in the commune (see quote in text). At the same time, "the Kibbutz secretary, treasurer, and farm manager enjoyed the esteem and prestige (and power) of their positions, and this benefit was sufficient compensation" (Gavron (2000) p.

9). Moreover, leadership positions were rotated to provide incentives to members. The importance of peer pressure in the Kibbutz was highlighted by Lieblich (1981), Barkai (1986) and Keren, Levhari and Byalski (2000). A similar logic applies for professional partnerships (see Kendel and Lazear (1992)) and for tenured professors in the academia, who are rarely dismissed but continue to publish, among other reasons, due to imperfectly observable effort and peer pressure.[32]

To summarize, the Kibbutz movement was able to reduce information asymmetries and to make effort observable, which, together with effective peer pressure and information transmission mechanisms alleviated the moral hazard problem.[33] This allowed the Kibbutz to provide members with valuable insurance (described in previous sections) without the usual consequence faced by insurance companies of reduced effort. At the same time, information transmition mechanisms and peer pressure are less efficient in big groups, which rationalizes why a Kibbutz cannot be too big.

Nevertheless, there is little empirical work that tests moral hazard in the Kibbutz movement. A new data set under construction on members' wages and occupational choices (in forty Kibbutzes) before and after differential reforms were undertaken will allow me to test for moral hazard.

# APPENDIX B: Why Isn't the Kibbutz a More Widespread Phenomenon?

If Kibbutzes provide such a valuable insurance, why do only 2.6% of the Israeli population live in a Kibbutz? And, why don't we observe kibbutzes in other parts of the world? The answer to these questions is related to the homogeneity of founders and to their cultural beliefs, as well as to the needs of Zionist Jews in Palestine and Israel.

First, the model highlights the importance of ex ante homogeneity in creating common ownership of property. As discussed in the text, the founders of the Kibbutz movement can be regarded as homogenous at the time they joined the Kibbutz.

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[32]Kendel and Lazear (1992), Lang and Gordon (1995), Gaynor and Gertler (1995) predicted that "partnerships tend to be formed among individuals who perform similar tasks because mutual monitoring is more effective" (Kendel and Lazear (1992) p. 816). However, the Kibbutz is composed of individuals with different occupations working in different industries and who perform different tasks. Mutual monitoring is still effective in the Kibbutz since the interaction among members and the information transmition mechanisms are more intensive in a Kibbutz than it is in professional partnerships.

[33]Other explanations for lack of free riding in the Kibbutz are the importance of 'intrinsic rewards' (as opposed to 'extrinsic rewards') in determining motivation, and members' ability to pre-commit to match work contributions of fellow members (Guttman (1978) and Guttman and Schnytzer (1989)).

Second, living in a Kibbutz implies that one has little privacy, that individualism is discouraged, that one has to give up the centrality of the family in favor of her community, and that one's children are raised in special residences outside home. One of the founders of the first Kibbutz (Degania) said in a meeting that "there must be no privacy. All privacy interferes with our communal life. All of us are obligated to participate in the expense of raising children - not just the parents". Such requirements facilitated mutual monitoring and peer pressure and enabled the insurance mechanism to work without moral hazard. Similarly to the cases of religious sects studied by Iannaccone (1992) and Berman (2000), these practices can be interpreted as "efficient prohibitions" inducing members to better monitor each other or as costly sacrifices that induce members to signal their sincere intention to live in the Kibbutz.

The founding generation of the Kibbutz movement was ideological Socialist and Zionist, and was not reluctant to give up privacy, individualism and the central role of the family. They were often young individuals without families who came from Russia and Eastern Europe during the second (1904-1914) and third (1919-1923) waves of migration to Palestine as pioneers who wanted to establish agriculture communes based on Jewish labor.[34] The founders were influenced by socialist movements in their home countries and by the Soviet revolution, and were trained (before migrating) in youth movements such as *He'chaluz* ("the pioneer") and *Ha'shomer Ha'tzair* ("the young guard") for hard physical work and communal life. They were joined by Palestine-born Jews who rejected their parents' way of life and wanted to experience a new way of life.[35] That is, the origin of the Kibbutz movement reflects certain cultural circumstances and illustrate once again that cultural factors are important in institutional choice (North (1990), Greif (1994), Temin (1997), Mokyr (2002), Botticini and Eckstein (2004)).

A comparison between the Kibbutz and the Moshav, a different agriculture cooperative in Israel, illustrates the role of culture in institutional choice. The Moshav is defined as "an agricultural cooperative, which is a village in itself and its main aim are to organize and to settle its members as *independent-individual farmers*, working by themselves and holding *private means of production and property* and *maintaining cooperation* in supply, marketing, and *mutual aid*, and fulfilling the function of a munici-

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[34] The data I collected from primary sources in Israel reveal that in the late 1930s and early 1940s, 80% of Kibbutz members were under 35 years old and that the vast majority of members came from Eastern Europe and Germany.

[35] The second and third generations have already been born into the Kibbutz, so that it was the default for them and thus less costly sacrifice.

pal authority". Like the Kibbutz movement, the Moshav is based on agriculture and buys its inputs and markets its products collectively. Moreover, an important ingredient of the Moshav is mutual assistance among members, which provides valuable insurance against volatile income. Unlike the Kibbutz movement, however, each individual works his own land and earns his own profits, and the family, rather than the collective, is the basic unit. Whereas the traditional Kibbutz can be thought of as a full insurance institution, the Moshav provides members with partial insurance. Individuals who joined a Moshav could have instead joined a Kibbutz or established a new Kibbutz but did not (despite the fact that the Kibbutz offered to its members better insurance than did the Moshav and also better economies of scale, and similar subsidies and credit advantages).

The reason a Moshav was preferred by some individuals over a Kibbutz was cultural. As already mentioned, Jews from Eastern Europe, especially young idealists who were in Socialist youth movements, were more 'collectivist' and did not care much about privacy and family. The Moshav was founded to answer "a distinct need for farmers who believed in cooperation but rejected the intense communal way of life of the *Kvutza* [Kibbutz]" (Gavron p. 29). Later on, when many Sepharadic Jews from Middle Eastern countries poured into the new state of Israel, they joined a Moshav or settled in cities rather than a Kibbutz. This is hardly surprising: they were more 'individualist' and cared more for their privacy. The family was very important for Middle-Eastern Jews, and they rejected the Kibbutz concept of placing the commune before the family.

Such differences in cultural beliefs may have substantial effect on subsequent institutional development (Greif (1994)). Sephardic Jews joined the more individualistic Moshav, which placed the individual and the family at the center and provided partial insurance through mutual assistance. Ashkenazic Eastern European Jews joined the Kibbutz communes and enjoyed full insurance. Since moral hazard is potentially more severe in a Kibbutz (full insurance) than in a Moshav (partial insurance), organizations supporting peer pressure developed in the Kibbutz movement more than in the Moshav movement. Since adverse selection is potentially more severe in a Kibbutz than in a Moshav, Kibbutzes developed more "lock in devices" and heavy reliance on public goods (described in a previous section), which served as a "bond" that made it costly for members to leave.

TABLE 1

Kibbutz population, 1910-1999.

| Year | Number of Kibbutzim | Population |
|---|---|---|
| 1910 | 1 | |
| 1920 | 12 | 805 |
| 1930 | 29 | 3877 |
| 1940 | 82 | 26554 |
| 1950 | 214 | 66708 |
| 1960 | 229 | 77955 |
| 1970 | 229 | 85100 |
| 1980 | 255 | 111200 |
| 1987 | 268 | 127000 |
| 1990 | 270 | 125100 |
| 1999 | 267 | 117400 |

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

TABLE 2

Summary statistics of variables used in the regressions

| Variable | Mean | Std. dev | Min | Max |
|---|---|---|---|---|
| **Equality:** | | | | |
| Equality (1-4) | 1.868 | 1.152 | 1 | 4 |
| Equality (1-3) | 1.603 | 0.762 | 1 | 3 |
| *Wealth (K):* | | | | |
| Economic status 1989 (1-4) | 2.373 | 0.903 | 1 | 4 |
| Joined 1987-1995 | 43.615 | 29.155 | 0 | 179 |
| Credit rating 1995 (1-4) | 2.209 | 0.84 | 1 | 4 |
| Credit rating 2002 (1-100) | 39.891 | 17.994 | 2 | 78 |
| Fixed capital (millions) 2001 | 35.825 | 25.391 | 4.633 | 173.123 |
| *Switching costs (s):* | | | | |
| Land size | 5487.44 | 2420.073 | 400 | 12000 |
| Household size 1995 | 2.143 | 0.219 | 1.7 | 3 |
| *Ideology:* Movement | 1.935 | 0.862 | 1 | 3 |
| *Controls:* | | | | |
| Left 1987-1995 | 148.159 | 73.548 | 31 | 539 |
| Membership 1995 | | | | |

t-test for difference in means significant at ***1% **5% *10%

# TABLE 3

Ordered Probit Analysis of the determinants of equality (3-categories)

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Wealth (K):** | | | | | | |
| Economic status 1989 (1-4) | 0.341*** | | 0.23** | | | |
| Joined 1987-1995 | | 0.178*** | 0.017*** | 0.017*** | 0.016*** | 0.022*** |
| Credit rating 1995 (1-4) | | | | 0.23** | | |
| Credit rating 2002 (1-100) | | | | | 0.012*** | |
| Fixed capital 2001 | | | | | | 0.012*** |
| **Switching costs (s):** | | | | | | |
| Land size | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** | 0.0001*** |
| Household size 1995 | -0.131 | -0.17 | -0.27 | -0.21 | -0.21 | -0.28 |
| *Ideology:* Movement | -0.01 | -0.04** | -0.038** | -0.04** | -0.035** | -0.036** |
| **Controls:** | | | | | | |
| Left 1987-1995 | -0.003 | -0.05*** | -0.04** | -0.04** | -0.05*** | -0.004** |
| Membership 1995 | 0.0001 | 0.0004 | -0.0001 | -0.0002 | 0.0001 | -0.002** |
| | | | | | | |
| Observations | 181 | 184 | 181 | | 176 | 152 |
| LR $\chi^2$ | 26.1 | 34.92 | 40.53 | 39.18 | 36.25 | 39.84 |
| Pseudo $R^2$ | 0.075 | 0.098 | 0.1151 | 0.111 | 0.107 | 0.132 |

t-test of difference in means significant at ***1%  **5%  *10%

This table presents the results of six regressions, each using a different measure of the Kibbutz's wealth, as discussed in the text.

The dependent variable, which is the degree of equality maintained by the Kibbutz, has 3 categories:

"Low equality" refers to the "safety net" category.
"Medium equality" refers to both the "combined model" and the "differences in the margin" category.
"High equality" refers to Kibbutzes that maintain full income equality.

## TABLE 4

Marginal effects of variable X on the probability of different levels of equality (3 categories)

| Variable | $\dfrac{\partial \Pr(equality = low)}{\partial X}$ | $\dfrac{\partial \Pr(equality = medium)}{\partial X}$ | $\dfrac{\partial \Pr(equality = high)}{\partial X}$ |
|---|---|---|---|
| ***Wealth (K):*** | | | |
| Economic status 1989 (1-4) | -0.091** | 0.040** | 0.050** |
| Joined 1987-1995 | -0.007*** | 0.003*** | 0.003*** |
| ***Switching costs (s):*** | | | |
| Land size | -0.00005*** | 0.00002*** | 0.00003*** |
| Household size 1995 | 0.109 | -0.049 | -0.061 |
| ***Ideology:*** Movement | 0.015** | -0.007** | -0.008** |
| ***Controls:*** | | | |
| Left 1987-1995 | 0.0017** | -0.0007** | -0.0009** |
| Membership 1995 | 0.00005 | -0.00002 | -0.00003 |
| | | | |
| Pr(equality=low) | 0.573 | | |
| Pr(equality=medium) | 0.291 | | |
| Pr(equality=high) | 0.136 | | |

t-test for difference in means significant at *** 1%  ** 5%  * 10%

The "equality=low" category refers to the "safety net" category.
The "equality=medium" category refers to both the "combined model" and the "differences in the margin" category.
The "equality=high" category refers to Kibbutzes that maintain full income equality.

TABLE 5

Marginal effects of variable X on the probability of different levels of equality (4 categories)

| Variable | $\dfrac{\partial \Pr(equality = low)}{\partial X}$ | $\dfrac{\partial \Pr(equality = med_L)}{\partial X}$ | $\dfrac{\partial \Pr(equality = med_H)}{\partial X}$ | $\dfrac{\partial \Pr(equality = high)}{\partial X}$ |
|---|---|---|---|---|
| ***Wealth (K):*** | | | | |
| Economic status 1989 (1-4) | -0.096** | 0.022** | 0.022** | 0.053** |
| Joined 1987-1995 | -0.007*** | 0.001*** | 0.001*** | 0.004*** |
| Credit rating 1995 (1-4) | | | | |
| Credit rating 2002 (1-100) | | | | |
| Fixed capital 2001 | | | | |
| ***Switching costs (s):*** | | | | |
| Land size | -0.00005*** | 0.00001*** | 0.00001*** | 0.00002*** |
| Household size 1995 | 0.077 | -0.017 | -0.017 | -0.043 |
| ***Ideology:*** Movement | 0.014* | -0.003* | -0.003* | -0.008* |
| ***Controls:*** | | | | |
| Left 1987-1995 | 0.016** | -0.0004** | -0.0004** | -0.0009** |
| Membership 1995 | 0.00005 | -0.00001 | -0.00001 | -0.00002 |
| | | | | |
| Pr(equality=low) | 0.573 | | | |
| Pr(equality=med$_L$) | 0.195 | | | |
| Pr(equality=med$_H$) | 0.096 | | | |
| Pr(equality=high) | 0.136 | | | |

t-test for difference in means significant at *** 1% ** 5% * 10%


The "equality=low" category refers to the "safety net" category.
The "equality=med$_L$" category refers to the "combined model".
The "equality=med$_H$" category refers to the "differences in the margin" category.
The "equality=high" category refers to Kibbutzes that maintain full income equality.

## TABLE 6

Marginal effects of various measures of K on the probability of different levels of equality (3-categories)

| regression | measure of K used | $\dfrac{\partial \Pr(equality = low)}{\partial X}$ | $\dfrac{\partial \Pr(equality = medium)}{\partial X}$ | $\dfrac{\partial \Pr(equality = high)}{\partial X}$ |
|---|---|---|---|---|
| (1) | Economic status 1989 (1-4) | -0.134*** | 0.055** | 0.079*** |
| (2) | Joined 1987-1995 | -0.007*** | 0.003*** | 0.004*** |
| (3) | Economic status 1989 (1-4) | -0.091** | 0.040** | 0.050** |
|  | Joined 1987-1995 | -0.007*** | 0.003*** | 0.003*** |
| (4) | Credit rating 1995 (1-4) | -0.084** | 0.037** | 0.047** |
|  | Joined 1987-1995 | -0.007*** | 0.003*** | 0.003*** |
| (5) | Credit rating 2002 (1-100) | -0.005** | 0.002** | 0.003** |
|  | Joined 1987-1995 | -0.006*** | 0.003*** | 0.003*** |
| (6) | Fixed capital 2001 | -0.005*** | 0.002** | 0.003*** |
|  | Joined 1987-1995 | -0.009*** | 0.040*** | 0.050*** |
| (7) | Credit rating 1995 (1-4) | -0.123*** | 0.050*** | 0.073*** |
| (8) | Credit rating 2002 (1-100) | -0.006*** | 0.003*** | 0.004*** |
| (9) | Fixed capital 2001 | -0.006*** | 0.002*** | 0.004*** |

t-test for difference in means significant at *** 1% ** 5% * 10%

This table presents the coefficients of the different measures of *K*. The first six columns refer to the six regressions presented in TABLE 3. Columns 7-9 show the coefficients from regressions with the indicated measure of K.

The "equality=low" category refers to the "safety net" category.
The "equality=medium" category refers to both the "combined model" and the "differences in the margin" category.
The "equality=high" category refers to Kibbutzes that maintain full income equality

TABLE 7

Marginal effects of various measures of K on the probability of different levels of equality (4-categories)

| regression | measure of K used | $\dfrac{\partial \Pr(equality = low)}{\partial X}$ | $\dfrac{\partial \Pr(equality = med_L)}{\partial X}$ | $\dfrac{\partial \Pr(equality = med_H)}{\partial X}$ | $\dfrac{\partial \Pr(equality = high)}{\partial X}$ |
|---|---|---|---|---|---|
| (1) | Economic status 1989 (1-4) | -0.138*** | 0.028*** | 0.029*** | 0.080*** |
| (2) | Joined 1987-1995 | -0.007*** | 0.001*** | 0.001*** | 0.004*** |
| (3) | Economic status 1989 (1-4) | -0.096** | 0.022** | 0.022** | 0.053** |
|  | Joined 1987-1995 | -0.007*** | 0.001*** | 0.001*** | 0.004*** |
| (4) | Credit rating 1995 (1-4) | -0.091** | 0.020** | 0.020** | 0.051** |
|  | Joined 1987-1995 | -0.007*** | 0.002*** | 0.002*** | 0.004*** |
| (5) | Credit rating 2002 (1-100) | -0.005** | 0.001** | 0.001** | 0.003** |
|  | Joined 1987-1995 | -0.006*** | 0.001*** | 0.001*** | 0.003*** |
| (6) | Fixed capital 2001 | -0.005*** | 0.001*** | 0.001*** | 0.003*** |
|  | Joined 1987-1995 | -0.009*** | 0.002*** | 0.002*** | 0.005*** |
| (7) | Credit rating 1995 (1-4) | -0.129*** | 0.026*** | 0.026*** | 0.076*** |
| (8) | Credit rating 2002 (1-100) | -0.006*** | 0.001*** | 0.001*** | 0.004*** |
| (9) | Fixed capital 2001 | -0.006*** | 0.001*** | 0.001*** | 0.004*** |

t-test for difference in means significant at *** 1%  ** 5%  * 10%

This table presents the coefficients of the different measures of *K*. Each raw represents a different regression with the indicated measure of K.
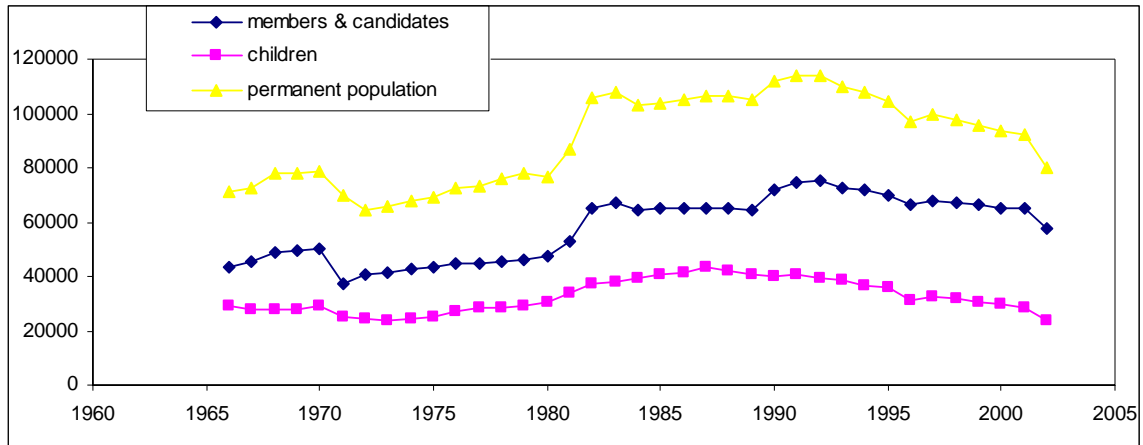
The "equality=low" category refers to the "safety net" category.
The "equality=med$_L$" category refers to the "combined model".
The "equality=med$_H$" category refers to the "differences in the margin" category.
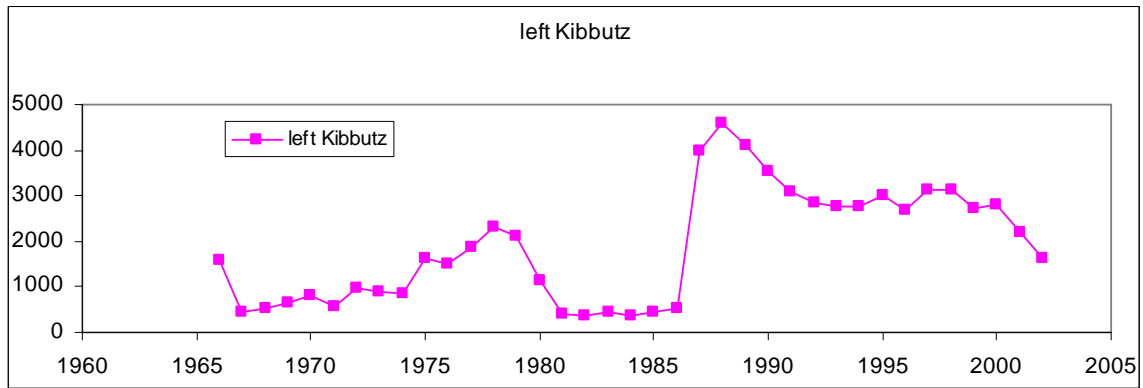The "equality=high" category refers to Kibbutzes that maintain full income equality

## FIGURE 1:
## Kibbutz Population



Source: Abramitzky (2003)

## FIGURE 2:
## Exit from the Kibbutz



Source: Abramitzky (2003)

FIGURE 3:
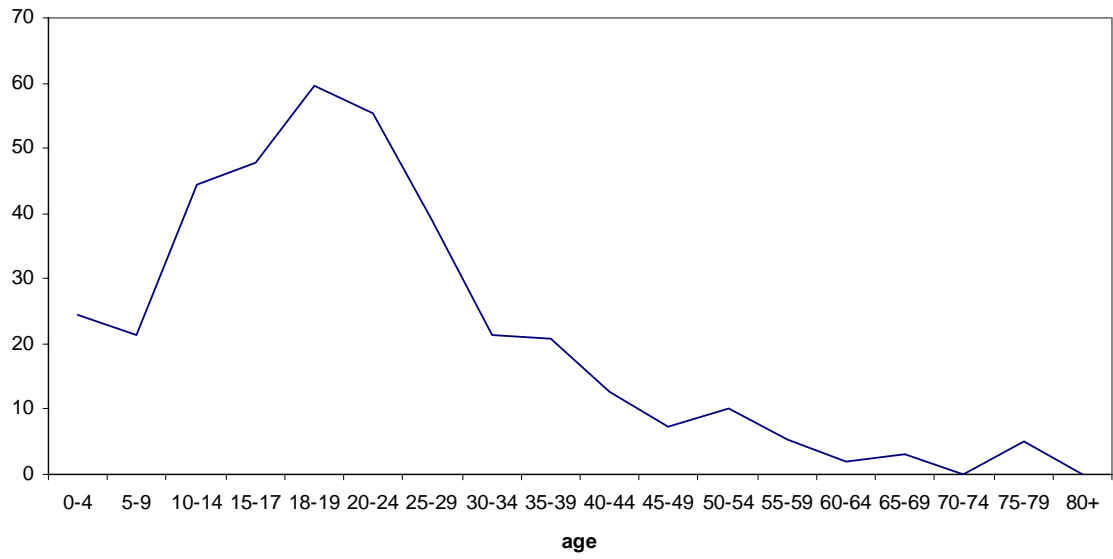Emigration rate from the Kibbutz by Age, 1983-1995

FIGURE 4:

Kibbutzes' likelihood to maintain full income equality, by economic strength



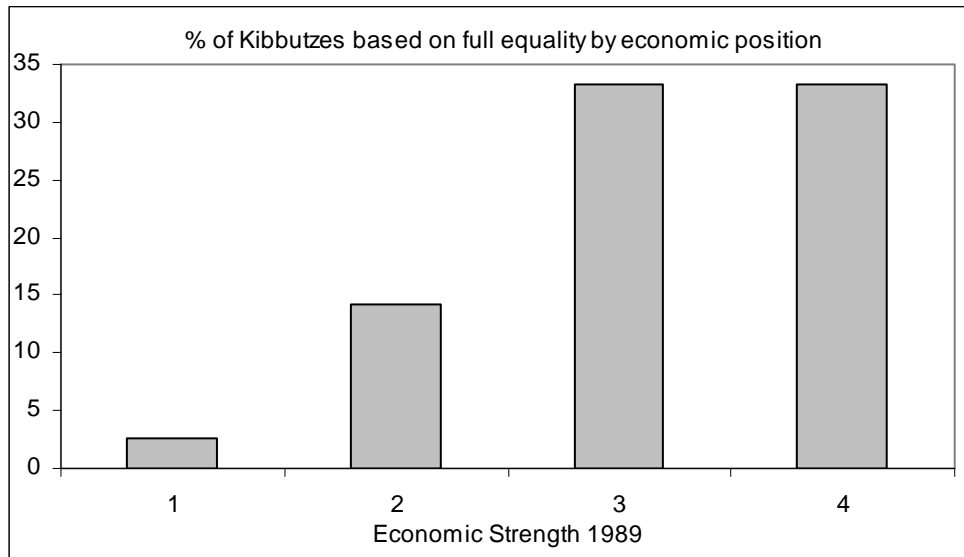% of Kibbutzes based on full equality by economic position

Economic Strength 1989

FIGURE 5:

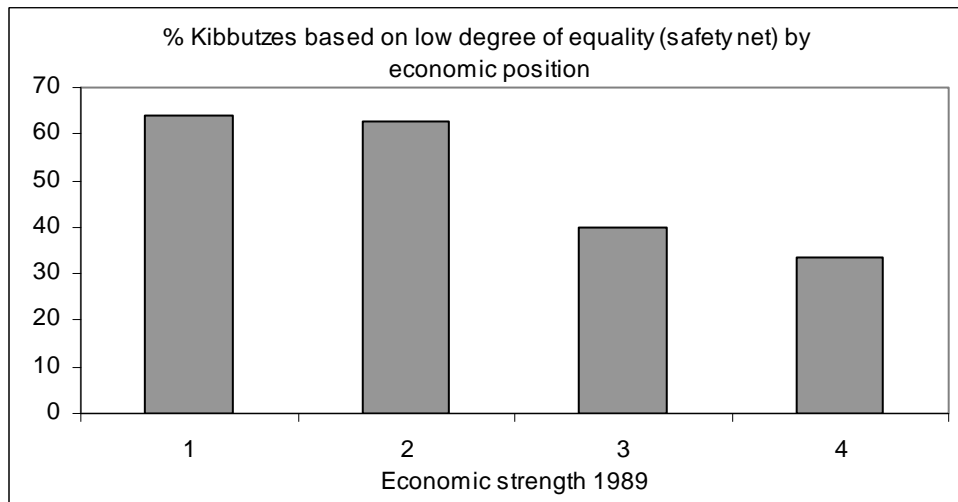Kibbutzes' likelihood to provide a low level of income equality, by economic strength



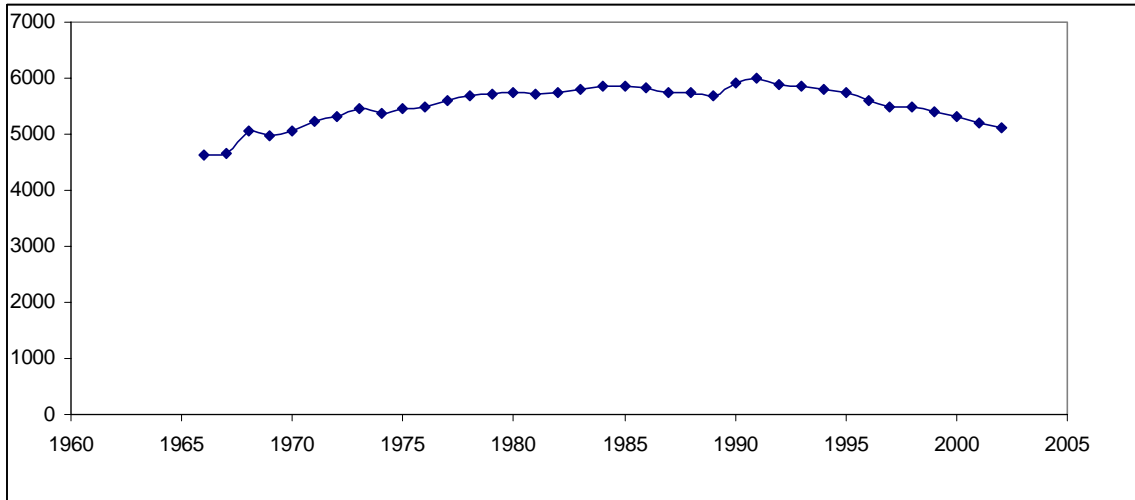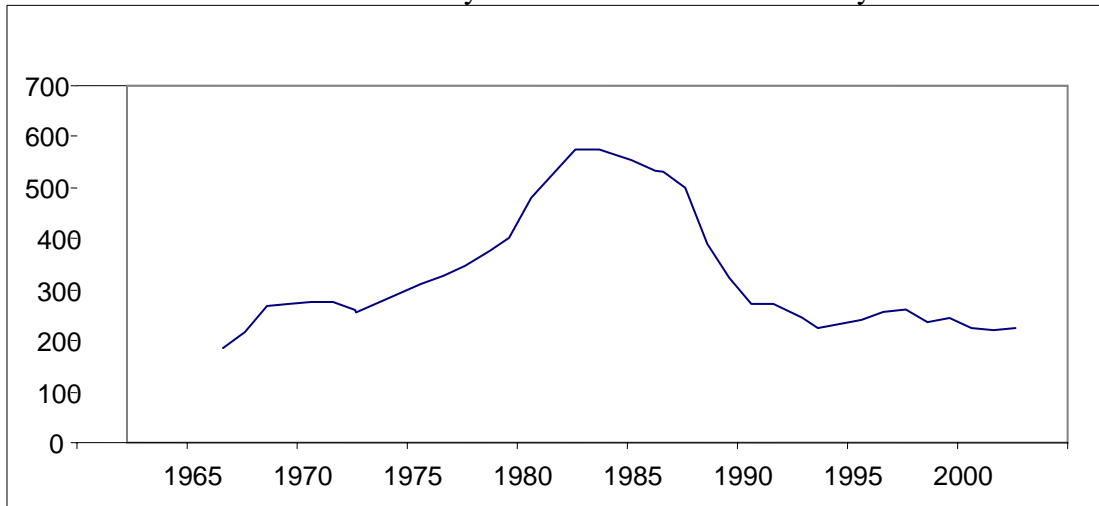% Kibbutzes based on low degree of equality (safety net) by economic position

Economic strength 1989

FIGURE 6:
Membership in Kibbutzes not affected by crisis that did not reform

FIGURE 7:
A Kibbutz that was hit by the crisis and introduced early reform

FIGURE 8:
Countercyclical membership in the Kibbutz, 1966-2000