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Has Debt Restructuring Facilitated Structural Transformation on Israeli Family Farms?

by

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Abstract

This paper analyzes structural transformation on Israeli family farms using longitudinal village-level data for the years 1992-2001, with particular emphasis on the effects of the 1985 debt crisis and the subsequent 1992 debt settlement legislation. Dynamic panel GMM estimation reveals a negative effect of the amount of debt, and a positive effect of reaching a debt restructuring agreement, on farm size. Reaching an agreement also had an indirect negative effect on the shift to off-farm work. No significant effect was found on farm exits. This implies that the debt restructuring legislation accomplished its goal of rehabilitating the farm sector, at least to some extent.

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Introduction

As in many other developed economies, the farm sector in Israel has experienced considerable structural changes over the last few decades. These included a massive exit of self-employed farm operators, an increase in the size of remaining farms, and an increase in off-farm labor participation among the farm population. The process of structural change has been accelerated by two major events: the debt crisis of 1985 and the opening of the country to foreign labor in the early 1990s. The effect of foreign workers on farm structure in Israel has been examined by Kislev (2003). In this paper I focus on the effects of the debt crisis and the subsequent legislation and implementation of a debt restructuring policy.

Before describing the debt crisis, I would like to motivate the discussion by establishing that the year 1985 can be viewed as an important point in the structural change process. Official data published by the Central Bureau of Statistics show that the number of self-employed in agriculture has decreased at an annual rate of 0.6% between 1955 and 1985, and this exit rate was almost 10 times higher between 1985 and 2002, at 5.6% annually. The quantity index of net product per farm has increased at an annual rate of 7.4% between 1955 and 1985, and at 10.6% annually between 1985 and 2002. The fraction of the labor force in Moshavim (cooperative villages) employed in agriculture has decreased from 73% in 1956 to 45% in 1985 (just under 1% annually), and to 15% in 2002 (1.8% annually between 1985 and 2002). It is by no means clear that the debt crisis alone was responsible for this structural break. Indeed, terms of trade in agriculture decreased at an annual rate of 0.9% between 1952 and 1985, and at 1.2% between 1985 and 2002 (Kislev and Vaxin, 2003).

The debt crisis was triggered by the anti-inflationary government policy of 1985 (Dornbusch *et al.*, 1990; Helpman and Leiderman, 1988; Kandel, Ofer and Sarig, 1996). During that year, inflation was reduced from an annual rate of over 500% to about 20%. The real rate of interest on agricultural debt, which was negative since the early 1970s, increased almost overnight up to 20% (Kislev, Lerman and Zusman, 1991). The balance sheet of agriculture in 1988 showed little if any equity (Kislev, 1993a). Before the crisis, farmers used to pay debt by taking new cheap loans. After the crisis, new credit could be

raised at interest rates of 100% and even more. Under these conditions, there was no way in which the farm sector could continue to service its debt.

While the 1985 anti-inflationary policy was the trigger of the agricultural debt crisis, the roots of the crisis were planted decades earlier. The vast majority of pioneering farmers came to Israel with little or no assets, and had to rely on institutional provision of land and capital. Individual farms organized in local and regional cooperatives, the most important service of which was financial intermediation. As farmers cultivated mostly national land, they could not use their assets as collateral and lacked direct access to the capital market (Kislev, 2000). Cooperatives were able to borrow using mutual guaranties at the local (village) level, at the regional level, and at the national level. The political influence of agricultural cooperatives, which was way above their share in society, caused the government to bail them out of financial difficulties again and again, and this made the cooperatives preferred borrowers in the eyes of the banking system. Farmers did not take advantage of the negative interest rates of the 1970s in order to repay debt and increase equity. Rather, they continued to invest in farm capital, often to over-capacity, financed housing and infrastructure investments, and increased consumption. Altogether, all three parties, farmers, banks, and the government, shared the responsibility for the debt crisis.

While the government had an interest in rescuing both agricultural cooperatives and commercial banks from collapsing, it could not simply take responsibility for the debt because of its volume - about $3.6 billion in 1988 - and because of the lack of public support for such action. What it could do is convince the commercial banks to reach an agreement with the farmers on debt restructuring. This was an easy task because the banks had no other alternatives – as mentioned before, the debt of the farm sector was backed mostly by mutual guarantees, and those are useless when the crisis is global. The agreements signed in 1988-89 involved erasing almost a third of outstanding debt and rescheduling the remaining debt for 15 to 20 years, with positive but low real interest rates. As it turns out, it wasn't feasible for the agricultural sector to meet its obligations even under these favorable terms (Kislev, 1993a, 1993b). In addition, the farmers expected to obtain better terms in the future, which turned out to be correct. As a result, the implementation of these debt restructuring arrangements was minimal.

In 1992 (which was an election year), two separate debt settlements were reached for the Kibbutz (collective farm) sector and the Moshav (cooperative village) sector. The core of the two settlements was similar: determining the level of debt, as of December 31, 1991, that is directly related to agricultural activity; assessing the repayment potential of farms and rescheduling the part of the debt deemed repayable; and forgiving the remaining debt (Kislev, 2000). The Moshav settlement took the form of a law enacted by the Knesset (parliament) with support from both sides of the political spectrum. While the law did not entail public funds for direct debt repayment, it did provide for the establishment of a Debt Settlement Administration (hereafter DSA) that will oversee the implementation of the law. The purpose of the law was to enable Moshav farms to continue their production activity without being perpetually limited and threatened by banks and other creditors. The more detailed formal objectives were:

- Combining all legal processes standing against agricultural entities under one umbrella;
- Assessing the level of debt that resulted from agricultural activity up to the end of 1991;
- Negotiating a debt settlement agreement between each debtor and its creditors;
- Releasing farmers of their mutual financial guaranties for the debt of cooperatives;
- Promoting the rehabilitation rather than dissolution of agricultural entities.

The idea was that after reaching and implementing a debt restructuring agreement, farmers will be able to continue functioning, and in particular, will be able to obtain credit without being limited by their past debts. The implicit assumption was that without such credit, many farmers will be forced out of business. Two questions can be raised here: first, to what extent was the debt crisis responsible for the structural transformations in Moshav farms; second, to what extent did the implementation of the debt settlement law change the direction and/or the pace of these structural transformations.

The purpose of this paper is to provide an empirical assessment of these questions. Three structural characteristics are examined, at the village level: the growth in aggregate farm production, the exit of individual farms from agricultural production, and the extent to which active farmers engage in non-farm employment. Two pivotal

explanatory variables will be used: the size of the debt and the time of debt settlement agreement. The specific hypothesis is formally introduced in the following section. Next, the data sources are described. Subsequently, a dynamic simultaneous equations model is proposed and estimated. The final section concludes with a summary of the findings.

Research Hypotheses

The null hypothesis is that neither the size of the debt nor the time of debt settlement agreement affects the structural outcomes. The alternative hypotheses are based on the presumption, expressed in the debt settlement law, that unsettled debt is a burden on farms. This implies that the higher the debt, the less profitable is agricultural production. Hence, higher debt will lead to slower farm growth, to a higher rate of exit and a higher tendency to engage in non-agricultural activities. Similarly, an earlier agreement of debt restructuring relaxes the burden of the debt, and hence is expected to lead to faster farm growth, lower rate of exit and a lower engagement in non-agricultural activities.

Data

The data used in this research come from two sources. The first source is an annual survey of agricultural activity that is conducted at the village level by the Ministry of Agriculture and the Central Bureau of Statistics. We have access to the data from 10 consecutive surveys, 1992 to 2001. The production data gathered is limited to the allocation of cropland to the different crops and the numbers of different types of livestock. These are converted to gross value added using norms based on 1995 survey data. The size of the farm is defined as the sum of value added of all types of crops and livestock. A Size measure based on value added is preferred to alternative methods. For example, it is customary to measure size using cultivated land for crop farms and livestock-equivalent units for livestock farms (e.g. Weiss, 1999). However, most Israeli farms are mixed farms, combining crops and livestock. Hence, measuring size by either land or livestock is meaningless. Converting both cropland and livestock to value-added units provides a solution to the aggregation problem.

Since farm size is computed at the village level, and the number of farm units in each village is fixed, using the village aggregate is similar to studying the size of an average farm in each village. Besides farm size, the survey provides information about the number of active farms in each village, and on the fraction of active farm operators who engage in non-farm activities. While the survey provides information on all farm communities, our interest is on Moshavim only, and we have data for a total of 425 Moshavim out of 480. Data for the remaining 55 Moshavim were in bad shape and could not be used. In essence, we are studying the population as a whole rather than a sample.

Figure 1 portrays the evolution of the three variables of interest over the survey period. Panel A shows the increase in farm size. The scales are logarithmic, so the slopes of the lines reflect rates of change. The bottom line (whose units are on the left-hand vertical axis) shows a modest increase in aggregate size (i.e. aggregate value added per village). The middle line shows a faster increase in the size of an average active farm, reflecting the decreasing number of active farms over time. The top line shows a roughly similar increase in the size of an average full-time equivalent farm (a part-time farm was counted as half of a full-time farm for this purpose), reflecting the fact that the fraction of part-time farms did not change dramatically over time. The units for the upper two lines are on the right-hand vertical axis. Panel B shows the decrease in the number of active farms (left vertical axis) from roughly 51 per village in 1992 to less than 42 in 2001, and the change in the fraction of active farm operators who work off the farm (right vertical axis). The decrease in the number of active farms is monotonic and quantitatively significant. The fraction of active farm operators who work off the farm goes up from 0.50 in 1992 to 0.53 in 1997 and then goes down to 0.52 in 2001. These changes are not remarkable in magnitude.

The second source of data is the 2004 annual report of the Debt Settlement Administration. The report includes several attributes of the debt restructuring process for each village. For our purposes, the relevant attributes are level of debt as determined by the DSA, and the year in which the settlement was agreed upon. The level of debt is reported for 375 of the villages in the survey. Note that there are 20 villages with zero debt, and for these there is naturally no year of settlement. There are 30 other villages with positive debt that have yet to reach an agreement. The distributions of the level of

debt per farm and the year of settlement appear in figure 2. Note that the year of settlement 1997, for example, includes settlements agreed upon in the second half of 1996 or in the first half of 1997. Hence, the low figure for 2005 includes in fact settlements agreed upon in the second half of 2004 only.

Econometric approach

The three structural farm characteristics of interest, namely farm growth, farm exit and off-farm work, are estimated as a system of three dynamic simultaneous equations. This specification is supported by the existing literature. Weiss (1999) showed that farm size and farm survival are determined simultaneously, while Huffman and Evenson (2001), Yee, Ahearn and Huffman (2004) and Ahituv and Kimhi (2006) showed that farm size and off-farm labor are determined simultaneously, and Ahearn, Yee and Korb (2005) showed that all three structural characteristics are determined simultaneously. The dynamic specification facilitates the estimation, given the absence of proper cross-sectional instruments, as will be explained below.

The estimation method we adopt is the dynamic panel data GMM model of Arellano and Bond (1991). This model uses first differences to control for unobserved heterogeneity in the cross section, and corrects the resulting serial correlation using an appropriate transformation of the variance-covariance weighting matrix. Each equation is estimated separately, and lags of first differences of both endogenous and exogenous variables are used as instruments in the estimation. Combes, Magnac and Robin (2003) estimated a similar two-equation dynamic system to study changes in regional employment patterns in France, while Blien, Suedekum and Wolf (2005) applied a similar methodology to German data. Previous longitudinal studies of structural characteristics of the U.S. farm sector, including Huffman and Evenson (2001), Yee, Ahearn and Huffman (2004), Ahearn, Yee and Korb (2005) and others, were based on simultaneous estimation but did not explicitly account for the dynamics.

Specifically, the equations we estimate, at the village level, are:

$$(1) \qquad \ln y_{it} = \alpha_0 + \alpha_1 \ln y_{it-1} + \alpha_2 x_{it} + \alpha_3 z_{it} + \alpha_4 w_{it} + D_i t\alpha_5 + \mu_{yi} + u_{yit}$$

$$(2) \qquad x_{it} = \beta_0 + \beta_1 x_{it-1} + \beta_2 \ln y_{it} + \beta_3 z_{it} + \beta_4 w_{it} + D_i t\beta_5 + \mu_{xi} + u_{xit}$$

$$(3) \qquad z_{it} = \gamma_0 + \gamma_1 z_{it-1} + \gamma_2 \ln y_{it} + \gamma_3 x_{it} + \gamma_4 w_{it} + D_i t\gamma_5 + \mu_{zi} + u_{zit}$$

where *y* is average farm size (expressed in logs), *x* is the fraction of active farms, and *z* is the fraction of active farm operators who work off the farm. These are the endogenous structural farm characteristics. Also, *w* is a binary variable indicating whether the village has already signed the debt settlement agreement. This explanatory variable is also treated as endogenous, because reaching an agreement is a process that may depend on structural farm characteristics such as the fraction of active farms. Because of the first differencing, time-invariant explanatory variables are multiplied by *t* (time). These variables include total debt (per size), geographic region, year of establishment and number of farms in the village, and are arranged in the matrix *D*, along with a unit vector. The coefficient of this unit vector is the autonomous rate of change in the dependent variable, and the coefficients of the other time-invariant variables are shifts to this rate of change. The inclusion of a lagged dependent variable in each equation effectively controls for the long-run determinants of the dependent variables, hence the other explanatory variables only explain the short-run changes in the dependent variables. The sample means of all the variables in the model are shown in table 1.

After first differencing, equations (1)-(3) become:

$$(1)' \qquad \Delta \ln y_{it} = \alpha_1 \Delta \ln y_{it-1} + \alpha_2 \Delta x_{it} + \alpha_3 \Delta z_{it} + \alpha_4 \Delta w_{it} + D_i \alpha_5 + \Delta u_{yit}$$

$$(2)' \qquad \Delta x_{it} = \beta_1 \Delta x_{it-1} + \beta_2 \Delta \ln y_{it} + \beta_3 \Delta z_{it} + \beta_4 \Delta w_{it} + D_i \beta_5 + \Delta u_{xit}$$

$$(3)' \qquad \Delta z_{it} = \gamma_1 \Delta z_{it-1} + \gamma_2 \Delta \ln y_{it} + \gamma_3 \Delta x_{it} + \gamma_4 \Delta w_{it} + D_i \gamma_5 + \Delta u_{zit}$$

where Δ indicates a first difference, e.g., $\Delta z_{it} = z_{it} - z_{it-1}$. Note that the intercepts and the unobserved heterogeneity terms (μ) have been dropped, and that *D* is no longer multiplied by *t*. The model is estimated in one stage (see Arellano and Bond 1991 for details), and robust standard errors are computed. We also test for the existence of second order serial correlation, which could make the lagged first differences inappropriate instruments.

The estimation results are shown in table 2. The χ^2 test statistics at the bottom of the table show that the coefficients are jointly significant as a set for each equation. The Arrelano-Bond test statistics show that serial correlation is not a problem in any of the

equations. The first coefficient for each equation is that of the lagged dependent variable. These coefficients are all between zero and one and are strongly significant. This means that there is a nontrivial degree of persistence in all dependent variables. Convergence cannot be determined solely on the basis of these coefficients, because of the autonomous rate of change that is allowed here. However, the coefficients of the lagged dependent variables hardly changed when the models were estimated without the autonomous rate of change, so the convergence of all dependent variables in the long run is supported by the results.

The cross-effects of the dependent variable are mostly insignificant, except for the negative effect of farm size on the fraction of active farmers working off the farm. This effect is in line with previous findings (e.g., Ahituv and Kimhi, 2006). Note that the earlier studies discussed above found stronger and more significant cross-effects, because they did not include the dynamic effect and hence measured long-run rather than short-run effects.

The effects of the debt and the debt settlement arrangement appear to be significant only in the farm size equation. These effects are robust to the inclusion of shifts in the autonomous rate of change. In particular, the existence of a debt settlement arrangement seems to contribute to farm growth. Reaching an agreement could increase farm size by 11%-12%. This suggests that reaching a debt settlement agreement has a positive impact on the ability of farmers to compete in the post-cooperative era. We could not identify significant changes in the impact of the debt settlement agreement over time, when we added years since signing the agreement as an explanatory variable. We also tried to use, alternatively, the fraction of farms in each village that reached an agreement. This variable better reflects the fact that some agreements failed after they were reached, but it did not turn out significant. We also tried to include future values of this variable, to account for effects of anticipated agreements, but this also was not statistically significant.

The size of the debt (per-size) is allowed to affect the autonomous rate of change only, because it is time-invariant, and is also found to be statistically significant in the farm size equation only. In particular, the relative size of the debt slows down farm

growth. This confirms our initial hypothesis that agricultural debt is a burden on farm operation. The debt variable was divided by 1992 farm size in order to avoid the collinearity between debt and size. Because of the persistence in farm size, it is natural that larger farms will have higher debts. Dividing debt by size allows estimating the difference between two equally-sized farms with different levels of debt. Among the other shifters of the autonomous rate of farm growth, only the number of farms was found significant. Specifically, the number of farms decreased farm growth. Perhaps this is due to the fact that Moshavim that were larger in terms of number of farms also tended to be larger in terms of output per farm, so that they are closer to their "optimal" size.

The fact that debt and debt settlement agreements were not found to affect farm exits significantly may be a result of two separate effects going in opposite directions. We expected debt settlement to slow the exit rate because it relaxes the financial burden of the unsettled debt. However, it should be noted that prior to reaching a debt settlement agreements, some farmers were constrained in their ability to perform institutional transactions such as the sale of the farm, so a possible effect of debt settlement could be to relax those institutional constraints and perhaps to speed farm exits. This explains why the observed net effect is not significantly different from zero. The farm exit equation has a negative autonomous rate of change, reflecting the monotonous process of farm exits observed in figure 1. This coefficient is statistically significant when no shifters other than debt are included in the equation. After including other shifters, the autonomous rate of change becomes insignificant. The only significant shifter is the north dummy, and it is positive, meaning that the farm exit process is slower in the northern part of the country. This may be due to the success of the rural tourism industry in the north, which was found to be synergic with agriculture (Tchetchik et al., 2008). Unfortunately, we do not have data on the "size" of the rural tourism activities in the Moshavim.

We found no direct effect of debt settlement on the transition to off-farm labor, but in this case there is an indirect effect through farm size: debt settlement increases farm size and this in turn reduces off-farm labor. No significant autonomous rate of change was found in the off-farm labor equation. Hence, off-farm labor is increasing over time by its own persistence and decreasing over time because of the increase in farm size. The observed trends (figure 1) reflect the net effects of these opposite impacts.

Conclusions

This paper deals with the impact on structural transformation of Israeli family farms of the 1985 debt crisis and the subsequent 1992 debt settlement legislation. We have analyzed longitudinal village-level data on structural farm characteristics and debt settlement agreements for Moshavim (cooperative villages) for the years 1992-2001, using a dynamic simultaneous equations model. The key finding is that reaching a debt settlement agreement increases farm size and indirectly reduces off-farm labor. This implies that the debt restructuring legislation accomplished its goal of promoting the rehabilitation of the farm sector, at least to some extent.

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Table 1. Descriptive statistics

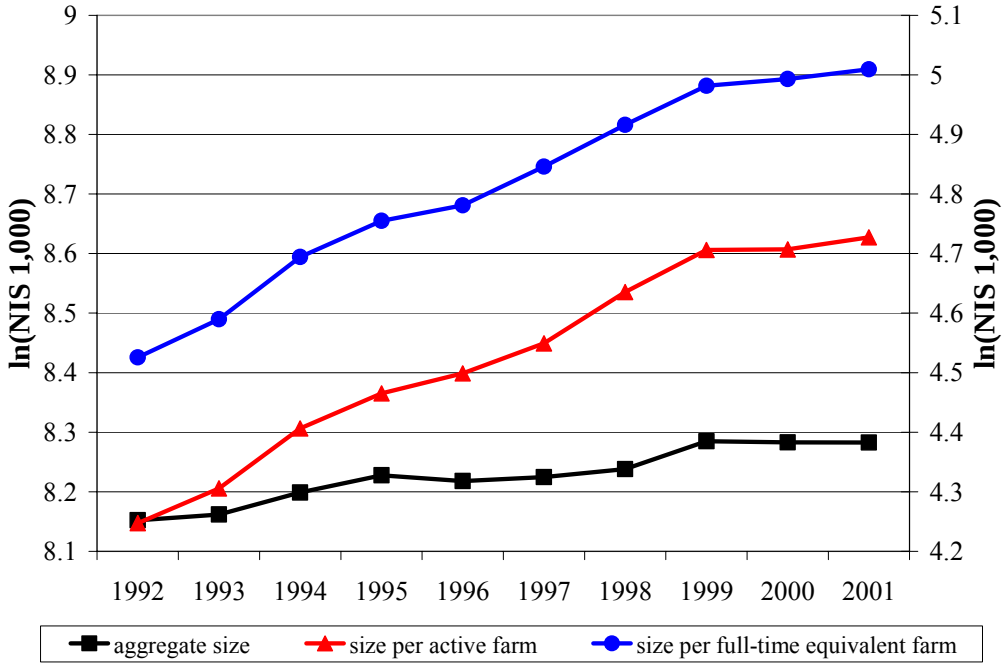
Explanatory variable	Sample mean	Units
Average farm size	0.0535	Million NIS in 1995 prices
Fraction of active farms	0.6529	Fraction
Fraction of active farmers working off-farm	0.5220	Fraction
Debt settlement agreement (dummy)	0.2969	Fraction
Debt per size	3.7630	Fraction*
North (dummy)	0.2528	Fraction
South (dummy)	0.3586	Fraction
Established up to 1948 (dummy)	0.1805	Fraction
Established after 1960 (dummy)	0.1805	Fraction
Number of farms	69.7717	Number

* Debt is recorded in 1991 prices while farm size is computed in 1995 prices.

Table 2. Dynamic panel GMM results

Explanatory Variable	Average Farm Size		Fraction Active Farms		Fraction Working Off-Farm	
<u>Endogenous</u>						
Lagged average farm size	0.5239** (10.43)	0.5120** (9.32)				
Lagged fraction active farms			0.5524** (8.05)	0.5153** (6.96)		
Lagged fraction working off-farm					0.6275** (10.54)	0.6256** (10.52)
Average farm size			-0.0043 (-0.13)	-0.0222 (-0.61)	-0.0544* (-2.08)	-0.0651* (-2.29)
Fraction active farms	0.0364 (0.24)	-0.0672 (-0.43)			-0.0726 (-1.00)	-0.1198 (-1.65)
Fraction working off-farm	0. 0804 (0.51)	0. 0569 (0.35)	-0.0172 (-0.27)	-0.0323 (-0.48)		
Debt settlement agreement	0.1112** (2.70)	0.1243** (2.59)	0.0136 (0.67)	0.0212 (0.97)	0.0015 (0.09)	0.0165 (0.85)
<u>Rate of change</u>						
Debt per size	-0.0014** (-2.86)	-0.0013** (-2.65)	0.0003 (1.46)	0.0002 (0.96)	-0.0003 (-1.62)	-0.0003 (-1.63)
North	0.0007 (0.12)		0.0112** (3.08)		0.0034 (1.36)	
South	-0.0022 (-0.35)		-0.0026 (-0.98)		0.0004 (0.17)	
Established up to 1948	-0.0012 (-0.20)		-0.0051 (-1.81)		-0.0028 (-1.04)	
Established after 1960	0.0145 (1.71)		0.0003 (0.05)		0.0038 (1.00)	
Number of farms	-0.0004* (-2.15)		-0.0000 (-0.05)		0.0000 (0.01)	
Intercept	0.0237 (1.51)	-0.0065 (-1.31)	-0.0082 (-1.13)	-0.0082** (-3.25)	-0.0019 (-0.33)	-0.0026 (-1.10)
<u>Test statistics</u>						
χ^2 statistic	340.00**	273.19**	165.28**	53.29**	125.19**	114.26**
Arellano-Bond test statistic	-0.11	-0.13	1.04	1.06	0.29	0.30

A. Logarithmic changes in aggregate size, size per active farm, and size per full-time equivalent farm



B. Number of active farms and fraction of active farm operators working off the farm

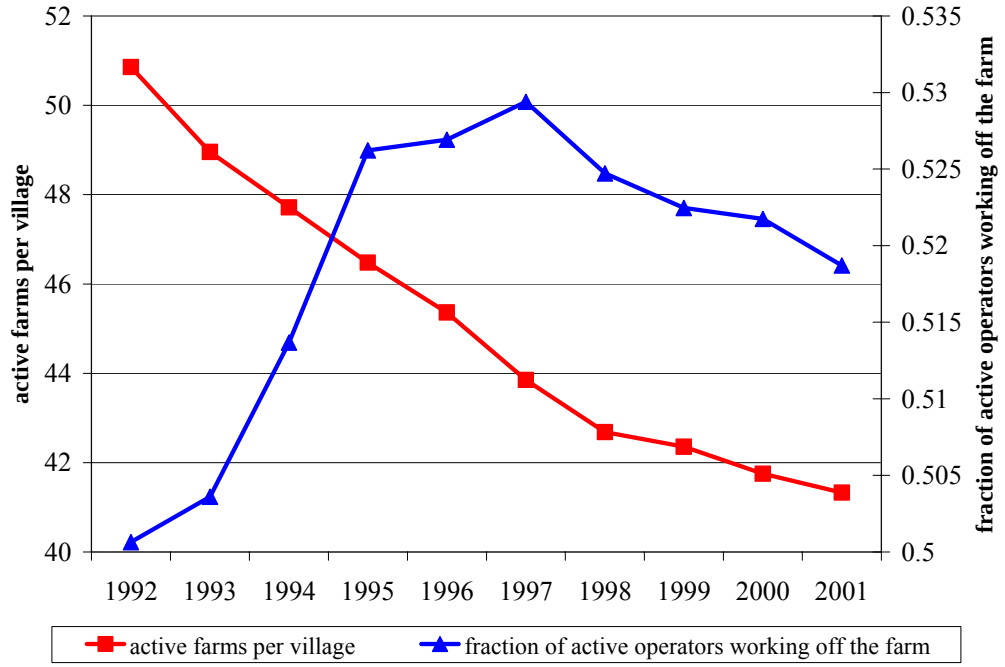
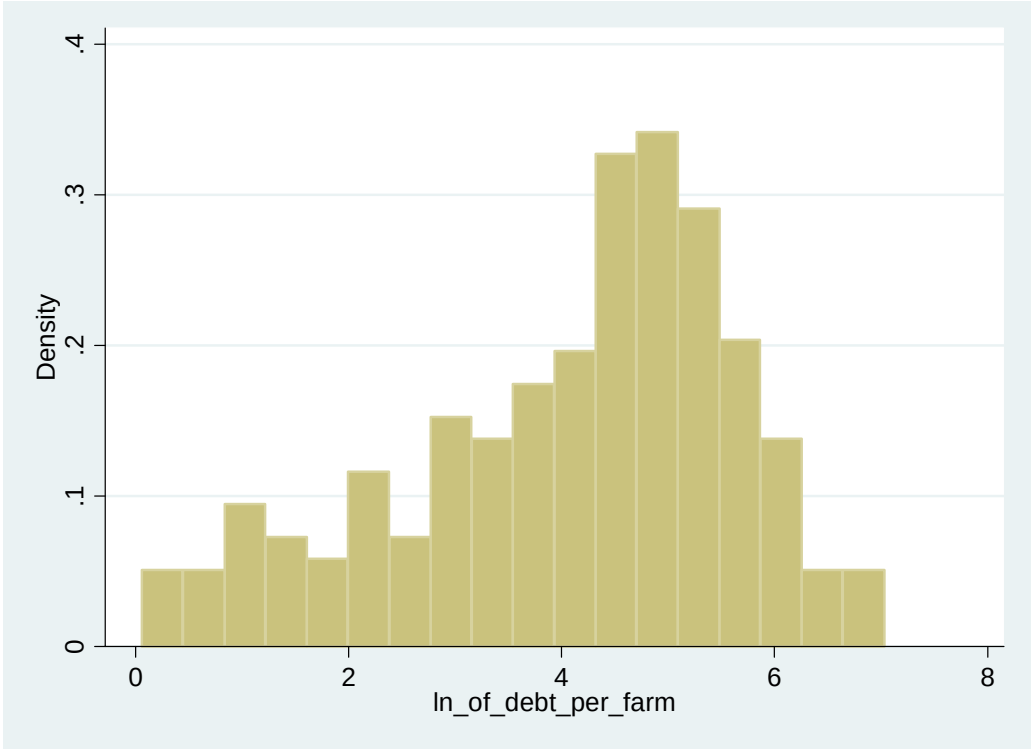


Figure 1. Evolution of structural characteristics

A. Logarithmic histogram of the level of debt



B. Distribution of year of settlement

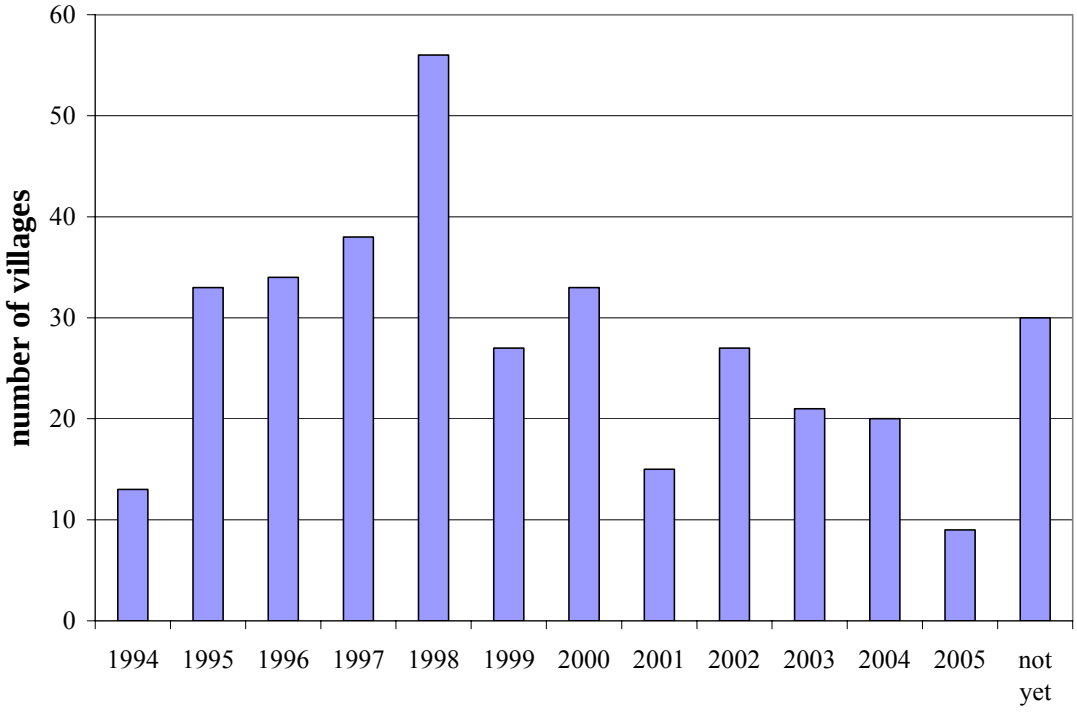


Figure 2. Debt and debt settlement characteristics

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1.01 Yoav Kislev - Water Markets (Hebrew).

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