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Evolution of Land Distribution in West Bengal 1967-2004

Role of Land Reform

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Abstract

This paper uses data from a household survey to estimate changes in land distribution in rural West Bengal between 1967-2004 and decompose these into contributions of different factors. There was a substantial drop in land per household and land per capita, while within-village inequality rose. The latter was associated mainly with rising landlessness induced by high rates of household division for marginal and small landowning households. Conversely, division of large landowning households reduced inequality. We find a significant indirect effect of the tenancy reform (Operation Barga) on inequality, as it reduced division rates of small landowning households while raising those of large landowning households. The land titling (patta) program also reduced inequality by reducing landlessness. Land markets were highly active, and were mildly equalizing. The inequality reducing effects of land reforms and land markets were dwarfed by the rising inequality and landlessness induced by division of small landowning households and immigration.

Keywords: household division, land inequality, land markets, land reform
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Abstract

This paper uses data from a household survey to estimate changes in land distribution in rural West Bengal between 1967-2004 and decompose these into contributions of different factors. There was a substantial drop in land per household and land per capita, while within-village inequality rose. The latter was associated mainly with rising landlessness induced by high rates of household division for marginal and small landowning households. Conversely, division of large landowning households reduced inequality. We find a significant indirect effect of the tenancy reform (Operation Barga) on inequality, as it reduced division rates of small landowning households while raising those of large landowning households. The land titling (patta) program also reduced inequality by reducing landlessness. Land markets were highly active, and were mildly equalizing. The inequality reducing effects of land reforms and land markets were dwarfed by the rising inequality and landlessness induced by division of small landowning households and immigration.

1 Introduction

Land is the pre-eminent asset in rural sectors of developing countries, the primary determinant of livelihoods of the poor. Many developing countries have recently experienced marked reductions in per capita and per household landownership, a factor that has reduced the

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ability of the rural poor to sustain their livelihoods from traditional agricultural occupations, inducing a 'push' towards non-agricultural occupations. Inequality of landownership and tenancy arrangements are key determinants of wealth and income inequality within the rural sector, with important implications for agricultural productivity, poverty, local governance and social capital (Berry and Cline (1979), Binswanger et al (1993), Banerjee et al (2001), Banerjee, Gertler and Ghatak (2002), Bardhan (2004)). Many arguments have thus been made for the need for land reforms in the developing world as an instrument for reducing land inequality and poverty, raising productivity, improving governance and easing social and political tensions.

To evaluate these arguments, it is important to assess the poverty-reduction and growth enhancing effects of land reforms, and in particular the channels by which they operate. Given the high correlation between rural poverty and landlessness, one needs to understand the effect of land reform on landlessness to study its effect on poverty reduction. Farms of differing sizes typically select different organizational forms of production which differ in productivity. For instance, small farms are frequently found to be more productive in rice growing areas owing to their greater reliance on family labor. Hence changes in the size distribution of farms are likely to significantly affect aggregate productivity, after controlling for within-farm incentive effects. The impacts of land reform should thus include impacts on the land distribution, representing general equilibrium effects operating through the market for land, immigration and household division. Most existing literature by contrast has focused mainly on partial equilibrium effects of land reform on within-farm incentives.

Besides implied effects on poverty reduction and productivity growth, effects on inequality and poverty are also of interest in their own right; land inequality and landlessness are prime determinants of these. The effect of land reforms on land distribution is not straightforward: the distribution of landownership depends on market transactions, division of households and migration patterns. One needs to understand how these social and market processes are affected by land reform, in order to assess whether the resulting indirect effects accentuate or moderate the direct effects.

In theory there could be several effects going in opposite directions. For instance the threat of appropriation of land for households with land above the allotted ceilings may motivate them to sub-divide in order to evade the ceiling, or keep the land within the larger family. Tenancy regulation can reduce the profitability of leasing out lands to tenants; awarding land titles to the landless may restrict the supply of agricultural workers, raise wage rates and thus render cultivation by hired workers less profitable. These may thus motivate selling off of lands by households with large properties, or subdivision among various family members who switch to cultivation based on family labor. These effects would be likely to reduce land inequality. On the other hand, medium and small farms may also be motivated to subdivide, in order to be eligible for land titles being distributed, and owing to rising wages and productivity of small farms. This can set off a process of landownership decline which in due course leads to landsizes being too small to be viable for

cultivation, eventually leading the family to sell off all its land. Land reforms may attract in-migration if immigrating households expect to receive land titles: by enlarging the number of resident households who start with no land, landlessness may increase. The overall effects are therefore theoretically ambiguous.

Besides the question of inequality effects of land reform, we are also interested in understanding the factors driving changes in the land distribution, such as the division of households and migration patterns. Whether or not the land market is active is another classic question in development economics that has not received enough attention, owing mainly to lack of suitable data. And even if it is active, whether the land market tends to equalize or disequalize the land distribution bears on debates concerning regulation of land markets. Arguments for regulation typically argue that the land market is thin, and most transactions tend to take the form of distress sales wherein small and marginal landowners sell their land to large landowners. Those arguing for deregulation emphasize the role of a vibrant land market in allowing more able farmers to expand their operations by buying out the land of less productive farmers, and argue that the land market tends to equalize landholdings as small farms tend to be more productive than large farms.

This paper examines the experience of West Bengal, a state in Eastern India with a population of 80 million, which ranks among the middle among Indian states with regard to both economic indicators as well as human development. Over the past four decades West Bengal has witnessed implementation of land reforms on a much larger scale than the average Indian state, distributing 6.7% of agricultural land in the form of land titles to the poor by the early 1990s compared with a national average of 1.35% (Appu (1996)), and registering tenancy agreements for over 1.5 million sharecroppers which protected them from eviction and put a floor to their cropshares. Most assessments of these reforms have found favorable effects on agricultural productivity and incomes, both at the farm level (Bardhan and Mookherjee (2011)) and at higher levels of aggregation such as the district (Banerjee, Gertler and Ghatak (2002)). Besley and Burgess (2000) examine the effect at the level of states, an even higher level of aggregation, using legislative measures of land reform; they find a significant effect on poverty reduction. The effect on the distribution of land itself has not been studied, except for a small number of village case studies (e.g., Lieten (1992), Sengupta and Gazdar (1996), Rawal (2001)). Some commentators (e.g., Lieten (1992) have informally argued that the land reforms in West Bengal were instrumental in lowering inequality between 1970 and 1985, and in explaining why small and marginal landowners own a larger proportion of land compared with neighboring states Bihar and Uttar Pradesh. Yet Bardhan and Mookherjee (2010, 2011) have noted that the land reforms involved a relatively small fraction of agricultural land, and that the bulk of the observed changes in the land distribution reflect changes in landownership owing to other factors such as household division and market transactions. This raises the question of the extent to which these social and market processes may have been indirectly affected by the land reforms.

We study the evolution of land distribution in a sample of 89 villages drawn from major agricultural districts of West Bengal. We utilize results from a survey of approximately 25 households in each village conducted in 2004-05, which was designed to trace the land histories of each household since 1967. These include details of land purchases and sales, land appropriated or distributed by land reform authorities, household divisions, immigration, exits of family members as well as major demographic changes such as marriages, births and deaths.

We find significant declines in mean household and per capita landholdings, along with rising landlessness and inequality. The most important factor underlying changes in the land distribution was division of households, which includes household splitting and exit of individual members. Secondary important influences were high rates of immigration into villages from other parts of the country. Much of the increased inequality was associated with rising landlessness, induced by high rates of division of small and marginal landowning households, and immigration. Division of large landowning households tended to reduce inequality, but these effects were dominated by division of smaller landowning households. Land reforms had a relatively small direct effect on inequality. However, they exercised a statistically significant negative *indirect* effect. The tenancy registration program lowered inequality by lowering division rates of small landowning households while raising division rates of large landowning households; the land titling program lowered the incidence of landlessness. The land market was highly active, and tended to reduce inequality slightly. Nevertheless, the equalizing effects of the land reforms and land markets were outweighed overall by the effects of high rates of division of small landowning households and rising immigration, both of which raised the proportion of the landless.

The next section describes the nature of the data. The following section presents a number of figures that summarize the key changes in land distribution, land reform, household division, immigration and market transactions between 1967 and 2004, which helps assess the respective roles of these various phenomena in explaining changes in land distribution. This is followed by results of cross-section and panel regressions both at the household and village level for land market transactions, household division and immigration that illustrate the indirect effect of the land reforms on these phenomena. The final section summarizes the main findings.

2 Data

The survey involved 2,402 households in a sample of 89 villages in West Bengal. The village sample is a sub-sample of an original stratified random sample of villages selected from all major agricultural districts of the state (only Kolkata and Darjeeling are excluded) by the Socio-Economic Evaluation Branch (SEEB) of the Department of Agriculture, Government of West Bengal, for the purpose of calculating cost of cultivation of major crops in the state

between 1981 and 1996. The same sample is used in Bardhan and Mookherjee (2006, 2010, 2011) and Bardhan, Mookherjee and Parra-Torrado (2010) for earlier studies of targeting of local government programs, political economy and productivity effects of the land reforms.

The village selection procedure used by SEEB was the following: a random sample of blocks was selected in each district. Within each block one village was selected randomly, followed by random selection of another village within a 8 Km radius. Our survey teams visited these villages between 2003 and 2005, carried out a listing of landholdings of every household, then selected a stratified random sample (stratifying by landownership) of approximately 25 households per village (with the precise number varying with the number of households in each village). 2 additional households were selected randomly from middle and large landowning categories respectively, owning 5-10 acres and more than 10 acres of cultivable land. This was to ensure positive representation of these groups, which are small in number in many villages. The stratification of the sample of households was based on a prior census of all households in each village, in which demographic and landownership details were collected from a door-to-door survey.

Representatives (typically the head) of selected households were subsequently administered a survey questionnaire consisting of their demographic and land history since 1967, besides economic status, economic activities, benefits received from various development programs administered by GPs, involvement in activities pertaining to local governments (gram panchayats (GPs)), politics and local community organizations. Response rates were extremely high: only 15 households out of 2400 of those originally selected did not agree to participate, and were replaced by randomly selected substitutes.

We combine the household-level data with data on the extent of land reform carried by the land reform authorities in each of these villages (which is available until the year 1998). Additional village-level information is available from previous surveys concerning various agricultural development programs implemented by local governments, productivity in a farm panel drawn from these villages for subperiods, and in indirect household land survey for each village corresponding to 1978 (or 1983) and 1998 (in which village elders compiled household land distributions for each of these two years, based on an enumeration of voters for each village).

2.1 Constructing Land and Household Size Time Series: Key Problems

The survey data included each household's land holding at the time of being surveyed (2004) and as of 1967. In subsequent blocks the respondents were asked to list all land transactions that occurred in between these two dates, for each of the following categories: acquisitions (purchases, patta (land titles received), gifts and others), disposals (sales, transfers, appropriation by land reform authorities, and natural disaster), and household division (involving both exits of individual members and household splits). We focus on agricultural land, both irrigated and unirrigated (in order to determine the relevant ceiling imposed by the land

reform laws, which incorporate irrigation status and household size). Corresponding changes in household demographics on account of births, deaths, and marriages were also recorded.

An effort was made in the questionnaire design to distinguish between exit of individual members and household splitting (where a household sub-unit consisting of at least two members left the original household). But the questionnaire responses indicate that the interviewers and respondents tended to lump the two together. In order to avoid double-counting, we merged the observations that were both in the individual exit and household splitting datasets. We classified the cause of individual exit and household division into four categories: death of the member of the household, exit of the spouse of the head due to death of the head of the household, out-marriage, and exit/division due to other reasons (such as change in household size, change in income/expenditure, disputes, registration of tenants and threat of land reforms). Table 1 shows that the latter category is by far the most relevant, both in terms of frequency of ocurrence and amount of land involved.

Recalling the details of past changes in landholdings over the past three decades can be a challenging task. In order to gauge the significance of recall problems, we checked the consistency of reported landholdings in 1967 and 2004 with reports of land changes in the intervening period. Starting with the 2004 land holdings, we added in all transactions for any given year to compute the total land holding in the previous year. Repeating this iteratively, we calculated landholdings for every previous year until 1967.[1] We compare the estimated landholding in 1967 with that actually reported for that year. For households immigrating into the village since 1967, we carry out the match for the initial year that the household arrived in the village.

An additional difficulty arises with the individual exit dataset: no distinction was made in the questionnaire between agricultural and non-agricultural land lost thereby (i.e., associated with the exit). This complicated our calculation of agricultural landholdings. To deal with this problem we considered three different alternatives. The first assumes that all land reported in individual exits involved non-agricultural land, and therefore is not considered in the analysis. The second assumes the opposite, i.e. that all land reported in individual exits corresponds to (unirrigated) agricultural land. Finally, the third alternative assumes that whenever there is "missing" agricultural land (by the iterative procedure described above), it is accounted by land lost because of individual exits.

Table 2 presents the result of the iterative process for the three alternatives explained above. When all land lost owing to individual exits is assumed to be non-agricultural (alternative 1), around 88% of the households matched their reported landholdings in 1967, upto a 0.2 acres margin of error. This figure increased to 91% when allowing for a 0.5 acre margin of error. The fact that we were able to reconstruct the land history for many

[1]For example, consider a household with 2 acres in 2004 that lost 1 acre due to household division in 1995 and bought 3 acres in 1970. Then, we would list the household as owning 2 acres each year from 1995-2004, 3 acres from 1970-1995, and 0 acres from 1967 until 1970.

households implies that imperfect recall problems problems were not very important in this context. The match rate fell to 82 and 86% respectively when we assume that land lost from individual exits was entirely agricultural land (alternative 2). Therefore it seems that land lost from individual exits correponds to other uses of land, such as homestead, ponds or orchards. Finally we present the results for assuming that the gap between the reconstructed agricultural land holdings and the self reported in 1967, if any, had to come from agricultural land reported in the individual exit dataset (alternative 3). For this case 89% of the households matched their reported landholdings in 1967, upto a 0.2 acres margin of error. This 1% improvement in comparison with the first alternative corresponds to only 26 households. Hence we do not believe our lack of knowledge of type of land lost in exits is of any signficance. In the rest of the paper, we use the data implied by the third alternative in order to construct the agricultural land time series for each household.

Finally, since there was no distinction between irrigated and unirrigated land in the individual exit dataset, we assumed that all land coming from this dataset was unirrigated. Whenever possible, we apportioned unirrigated to irrigated land to match initial and final holdings of irrigated and unirrigated land. There were a few household-year observeations in which households still had negative land holdings, which were set equal to zero.

A similar check for household size and composition indicated consistent reports for 82% of all households, shown in column 3 in Table 3. And when we seek consistent reports of both demographics and land histories, we end up with 73% of the sample, shown in column 4 of Table 3.

We thereafter proceed on the basis of two samples. One is the restricted sample formed by those households with consistent reports regarding both land and household size. The other is the full sample. The differences between these two samples are presented in column 7 of Table 3. It shows the restricted sample contains a larger fraction of immigrants and a smaller fraction of medium, large and big landowners. This is to be expected as recall problems are less likely for immigrants or those owning less land. All subsequent results in the paper are shown for both samples, to gauge the sensitivity of results to possible recall problems.

3 Basic Facts

3.1 Trends in Land per Household

Figure 1 shows trend in agricultural land per household for the full and restricted sample, averaged across all villages. In the full sample there is a sharp drop in the mean from nearly 3 acres per household to a little over 1 acre. The median drops by less, from 0.7 acre to 0. The third quartile drops from 3.6 acres to slightly above 1. The drop in mean, median and third quartile is less dramatic in the restricted sample, but significant nonetheless: both the median and the third quartile are more than halved. By 2004 less than one quarter of

households had more than 1 acre of land. Figure 2 shows similar but somewhat attenuated patterns for the sample that excludes immigrant households.

Figure 3 shows corresponding trends for household size. The median falls from 6 to 5, and the mean also falls by 1 unit, resulting in a reduction of the order of 16%. The steepest fall is in the third quartile. The distribution of household size shrinks over time, with the largest households shrinking by more. The inter-quartile range fell from 4–8 to 4–6.

The drop in household size was thus less dramatic than the drop in land per household. Consequently land per capita fell by a factor of three, as shown in Figure 4. In the restricted sample, the mean and third quartile dropped from 0.4 and 0.5 to near 0.2 acres per capita. This confirms the view commonly expressed in rural West Bengal that it is increasingly difficult for rural households to derive their livelihood from agriculture, creating an urgent need to generate non-agricultural employment opportunities in the state. It is also evident that the changes observed are gradual, with no noticeable fluctuations across different years. Figure 5 shows similar patterns for native households.

To corroborate these findings, Table 4 shows changes in cultivable land and number of households over two decades of the 1980s and 1990s, using the indirect household survey used in Bardhan and Mookherjee (2006, 2010). The number of households rose sharply, while the amount of cultivable land remained approximately the same. This indicates that conversion of agricultural land into forests or other non-agricultural purposes was not the cause of the decline in land availability per household.

Returning to the direct household survey, immigration accounted for a 15% drop in land per household for both the full and restricted samples, while for natives it dropped by about 40%. Table 5 decomposes the latter change between different channels. For the full (restricted) sample, 81% (85%) of the decline in land for native households is accounted for by land lost owing to household division, 6.6% (11%) to land market transactions, 6.3% (7%) to gifts and transfers, 4.6% (-1.1%) for land reforms, and 3.6% (1.3%) for other miscellaneous reasons. Hence land lost owing to household splits and migration of household members was the dominant source, followed by immigration, land market transactions and transfers. The direct effect of land reforms was negligible. It is therefore necessary to evaluate possible indirect ways in which land reforms affected the land distribution, by affecting processes of household division, immigration and land transfers.

3.2 Trends in Inequality and Landlessness

Figure 6 shows that for the full sample within-village inequality (averaged across villages) rose by 10% for the Gini and somewhat more (15–20%) for the coefficient of variation. The restricted sample shows a steeper increase for both the Gini and the coefficient of variation (17% increase). For this sample the Gini has a relatively lower level at the beginning of the period, compared to the full sample (about 0.06 points). But this difference is almost negligible at the end of the period. Figures 7 and 8 calculate the contribution of three

principal channels by which household landholdings changed: household division, land market transactions, and land reform respectively, using the following accounting exercise. For each of these channels, we calculate the amount of land the household would have owned in any given year had the landholding change associated with the corresponding channel not occurred, and all other changes in landholding would have occurred as observed. We then calculate the average within-village inequality that would have resulted, and subtract this from the observed inequality to estimate the contribution of this channel.

These figures show clearly that the source of rising inequality was household division, particularly after the mid-80s. Land market transactions contributed to a reduction in inequality, by an extent depending on the precise inequality measure used and the sample in question. In the case of the coefficient of variation, the inequality reduction effect of land market transactions was more pronounced, mostly occurring by the mid-80s. However if we use the Gini coefficient instead, the land market had a more modest effect on inequality, and nearly zero in the case of the restricted sample. Finally, the role of the land reforms was to reduce the coefficient of variation by a magnitude comparable to the land market for the period as a whole, though the effect was weaker in the first half of the period. For the Gini coefficient, by contrast, the direct effect of the land reform was near zero for the period as a whole, in both restricted and the full sample. Hence the land reforms exercised a substantially weaker direct effect on land inequality, compared to household division. The significance of the land reforms relative to land market transactions depends on the precise inequality measure used.

Table 6 shows the distribution of land across different size classes in 1967 and 2004. Landlessness rose from 38% to 46% for natives, and 56% for the population including immigrants. The proportion of households that were either landless or marginal (owning less than 1 acre) rose from 61% to 75% among natives, and 81% among the entire population. This was accounted for by a drop mainly of small landowners (between 1 and 2.5 acres) and large and big landowners (owning more than 5 acres).

In order to understand better the changes in the land distribution we examine the density of the distribution of land for those households owning between 0 and 3 acres of land (i.e. landless households were excluded). Figure 9 shows the results for both the full and restricted sample, for three different years (1970, 1985 and 2000). There are two striking results here. First the density at each of these dates peaks at 0.5 acres, with a sharp drop below this level. It suggests a minimum viable landholding size around half an acre. Second, changes in the distribution involve a lowering of the density between one and three acres, and a rise in the density at the half acre peak. Combined with the rising incidence of landlessness, it suggests that there was an increasing tendency for the bottom tail of the land distribution to have two peaks, one at the half acre mark, and the other at zero. It suggests a process whereby land owned by most landed households tended to drift downwards (following division of the household over time), until it hit the half acre threshold, whereupon the household would either struggle to preserve its landholding or rapidly progress to landlessness.

In order to gauge the effect of rising landlessness on land inequality, we also examined the distribution of land among households owning land in 2004. These are not shown here, in order to conserve space. Briefly, land inequality among landowning households as measured by the coefficient of variation declined in the first half of the period, and rose thereafter to neutralize the earlier decline. In the case of the Gini coefficient there was a significant decline. Hence the rise in inequality observed for either inequality measure was primarily accounted for by rising landlessness.

3.3 Immigration

Figure 10 focuses on the role of immigration, defined by arrival of the household in question in the village after 1967. This includes both domestic and foreign immigrants. The proportion of immigrants rose smoothly to approximately 28% (33% in the restricted sample). Clearly the demographic share of immigrants amongst the landless is much larger than in the village population as a whole, so the arrival of immigrants tended to swell the ranks of landless households. Less than a third of this was accounted for by immigrants from Bangladesh, which tended to level off after 1995.

We have discussed above how immigration explains about one-third of the observed reduction in land per household. The role of immigration in contributing to inequality is illustrated by comparing the rise in inequality within native households (shown in Figure 11) with the rise in inequality in the village as a whole (Figure 6). The Gini rose by about 4% instead of 10%, and the rise in coefficient of variation is also halved. *Hence the two main factors accounting for the observed rise in inequality were household division and immigration, whose combined effect outweighed the inequality reducing effects of land reform and market transactions.* During the first half of the period (until 1985) inequality among natives actually fell (for CV) and remained stationary (for the Gini), owing to the greater effect of the market and land reform. Subsequently household divisions accelerated to cause inequality to increase overall, both among the native population as well as for the village as a whole.

3.4 Land Market Transactions

Figure 12 shows the size and frequency of land market transactions. These are not necessarily balanced because we are working with a sample of households rather than the entire village population. Besides we exclude non-residents who may own some land, as well as those who may have left the village between 1967 and 2004. Nevertheless it is apparent that the sales and purchases approximately balance each other in the data, except the last 5 years or so when the sales outstrip the purchases (which may reflect an increasing tendency for non-residents to purchase land). However the extent of excess sales towards the end is of the order of 0.2–0.25 acres, not large enough to explain the mean reduction in land per

resident household in excess of 1 acre for the period as a whole shown in Figure 1. It is within the margin of variation observed from year to year during the period in queston, thus unlikely to be statistically significant. Note also that the land transactions are considerable in frequency, and occur throughout the period. Hence the land market has been quite active. In the full sample there is a tendency for rising extent of transactions in the first half, with some noticeable spikes between 1980–85, the period of heightened land reform activity. In the restricted sample these spikes are muted, with no evident tendency to be bunched in the earlier period. The earlier decompositions indicated that the land market transactions tended to reduce the coefficient of variation, and did not have a significant impact on the Gini. We shall investigate the inequality effects in more detail below.

3.5 Land Reform

Figure 13 shows lands lost and gained by households owing to land reform. In both sample the lands appropriated exceed those distributed, confirming the observation in Bardhan and Mookherjee (2010) that much land that is appropriated by land reform authorities is not distributed as titles, reflecting either legal roadblocks or corruption. As in the case of land market transactions, the spikes in lands appropriated are muted in the case of the restricted sample. This indicates that the restricted sample tends to miss households that lost a lot of land owing to the reforms that happened till the mid-80s. But there are still spikes in the restricted sample between 1970 and 1985, and only one later year (around the mid-90s). The spikes indicate an excess of land appropriated over distributed which in three years happens to exceed 0.1 acre, and is nearly 0.4 acres in one year. This accounts for the slight negative contribution of the land reforms to land per household noted above.

Figure 14 uses data from the local land records offices for both tenancy registration (*barga*) and land title distribution (*patta*) for the village as a whole, until the year 1998 (the year when the official village level data on land reform was collected). The figure on the left expresses the extent of land reform as percent of cultivable land, while the latter as a percent of households. These data series are taken from Bardhan and Mookherjee (2006, 2010), with the land area and household numbers calculated on the basis of interpolation of estimates from the indirect household survey for years 1978 and 1998. Both sets of land reforms were pronounced between the late 1970s and mid-80s, with the tenancy reform more significant in terms of cultivable land area and the land titling program more significant in terms of the number of households directly benefitting. This reflects the phenomenon described in Bardhan and Mookherjee (2011) for tenants involved in the reform to be cultivating fertile plots in excess of an acre, while land titles were typically low quality land well under an acre.

3.6 Household Division

Figure 15 breaks down changes in household size into different sources: births, in-marriages (i.e., those who join the household via marriage), household division and other exits (including deaths, out-migration and out-marriages). Births rose over the period, while in-marriages had a steady effect on household size. These were outweighed by household division and other exits, generating a negative overall impact. Other exits were more pronounced in the first half of the period, while household division tended to arise especially in the second half. Exits owing to out-migration, out-marriages and household splits typically reduce land owned by the household, as departing members tend to leave with a certain share of the land. To the extent that big landowning households are more prone to such divisions than the rest of the village, land inequality tends to decline. However if small and marginal landowning households divide, it reduces their landholdings to below minimum viable sizes of cultivation, raising landlessness and inequality. Hence the effects of household division on the land distribution depend on the size classes in which they are particularly pronounced.

To examine this, Tables 7, 8 and 9 show division rates and land lost for households dividing, for different size classes. Over the entire period, the former table shows that the division rates for landless, marginal and small households were higher than for medium, large and big households. There is a peak in the division rate in the 1977-1986 decade, after which the rates go down again to the pre-70 levels. Table 9 shows the net rate at which land was lost for different size classes. For the period as a whole, small households lost land at a higher rate (around 1.45% per year) than big households, who lost land at 1.20% per year. This reinforces our claim that division of small households led to rising inequality and landlessness.

4 Indirect Effects of Land Reform: Regression Results

In this section we explore the possible indirect role of land reforms in changing land distribution by affecting land market transactions, household division and immigration. We predict market transactions and division of households, utilizing the household panel, controlling for household demographics, land owned and status vis-a-vis land ceilings defined by the land reform regulations. Land reforms implemented in the village are measured by the proportion of land or households affected directly by the tenancy registration and land titling program in the village in question. These may have signaled the seriousness with which the land reforms were being implemented in the local area, thus affecting the inclination of large landowning households with land in excess of the ceiling to sub-divide or sell land in order to avoid having their lands appropriated by land reform authorities. Large landowning households below the ceiling may also have been affected by either kind of land reform. Operation Barga is likely to have reduced the profitability of leasing out land to tenants, while the land titling program may have raised wage rates for agricultural workers, reducing

the profitability of cultivating land using hired workers.[2] The land titling program may also have increased the inclination of small and medium landowning households to divide into landless or marginal fragments in order to become eligible to receive the land titles.

Many other factors would be expected to affect incentives to divide or sell land. Demographic events (such as births, deaths, marriages, out-migration) that alter household size could trigger divisions or sales, as these change the ratio of land owned to family labor. Large households with multiple adult siblings may have a greater tendency to sub-divide owing to greater free-riding in household collective activities, lower value placed on household colective goods and increasing desire for privacy and independence in lifestyle as living standards increase (see e.g., models of Foster and Rosenzweig (2002) and Guirkinger and Platteau (2011)). We do not model the process of division or market transactions in this paper. Instead our intention is to examine the patterns in the data, as a prelude to any such modeling exercise.

We present reduced form regressions which predict land market transactions or household division for a household in any given year, based on lagged household size which incorporate the effect of recent demographic events, lagged landholdings, and recent incidence of land reforms implemented in the village, besides household and year fixed effects. In all of the following regressions, we use the average of land reforms implemented in the village in the past three years.[3] We calculate the land ceiling applicable to the household in question in any given year, using information concerning the number of household members and amounts of irrigated and unirrigated land owned in that year. This is used to create a dummy for whether the household is subject to the ceiling in any given year. The controls for land size include quadratic and cubic terms, so by including a ceiling dummy and interactions of this dummy with various measures of land reform activity in the village we examine how households above the ceiling behave differently from those below.

4.1 Household Division

Table 10 presents a logit regression predicting the event that a household experienced a division in any given year. The likelihood rises significantly with lagged household size, controlling for landholdings. It also rises in landholdings, though the coefficient is not significant across all specifications. Columns 2 and 6 show that recent implementation of Operation Barga (measured by proportion of cultivable land affected) decelerated division rates significantly more for small landowning households, while it accelerated division for the large

[2]Bardhan and Mookherjee (2011) found using a farm panel for these villages between 1982-95 that Operation Barga induced substitution of family labor for hired labor and a corresponding reduction in the wage rate. The land titling program also induced a similar substitution pattern, with a positive but statistically insignificant effect on wages of hired workers.

[3]We also examine a variant where this is replaced by the average of the reforms implemented for the subsequent three years, in case households were able to anticipate the reforms. The results were less sharp in that formulation, though qualitatively similar. Hence we do not show them here.

ones (above around 4 acres). This result is robust across different specifications and samples (columns 3,4,7,8) . Hence the tenancy registration program tended to lower inequality. In contrast the land titling program raised division rates of households, irrespective of the amount of land owned, implying an ambiguous indirect effect on inequality.

Households with land above the ceiling subdivided at a discontinuously higher rate, compared to those just below the ceiling. This is indicated by column 3, which show that the ceiling effect does not disappear upon inclusion of quadratic and cubic terms in landholding. Column 6 however shows that the ceiling effect is smaller and imprecisely measured. Most likely this is because the restricted sample does not contain the large landowning households that broke up in the first half of the period. The land reform legislation thus tended to accelerate the break up of large landowning households, reducing inequality.

We turn now to the amount of land lost, conditional on dividing, shown in Table 11. In the first column we see that household size, landholding and the above-ceiling dummy positively affected the amount of land lost by dividing households, while land reform implementation did not have a statistically significant effect. When the interactions of ceiling with landholding and barga are included (column 2), the effect of the ceiling dummy becomes negative but insignificant. On the other hand, the interaction of ceiling with barga has a very large cofficient, though imprecisely estimated. This coefficient is even larger and statistically significant in the restricted sample (column 4). Therefore households above the ceiling were losing (or giving away) more land in those villages where Operation Barga was implemented more vigorously.

In summary we see evidence that implementation of the tenancy registration program indirectly reduced inequality via their effect on household division patterns, i.e. inducing large households to divide at a larger rate and to give away larger amounts of cultivable land conditional on division.

4.2 Land Market Transactions and Gifts

Table 12 present regressions for net sales (sales minus purchases) as explained by the same set of explanatory variables. As expected, lagged household size has a significant negative effect, while lagged landownership has a significant positive effect. This confirms that land market transactions tended to equalize the land distribution.

Regarding the indirect effect of land reforms, the full sample (columns 1 and 2) shows no evidence that above-ceiling households behaved differently with respect to net sales. Nor is there any evidence of a significant positive effect of land reform implementation rates. In the restricted sample (columns 3 and 4) ceiling has a positive and significant effect on net sales, though it is not significant when the interactions are included.

Table 13 presents analogous regressions for net gifts (gifts given, minus received) of land. Again we see no significant effect of land reform implementation rates.

4.3 Immigration

Table 14 considers the determinants of demographic share of post-1967 immigrants, at the village level. Columns 1 and 3 regresses this on contemporaneous land per household, and measures of land reform, besides village and year dummies. Columns 2 and 4 present corresponding Arellano-Bond regressions with a lagged dependent variable. There is a significant negative coefficient on land availability, possibly reflecting the greater tendency for immigrants to settle in areas of high population density (owing to their concern for finding employment as workers). But we see no robust significant effects of the land reform on immigrant inflows.

4.4 Reduced Form Impact of Land Reforms on Land Inequality

Above we have found that the tenancy reforms had a significant negative effect on inequality via their effect on divisions of small and large landowning households in opposite directions, with no corresponding effect on land market transactions or immigration. The land title reforms did not seem to affect any of these processes.

Tables 15 and 16 examine the total impact of the land reform measures implemented on changes in land inequality. Table 15 presents a cross-village regression predicting 1998 inequality (either Gini coefficient or coefficient of variation) by the cumulative land reforms implemented since 1968 and the level of inequality in 1968. Here the land title program (measured by the proportion of land area distributed, or households receiving titles) registers a significant negative coefficient in three out of the four regressions (the only exception being the Gini regression in the restricted sample). With approximately one-third of all 1967 households receiving titles, the estimates for the full sample imply a 0.18 drop in the coefficient of variation, and a 0.03 drop in the Gini. We interpret this as resulting from the direct effect of the distribution of land titles in limiting the incidence of landlessness, which overcame any opposite effect operating through higher rates of division of small households. This is confirmed by Table 16 which presents the corresponding cross-village regression for the proportion of households that are landless, which shows a significant effect of the proportion of households receiving land titles in reducing landlessness. The magnitude of this coefficient is large, implying a reduction of landlessness by about 6%.

Table 15 shows a significant negative effect of Operation Barga in reducing inequality in the restricted sample. The effect is much smaller and not significant in the full sample. Given the regression results above, we interpret this as resulting partly from the indirect influence on household division rates. The quantitative impact is not large, even if we use the estimates from the restricted sample, since only about 8% of all 1967 households were registered in the program. The coefficients in the restricted sample regression predicts an impact of .03 for the CV and .02 for the Gini.

5 Summary and Concluding Observations

We summarize our main conclusions.

1. There was a significant reduction in land owned per capita and land per household. The most important factor causing land per household to fall was household division, followed by immigration. There was no evidence of significant conversion of land from agricultural to non-agricultural purposes. Sales to non-residents is also unlikely to have been a significant factor, as net sales of land by residents accounted for a small fraction of land loss.

2. Within-village inequality also rose, by between 10 to 20%, depending on the inequality measure used. The most important contributing factor was household division, particularly of small landowning households that became ultimately landless. Rising immigration also contributed to rising inequality, since immigrant households typically arrive in a landless status. Hence a combination of demographic factors and technological conditions (viz, scale economies wherein farms below a certain size become uneconomical) were the principal drivers of rising inequality.

3. Land market transactions effects on the Gini were negligible, but significantly negative for the coefficient of variation. Households owning more land tended to sell more, controlling for household size. Even for the CV measure of inequality, this effect was not significant enough to overcome the inequality-enhancing effects of household division and immigration.

4. The direct effects of the land reform on inequality were negative for the coefficient of variation, and negligible for the Gini coefficient. In the case of the former, it was roughly equal in magnitude to the inequality-reducing impact of land market transactions. In the case of both measures, it was dominated by the effect of household division and immigration.

5. Household division among small and marginal landowning households tended to raise inequality, while among large landowning households lowered inequality. Since the late-80s, the former effect dominated, resulting in rising landlessness and inequality overall.

6. There is some evidence that the tenancy reform tended to reduce inequality indirectly, mainly via induced impacts on household division. Households with more landholdings were more likely to divide, and more likely to give away more land, especially in those villages where Operation Barga was more intense.

7. There is no evidence of an indirect effect of the land reforms on market transactions, gifts or immigration.

8. Consistent with these results, the overall reduced form impact of the land reform on inequality and landlessness was negative – the land title program reduced landlessness directly, while the tenancy program reduced inequality indirectly through its effects on household divisions. The former effect was quantitatively more significant in lowering inequality. However, all of these were dwarfed by the inequality enhancing effects of division of small landowning households and immigration.

The main focus of this paper has been to understand the main facts, rather than modeling the complex behavior of households with respect to division, immigration and land market transactions. Future attempts to understand changes in land distribution in West Bengal will have to pay more attention to these. In particular, the factors determining household division need to be investigated more thoroughly.

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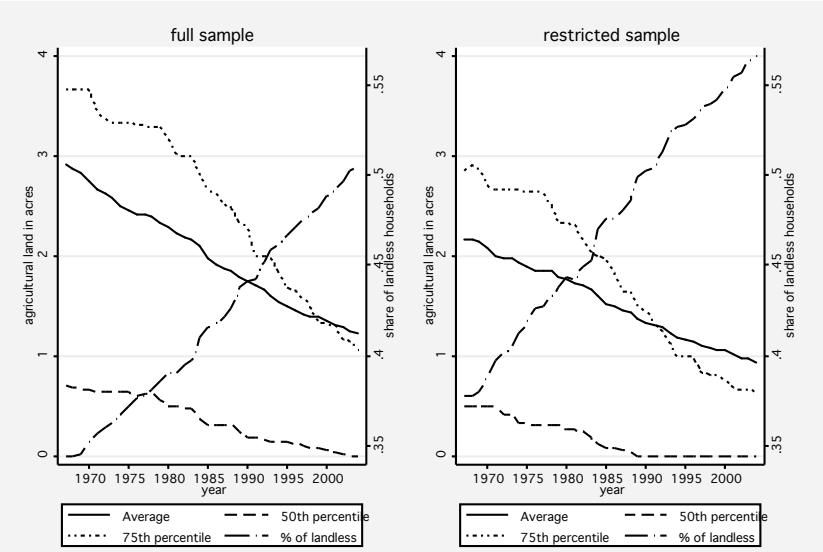
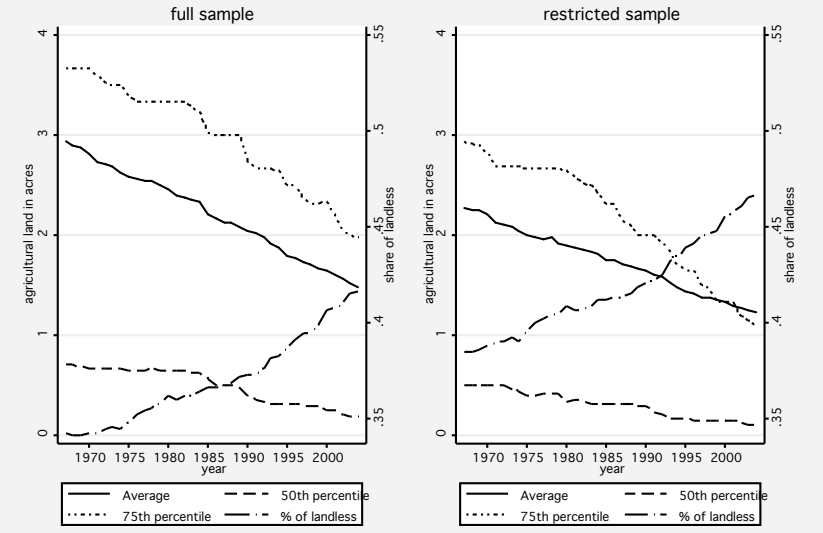
Figure 1: Agricultural land per household, various measures (1967-2004)



Note: The 25th percentile is not shown since it is equal to zero for the whole period analyzed.

Figure 2: Agricultural land per household, only natives (1967-2004)



Note: The 25th percentile is not shown since it is equal to zero for the whole period analyzed.

Figure 3: Household size, various measures (1967-2004)

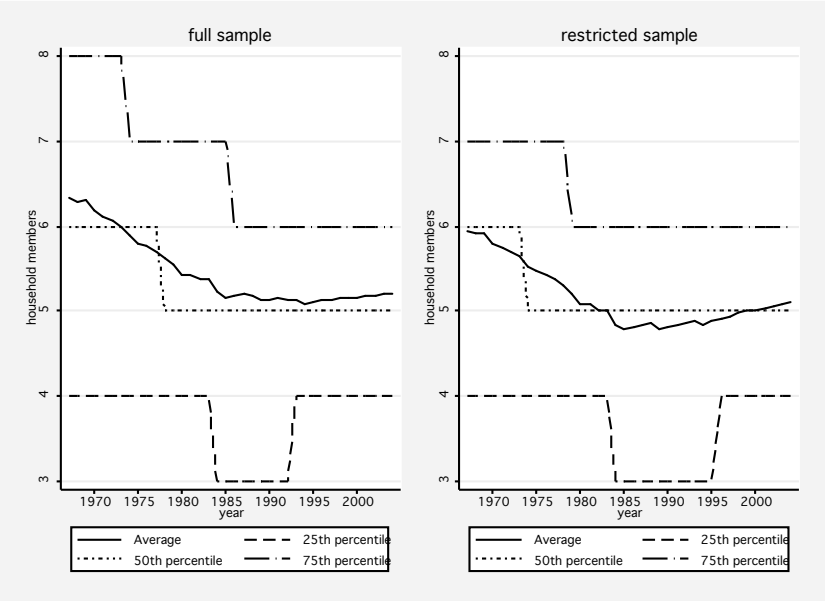
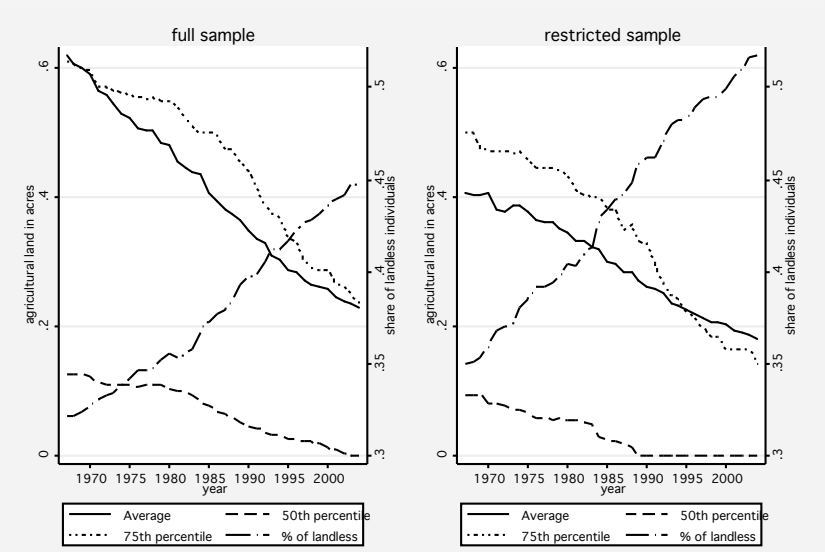
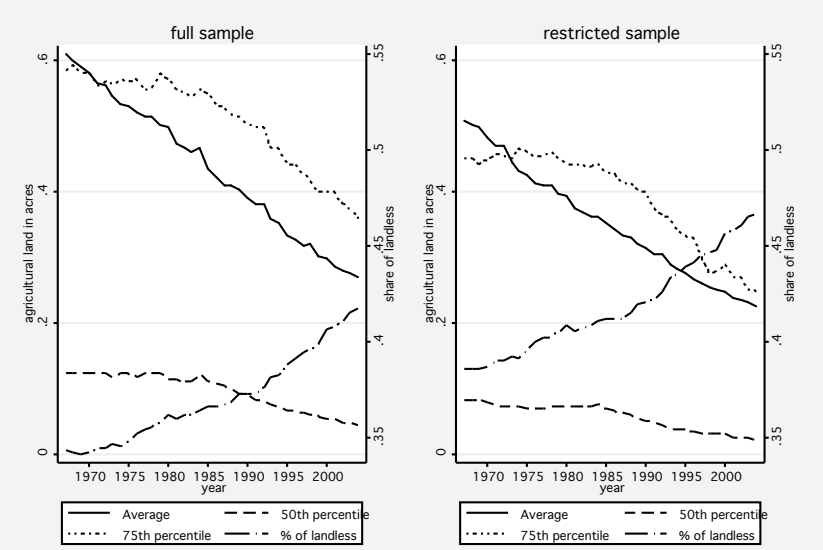


Figure 4: Agricultural land per capita, various measures (1967-2004)



Note: The 25th percentile is not shown since it is equal to zero for the whole period analyzed.

Figure 5: Agricultural land per capita, only natives (1967-2004)



Note: The 25th percentile is not shown since it is equal to zero for the whole period analyzed.

Figure 6: Average within-village land inequality, various measures (1967-2004)

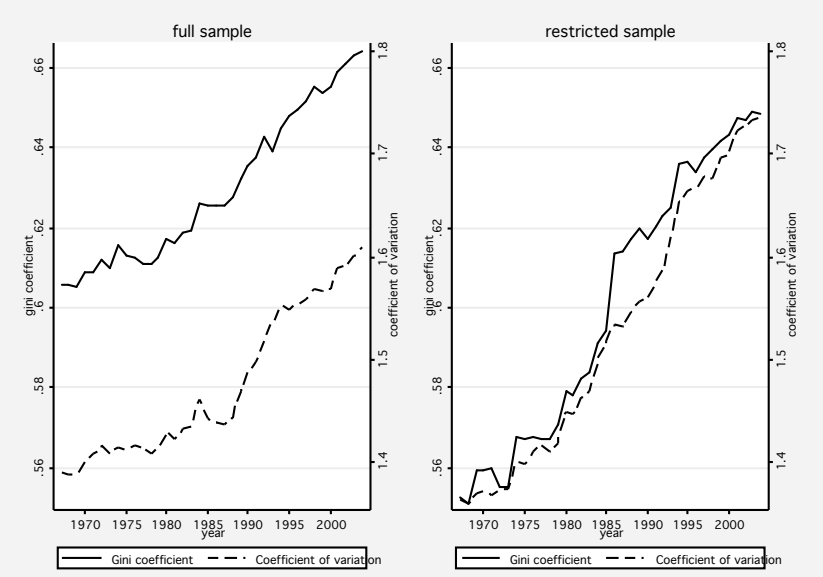
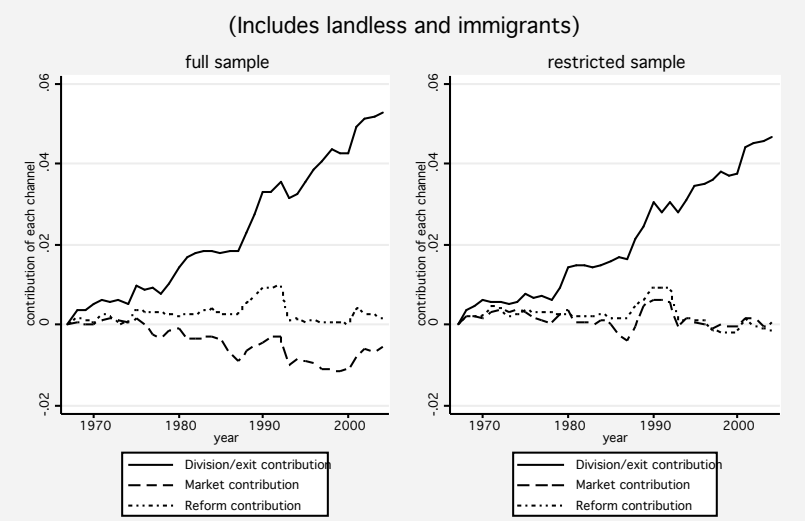
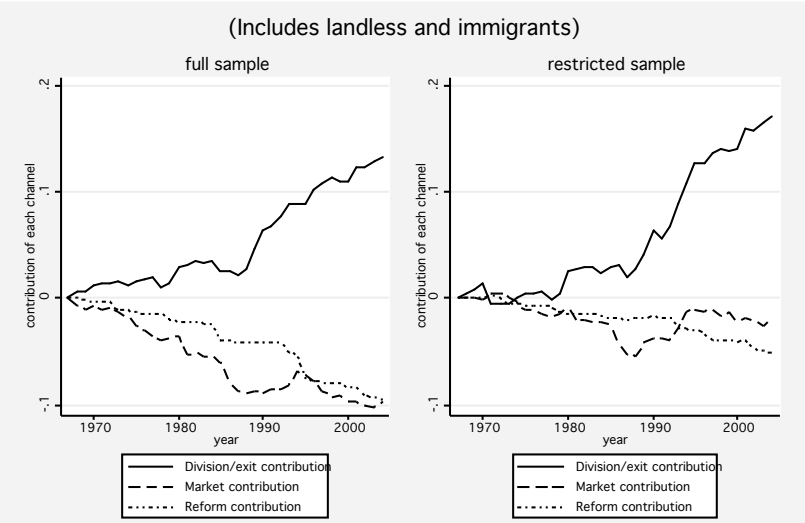


Figure 7: Average within-village land inequality, contribution to the Gini coefficient by channel (1967-2004)



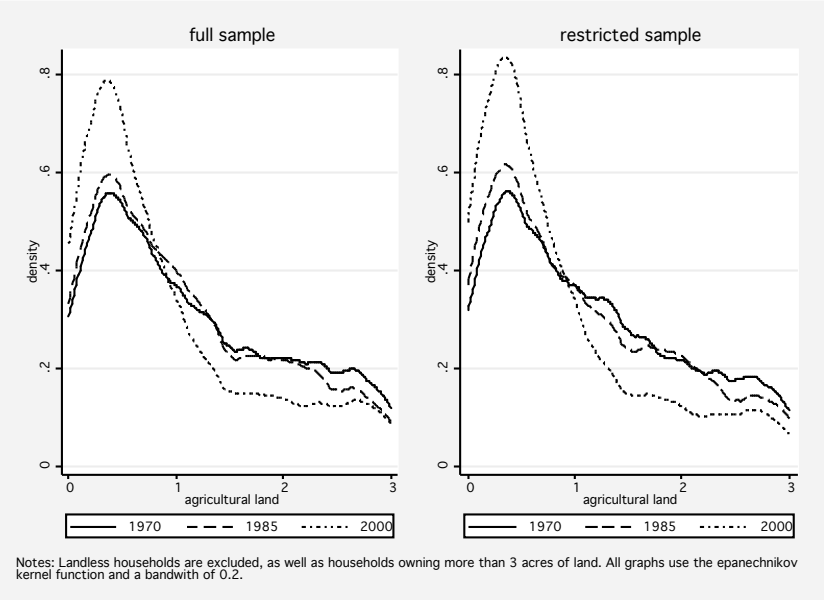
Note: Each line represents the contribution of each channel to the change in the gini coefficient.
The restricted sample corresponds to Sample (2) in Table 3, i.e. only land history correct.

Figure 8: Average within-village land inequality, contribution to coefficient of variation by channel (1967-2004)



Note: Each line represents the contribution of each channel to the change in the coefficient of variation.
The restricted sample corresponds to Sample (2) in Table 3, i.e. only land history correct.

Figure 9: Agricultural land kernel densities, various years



Notes: Landless households are excluded, as well as households owning more than 3 acres of land. All graphs use the epanechnikov kernel function and a bandwith of 0.2.

Figure 10: Immigration (1967-2004)

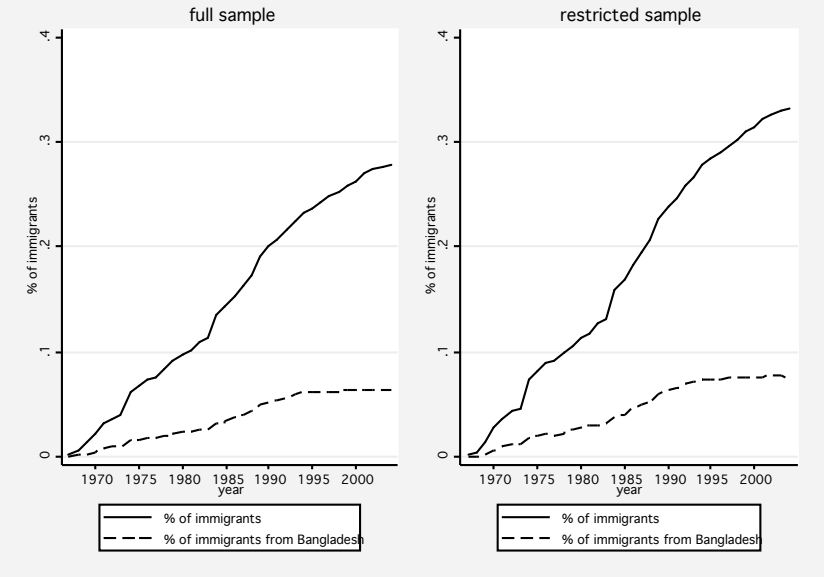


Figure 11: Average within-village land inequality, excluding immigrants (1967-2004)

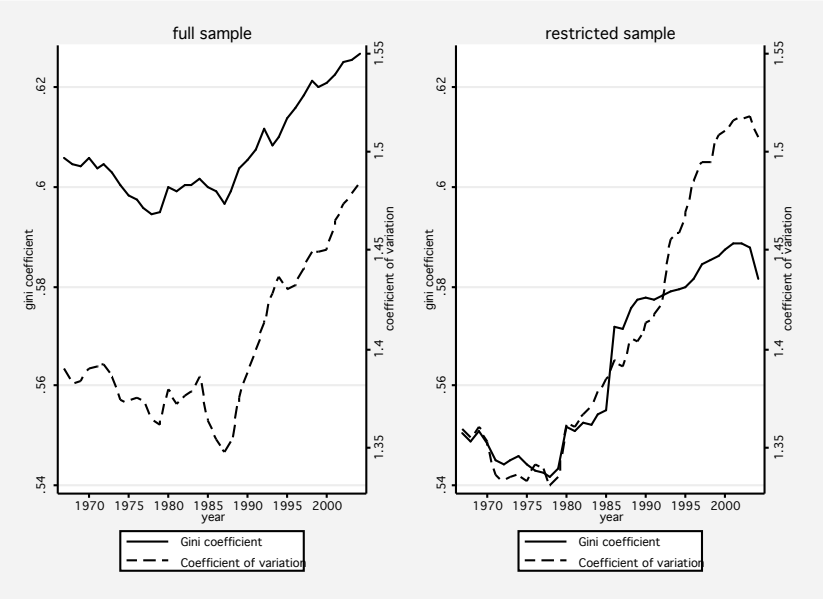


Figure 12: Land market: Average of total sales and purchases per village (1967-2004)

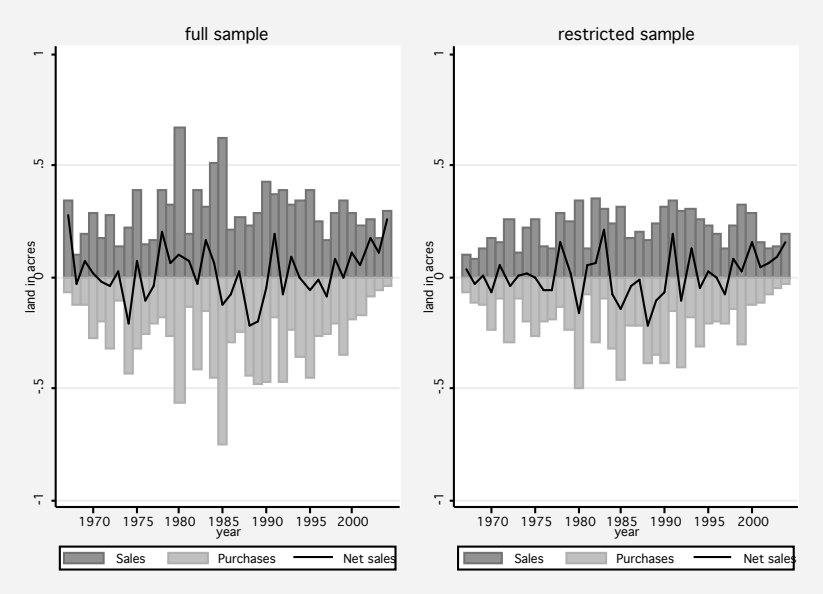
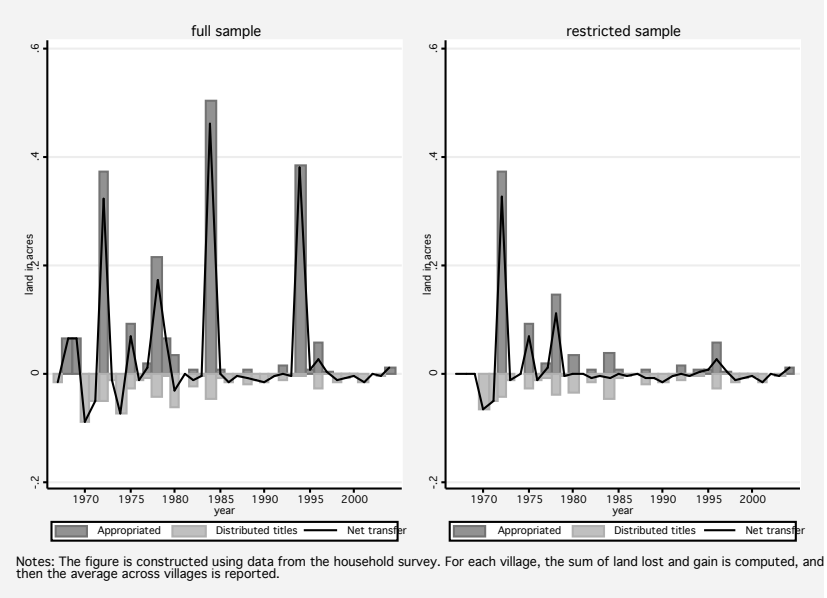
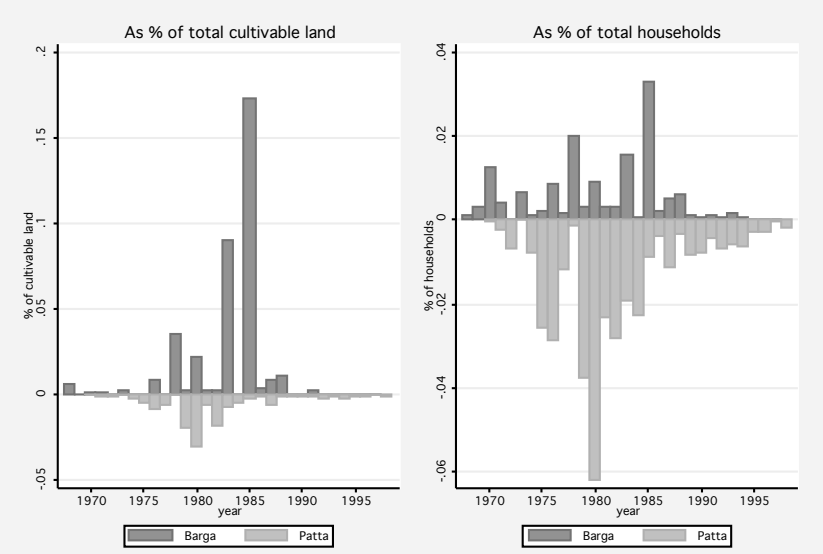


Figure 13: Average of total land lost and gained due to land reform, household survey (1967-2004)



Notes: The figure is constructed using data from the household survey. For each village, the sum of land lost and gain is computed, and then the average across villages is reported.

Figure 14: Average land reform implemented, official land records (1968-1998)



Source: West Bengal Block Land Reform Office (BLRO) for relevant villages.

Figure 15: Changes in household size by cause (1967-2004)

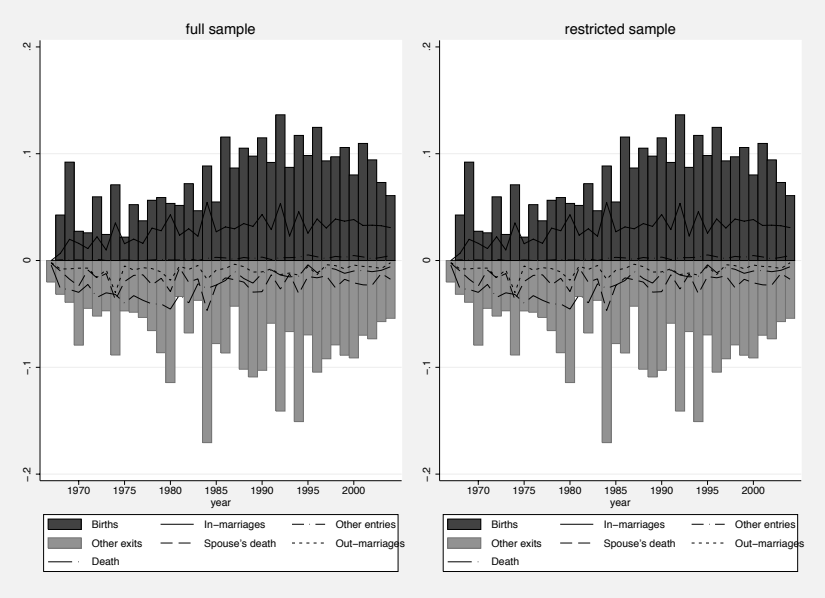


Table 1: Individual exits / household division dataset: Summary statistics

	#	Total	Mean	50th p.	75th p.	95th p.
(1) Death of member of the household	250	106.71	0.43	0.00	0.14	3.00
(2) Exit of spouse of head	18	15.88	0.88	0.03	2.00	2.82
(3) Out-marriage	365	203.96	0.56	0.01	0.66	2.00
(4) Exit/division due to other reasons	3,940	3,648.24	0.67	0.06	0.70	3.16

Notes: All figures are in acres, except for #, the total number of events. (4) includes change in household size, change in income/expenditure, disputes, registration of tenants and threat of land reforms.

Table 2: Constructing Agricultural Land Time Series

Alternative:	(1)	(2)	(3)
% of households matching self-reported and reconstructed landholdings in 1967			
Margin of 0.2 acres	87.84	82.43	88.93
Margin of 0.5 acres	90.76	86.01	91.72
Abs. difference between self-reported and reconstructed landholdings in 1967 (acres)			
Mean	0.35	0.53	0.32
75th percentile	0.00	0.00	0.00
90th percentile	0.40	1.02	0.33
95th percentile	1.67	3.33	1.34

Notes: In alternative 1 all land reported in exits of individual members is not agricultural. In alternative 2 all land reported in exits of individual members is agricultural. In alternative 3 we fill the gap between agricultural land reported in 2004 and 1967 with land reported in exits, whenever possible.

Table 3: Comparing samples

	Full Sample (1)	Land history Correct (2)	Household size history correct (3)	Both land and household histories correct (4)	Diff. between columns (1) and (2) (5)	Diff. between columns (1) and (3) (6)	Diff. between columns (1) and (4) (7)
Household size	5.159	5.083	5.228	5.098	0.115	-0.051	0.065
	(2.496)	(2.380)	(2.600)	(2.389)	(0.071)	(0.076)	(0.074)
Fraction of immigrant households	0.303	0.296	0.314	0.332	-0.012	-0.035	-0.046
	(0.460)	(0.457)	(0.464)	(0.471)	(0.012)	(0.013)**	(0.013)***
Total agricultural land	1.100	1.006	1.181	0.950	0.175	0.019	0.208
	(2.265)	(2.167)	(2.361)	(2.081)	(0.062)**	(0.066)	(0.063)***
Irrigated agricultural land	0.732	0.658	0.792	0.618	0.136	0.019	0.161
	(1.785)	(1.685)	(1.875)	(1.582)	(0.050)**	(0.053)	(0.051)**
Unirrigated agricultural land	0.368	0.346	0.388	0.333	0.039	0.001	0.047
	(1.287)	(1.261)	(1.315)	(1.219)	(0.033)	(0.034)	(0.034)
% Landless	53.42	55.06	52.33	56.60			
% Marginal (between 0 and 1.25 acres)	25.11	25.23	24.85	24.46			
% Small (between 1.25 and 2.5 acres)	5.13	4.82	5.32	4.90			
% Medium (between 2.5 and 5 acres)	9.51	8.94	9.74	8.29			
% Large (between 5 and 10 acres)	5.58	4.82	6.34	4.74			
% Big (more than 10 acres)	1.26	1.12	1.42	1.01			
N	2402	2099	1911	1697			

Notes: Columns (1)-(4) report means with standard errors in parentheses. Means are computed using only survey answers for the year 2004. Column (2) includes those households for which the constructed land holding matched the reported in 2004, up to a 0.2 acres margin of error. Column (3) includes those households for which the constructed family size matched the reported in 2004, up to a 1 member margin of error. Column (4) include those households for which both the constructed land holding and family size matched the reported in 2004. Columns (5), (6) and (7) report tests for differences of means across column (1) and columns (2), (3), and (4), respectively. Robust standard errors are in parentheses. Tests are based on regressions with village fixed effects.

Table 4: Changes in cultivable land and number of households, indirect survey

	Obs.	Mean	Std. Dev.	Min	Max
	Initial report prior to 1980				
Cultivable land in initial year	63	358.5	303.6	18.0	1265.5
Cultivable land in 1998	63	360.2	283.3	26.2	1304.0
Change in cultivable land	63	1.7	148.2	-843.8	244.4
No. households in initial year	63	231.0	219.5	24.0	1083.0
No. households in 1998	63	419.5	380.3	47.0	1692.0
Change in No. households	63	188.5	192.6	-6.0	841.0
	Initial report after 1980				
Cultivable land in initial year	26	230.6	170.1	4.6	642.7
Cultivable land in 1998	26	217.6	149.2	9.6	495.3
Change in cultivable land	26	-13.0	66.5	-225.3	109.9
No. households in initial year	26	236.7	156.0	18.0	759.0
No. households in 1998	26	346.7	186.9	60.0	770.0
Change in No. households	26	110.0	83.0	10.0	332.0

Notes: Cultivable land is measured in acres. 46 villages report cultivable land in 1977, 14 in 1978, 3 in 1979, 1 in 1980, 1 in 1981, 23 in 1983, and 1 in 1984.

Table 5: Determinants of decrease in land holdings: cumulative changes at the household level, only natives (1967-2004)

Sample:	full	restricted
Land change	-1.370	-0.926
Lost due to land division	-1.108	-0.785
Lost through sales	-0.557	-0.475
Gained through purchases	0.467	0.373
Lost due to reform	-0.097	-0.018
Gained due to reform	0.034	0.028
Lost as a gift	-0.116	-0.097
Gained as a gift	0.030	0.032
Lost for other reasons	-0.060	-0.024
Gained for other reasons	0.011	0.012

Notes: All numbers indicate average acres gained or lost per household. The category *Lost for other reasons* includes forced transfer, mortgaged, and lost due to natural disasters.

Table 6: Proportion of households in each land category (restricted sample)

	Initial	Final (2002-2004)	
Land Class	(1967-1971)	natives and immigrants	only natives
Landless	38.47	56.23	46.05
Marginal	22.36	24.45	29.34
Small	11.76	4.96	6.16
Medium	13.56	8.38	10.63
Large	9.91	4.96	6.55
Big	3.94	1.02	1.27

Notes: Numbers indicate the proportion of households in each category. Numbers are percentages.

Table 7: Proportion of households dividing (restricted sample)

Land Class	1967 - 2004	1967 - 1971	1972 - 1976	1977 - 1981	1982 - 1986
Landless	2.43	1.23	2.32	2.56	3.51
Marginal	2.39	1.23	2.05	2.44	3.22
Small	2.68	1.34	1.30	3.19	4.39
Medium	1.80	1.43	1.47	2.10	2.55
Large	1.92	1.10	1.13	3.96	2.56
Big	0.79	0.50	1.09	0.00	1.81
Land Class	1987-1991	1992-1996	1997 - 2001	2002 - 2004	
Landless	2.25	2.70	2.53	1.79	
Marginal	2.56	2.04	2.87	2.08	
Small	2.96	4.47	2.55	1.15	
Medium	1.33	1.47	2.21	1.64	
Large	1.71	1.89	2.29	1.97	
Big	0.00	1.83	0.49	0.00	

Notes: All numbers indicate the proportion of households that divided in a given period of time. Division means one or more members left the household. Numbers are percentages.

Table 8: Proportion of land lost due to division, conditional on dividing (restricted sample)

Land Class	1967 - 2004	1967 - 1971	1972 - 1976	1977 - 1981	1982 - 1986
Landless	0.00	0.00	0.00	0.00	0.00
Marginal	14.88	6.67	2.39	7.69	10.95
Small	19.10	5.56	8.90	0.00	12.64
Medium	11.87	4.55	11.11	12.18	10.14
Large	12.68	1.67	3.17	4.59	17.11
Big	7.01	0.00	0.00	0.00	28.04
Land Class	1987-1991	1992-1996	1997 - 2001	2002 - 2004	
Landless	0.00	0.00	0.00	0.00	
Marginal	20.56	19.06	19.66	11.54	
Small	31.53	33.02	17.91	33.33	
Medium	9.04	24.17	12.06	13.55	
Large	6.07	15.31	17.10	30.47	
Big	0.00	0.00	0.00	0.00	

Notes: Numbers indicate the proportion of land that households lost due to division (one or more members left the household). Numbers are percentages. Landless households have some land gave away because at the same time they gained land through purchase or other source.

Table 9: Proportion of land lost due to division, unconditional (restricted sample)

Land Class	1967 - 2004	1967 - 1971	1972 - 1976	1977 - 1981	1982 - 1986
Landless	0.31	0.00	0.00	0.00	0.00
Marginal	0.98	0.33	0.20	0.64	0.78
Small	1.45	0.07	0.66	0.41	1.31
Medium	1.14	0.32	0.87	1.26	1.79
Large	1.08	0.37	0.87	0.58	0.99
Big	1.20	1.68	0.35	0.64	2.29
Land Class	1987-1991	1992-1996	1997 - 2001	2002 - 2004	
Landless	0.00	1.67	0.00	0.00	
Marginal	1.33	1.60	1.26	0.72	
Small	2.23	3.46	1.72	1.80	
Medium	1.26	1.98	0.85	0.95	
Large	0.81	2.10	1.33	1.43	
Big	0.36	2.25	0.91	1.04	

Notes: Numbers indicate the proportion of land that households lost due to division (one or more members left the household). Numbers are percentages. Landless households have some land gave away because at the same time they gained land through purchase or other source.

Table 10: Determinants of household division, using past reform, average of last three years (logit model)

Dep. Variable:	Probability of fragmentation							
Sample:	full				restricted			
	(1)	(2)	(3)	(4)				
Lagged HH size	0.4480***	0.4395***	0.4395***	0.4411***	0.5207***	0.5192***	0.5190***	0.5163***
	(0.0320)	(0.0322)	(0.0322)	(0.0328)	(0.0401)	(0.0401)	(0.0401)	(0.0402)
Lagged land	0.0672	0.1494***	0.1492***	0.1364**	0.0673	0.0856	0.0856	0.2965***
	(0.0465)	(0.0566)	(0.0568)	(0.0629)	(0.0530)	(0.0597)	(0.0601)	(0.1130)
bargaland	-0.2675***	-0.2963***	-0.3436***	-0.3435***	-1.0433**	-1.0476**	-1.7296***	-1.7696***
	(0.0529)	(0.0432)	(0.0648)	(0.0649)	(0.4830)	(0.4843)	(0.6136)	(0.6191)
Lagged land*bargaland	0.0736***	0.0838***	0.0950***	0.0953***	0.2585**	0.2592**	0.4022***	0.4105***
	(0.0269)	(0.0166)	(0.0104)	(0.0103)	(0.1042)	(0.1041)	(0.1214)	(0.1228)
ceiling	1.2192**	3.1278***	3.1259***	3.9420***	0.5377	2.2813	2.2061	0.6018
	(0.4970)	(0.8871)	(0.8870)	(1.4881)	(0.6889)	(2.1218)	(2.0451)	(4.1552)
Lagged land*ceiling		-0.1699**	-0.1695**	-0.2317**		-0.1392	-0.1362	0.0666
		(0.0699)	(0.0701)	(0.1159)		(0.1438)	(0.1413)	(0.3418)
ceiling*bargaland		-7.9839	-8.7536	-8.6582		1.5733	0.2600	1.6672
		(7.9702)	(8.6910)	(8.7303)		(8.5430)	(8.4434)	(9.5109)
pattaland			0.8391***	0.8336***			1.4456***	1.4378***
			(0.1326)	(0.1340)			(0.3059)	(0.3120)
Lagged land*pattaland			0.0191	0.0223			0.0882	0.1687
			(0.0787)	(0.0792)			(0.2391)	(0.2757)
Lagged land^2				0.0007				-0.0303**
				(0.0057)				(0.0143)
Lagged land^3				0.0000				0.0006**
				(0.0001)				(0.0003)
Observations	36,870	36,870	36,870	36,870	25,442	25,442	25,442	25,442
Pseudo R^2	0.0908	0.0922	0.0925	0.0926	0.0973	0.0975	0.0982	0.0990

Notes: Robust standard errors in parentheses, adjusted for clustering on villages. All regressions include year dummies and household fixed effects. In (1) and (3), pattaland and bargaland are computed as the sum over the previous three years of the share of land affected by each program over the total cultivable land in each village. In (2) and (4), pattahh and bargahh are computed as the sum over the previous three years of the share of households affected by each program over the total number of households per village.(*** p<0.01, ** p<0.05, * p<0.1)

Table 11: Determinants of land lost by households when dividing (using lagged reform)

Dep. Variable:	Land given away (acres)			
Sample:	full		restricted	
	(1)	(2)	(3)	(4)
Lagged HH Size	0.09800**	0.10343**	0.05602	0.06857
	(0.047)	(0.047)	(0.041)	(0.043)
pattaland	0.43236	0.39263	0.23658	0.15519
	(0.774)	(0.750)	(0.232)	(0.215)
bargaland	-0.04736	-0.02489	-0.28258	-0.07794
	(0.113)	(0.094)	(0.266)	(0.228)
Ceiling dummy	1.84560**	-0.28339	3.13873**	-2.02747
	(0.890)	(2.826)	(1.449)	(7.760)
Lagged land	0.66015***	0.65727***	0.70973***	0.77254***
	(0.230)	(0.198)	(0.236)	(0.216)
Lagged land^2	-0.01488	-0.01488	-0.01170	-0.02482
	(0.033)	(0.029)	(0.030)	(0.025)
Lagged land^3	-0.00018	-0.00023	-0.00137**	-0.00124***
	(0.001)	(0.001)	(0.001)	(0.000)
ceiling*Lagged land		0.10650		0.36329
		(0.191)		(0.732)
ceiling*bargaland		59.65513		96.29121**
		(48.184)		(39.150)
Lagged land*bargaland	-0.04032	-0.05031**	0.00912	-0.03888
	(0.031)	(0.022)	(0.059)	(0.048)
Constant	-1.71003***	-1.33874***	-0.47460	-0.53505
	(0.375)	(0.414)	(0.298)	(0.323)
Adjusted R^2	0.184	0.191	0.426	0.442
Observations	2,640	2,640	1,808	1,808
No. households	1,395	1,395	968	968

Notes: Robust standard errors in parentheses, adjusted for clustering on villages. Regressions include household fixed effects and year dummies. pattaland and bargaland are computed as the sum over the previous three years of the share of land affected by each program over the total cultivable land in each village. (*** p<0.01, ** p<0.05, * p<0.1)

Table 12: Determinants of net sales (sales – purchases), using lagged land reform (average for past 3 years)

Dep. Variable:	Net agricultural land sold (acres)			
Sample:	full		restricted	
	(1)	(2)	(3)	(4)
Lagged HH Size	-0.0034***	-0.0033***	-0.0034***	-0.0033***
	(0.0007)	(0.0007)	(0.0011)	(0.0011)
pattaland	-0.0242	-0.0240	-0.0329	-0.0331
	(0.0448)	(0.0447)	(0.0305)	(0.0307)
bargaland	-0.0041	-0.0042	-0.0054	-0.0052
	(0.0054)	(0.0053)	(0.0054)	(0.0054)
ceiling	-0.0325	0.0104	0.0890*	0.1651
	(0.0531)	(0.0988)	(0.0466)	(0.1888)
Lagged Land	0.0432***	0.0422***	0.0524***	0.0515***
	(0.0092)	(0.0097)	(0.0115)	(0.0110)
Lagged land^2	-0.0010	-0.0009	-0.0018	-0.0017*
	(0.0007)	(0.0008)	(0.0011)	(0.0010)
Lagged land^3	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Lagged land*bargaland	-0.0011	-0.0010	-0.0005	-0.0007
	(0.0020)	(0.0018)	(0.0019)	(0.0019)
ceiling* Lagged land		-0.0037		-0.0067
		(0.0072)		(0.0139)
ceiling*bargaland		-0.0570		0.3455
		(0.4668)		(0.9424)
Constant	-0.0712***	-0.0714***	-0.0584***	-0.0586***
	(0.0121)	(0.0120)	(0.0109)	(0.0108)
Adjusted R^2	0.0143	0.0143	0.0241	0.0241
Observations	54,175	54,175	38,190	38,190
No. households	2,268	2,268	1,649	1,649

Notes: Robust standard errors in parentheses, adjusted for clustering on villages. Regressions include household fixed effects and year dummies. pattaland and bargaland are computed as the sum over the previous three years of the share of land affected by each program over the total cultivable land in each village. (*** p<0.01, ** p<0.05, * p<0.1)

Table 13: Determinants of net land gifts, using lagged land reform (average for past 3 years)

Dep. Variable:	Net agricultural land lost as gift (acres)			
Sample:	full		restricted	
	(1)	(2)	(3)	(4)
Lagged HH Size	-0.0016	-0.0018	-0.0007*	-0.0008**
	(0.0015)	(0.0016)	(0.0004)	(0.0004)
pattaland	0.0009	0.0005	0.0005	0.0011
	(0.0062)	(0.0068)	(0.0116)	(0.0111)
bargaland	0.0005	0.0002	0.0001	-0.0003
	(0.0009)	(0.0005)	(0.0004)	(0.0003)
ceiling	0.0127	-0.1500	0.0050	-0.1926
	(0.0194)	(0.1444)	(0.0262)	(0.3053)
Lagged land	0.0085	0.0123	-0.0021	0.0002
	(0.0063)	(0.0093)	(0.0080)	(0.0051)
Lagged land^2	0.0001	-0.0003	0.0012	0.0010
	(0.0002)	(0.0005)	(0.0013)	(0.0009)
Lagged land^3	-0.0000*	0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Lagged land*bargaland	-0.0008	-0.0005	-0.0005	-0.0001
	(0.0008)	(0.0004)	(0.0004)	(0.0002)
ceiling* Lagged land		0.0141		0.0172
		(0.0129)		(0.0247)
ceiling*bargaland		-0.2561		-0.6885*
		(0.3533)		(0.3811)
Constant	-0.0128**	-0.0119**	-0.0046**	-0.0042*
	(0.0058)	(0.0051)	(0.0023)	(0.0024)
Adjusted R^2	0.0075	0.0082	0.0048	0.0056
Observations	54,175	54,175	38,190	38,190
No. households	2,268	2,268	1,649	1,649

Notes: Robust standard errors in parentheses, adjusted for clustering on villages. Regressions include household fixed effects and year dummies. pattaland and bargaland are computed as the sum over the previous three years of the share of land affected by each program over the total cultivable land in each village. (*** p<0.01, ** p<0.05, * p<0.1)

Table 14: Determinants of immigration, village panel (restricted sample)

Dependent variable: Share of immigrants				
	(1)	(2)	(3)	(4)
	Fixed Effects	Arellano Bond	Fixed Effects	Arellano Bond
Lagged share of immigrants		0.4277***		0.4277***
		(0.1196)		(0.1196)
Lagged land per capita	-0.0980*	0.0162	-0.0981*	0.0162
	(0.0528)	(0.0269)	(0.0528)	(0.0269)
Lagged bargaland	-0.0024*	-0.0001		
	(0.0013)	(0.0006)		
Lagged pattaland	0.0297*	0.0063		
	(0.0152)	(0.0103)		
Lagged bargahh			-0.0096	0.0015
			(0.0268)	(0.0052)
Lagged pattahh			0.0111	0.0009
			(0.0150)	(0.0087)
Constant	0.0822***	0.1358***	0.0936***	0.1358***
	(0.0273)	(0.0325)	(0.0263)	(0.0325)
Adjusted R^2	0.4499		0.4497	
p-value from test for f.o. autocorr.		0.0000		0.0000
p-value from test for s.o. autocorr.		0.5990		0.6016
Observations	2,666	2,577	2,666	2,577
No. villages	89	89	89	89

Notes: Robust standard errors in parentheses, adjusted for clustering on villages. Regressions include village and year fixed effects. In (1) and (2), pattaland and bargaland are computed as the share of land affected by each program over the total cultivable land in each village. In (3) and (4), pattahh and bargahh are computed as the share of households affected by each program over the total number of households per village. (*** p<0.01, ** p<0.05, * p<0.1)

Table 15: The effect of land reform on inequality: cross section village regressions

sample	full				restricted			
Dependent variable:	Gini in 1998		CV in 1998		Gini in 1998		CV in 1998	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
gini coefficient in 1968	0.6520***	0.5754***			0.6577***	0.6110***		
	(0.1259)	(0.1200)			(0.1247)	(0.1320)		
coefficient of variation in 1968			0.7559***	0.6883***			0.8974***	0.8583***
			(0.1352)	(0.1237)			(0.1367)	(0.1401)
cummulative bargaland	0.0024		0.0283		-0.0176		0.0388	
	(0.0042)		(0.0187)		(0.0149)		(0.0521)	
cummulative pattaland	-0.0630**		-0.3835**		-0.1025		-1.0571**	
	(0.0302)		(0.1468)		(0.1231)		(0.4879)	
cumulative bargahh		-0.0719		-0.0957		-0.2709***		-0.4218*
		(0.0744)		(0.2811)		(0.0782)		(0.2437)
cumulative pattahh		-0.1115***		-0.5955***		-0.0406		-0.4140*
		(0.0298)		(0.1488)		(0.0565)		(0.2200)
Constant	0.2660***	0.3360***	0.5590***	0.7550***	0.2965***	0.3401***	0.5388***	0.6315***
	(0.0708)	(0.0677)	(0.1629)	(0.1618)	(0.0797)	(0.0907)	(0.1655)	(0.1795)
Adjusted R^2	0.3438	0.3882	0.4176	0.4704	0.5633	0.5928	0.4417	0.4366
Observations	89	89	88	88	88	88	83	83

Notes: Robust standard errors in parentheses. In (1), (3), (5) and (7) cumulative pattaland and bargaland are computed as the share of total land affected by each program over the total cultivable land in each village. In (2), (4), (6) and (8) cumulative pattahh and bargahh are computed as the share of total households affected by each program over the total number of households per village. (*** p<0.01, ** p<0.05, * p<0.1)

Table 16: The effect of land reform on the proportion of landless households: cross section village regressions

Dependent variable: Share of landless in 1998		
	(1)	(2)
share of landless in 1968	0.84763***	0.72910***
	(0.102)	(0.097)
cummulative bargaland	-0.01648	
	(0.010)	
cummulative pattaland	0.01903	
	(0.095)	
cummulative bargahh		-0.18894
		(0.132)
cummulative pattahh		-0.21832***
		(0.059)
Constant	0.11741***	0.21012***
	(0.033)	(0.036)
Adjusted R^2	0.533	0.628
Observations	89	89

Notes: Robust standard errors in parentheses. In (1) cumulative pattaland and bargaland are computed as the share of total land affected by each program over the total cultivable land in each village. In (2) cumulative pattahh and bargahh are computed as the share of total households affected by each program over the total number of households per village. (*** p<0.01, ** p<0.05, * p<0.1)