

Land Reforms, Poverty Reduction, and Economic Growth:

Evidence from India

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Abstract

Recognition of the importance of institutions that provide security of property rights and relatively equal access to economic resources to a broad cross-section of society has renewed interest in the potential of asset redistribution, including land reforms. Empirical analysis of the impact of such policies is, however, scant and often contradictory. This paper uses panel household data from India, together with state-level variation in

the implementation of land reform, to address some of the deficiencies of earlier studies. The results suggest that land reform had a significant and positive impact on income growth and accumulation of human and physical capital. The paper draws policy implications, especially from the fact that the observed impact of land reform seems to have declined over time.

This paper—a product of the Sustainable Rural and Urban Development Team, Development Research Group—is part of a larger effort in the group to assess the impact of land policies. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at kdeining@worldbank.org, jins@anr.msu.edu, and hknagarajan@ncaer.org.

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Land Reforms, Poverty Reduction, and Economic Growth: Evidence from India

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1. Introduction

Evidence from cross-sectional regressions pointing towards a negative relationship between initial levels of inequality and subsequent growth in developing countries (Barro 2000, Vollrath 2007) is increasingly substantiated at the micro-level. Empirical studies have demonstrated the far-reaching and long-lasting implications of initial differences in land holding patterns on productivity, growth, and social articulation (Nugent and Robinson 2002, Banerjee and Iyer 2005) and a number of channels through which high levels of asset inequality may reduce growth have been identified in the literature. These include credit market imperfections in the presence of indivisible investments, e.g. in education (Galor and Zeira 1993, Aghion and Bolton 1997); wealth-induced limitations on households' ability to articulate their concerns in the political arena (Bourguignon and Verdier 2000); high inequality reducing local communities' willingness and ability to provide public goods that benefit all inhabitants (Cardenas 2003); and a link between inequality and destructive tensions and social strife that can directly and indirectly undermine the basis for economic growth (Conning and Robinson 2007). As a result, policy makers are increasingly aware that the way in which productive assets and the associated economic opportunities are distributed will have far-reaching implications for long-term development (Bardhan *et al.* 2000, World Bank 2005).

If high levels of inequality reduce growth, countries that have inherited a very unequal asset distribution may be able to realize considerable gains from redistribution of assets. This argument, together with evidence of a negative relationship between farm size and productivity, and considerations of social justice has historically formed the justification for a wide range of redistributive land reforms that aimed to create the basis for a more inclusive and sustainable pattern of development (de Janvry 1981, Binswanger *et al.* 1995). However, despite the importance of the issue, there is little systematic evidence to evaluate past experience and thereby provide specific guidance for policy (Deininger 2003).

In India, the social stratification imposed by a century-old caste system already significantly limits social mobility and landlessness has long been a key determinant of poverty and low social status. While a system of positive discrimination was put in place to provide equal opportunity for low caste households, large-scale programs to redistribute land to poor and landless rural wage laborers were initiated to deal with the latter. The fact that responsibility for implementing these programs was not with the center but with individual states creates a source of exogenous variation that can be used to assess their impact in a number of dimensions (Besley and Burgess 2000). As such reforms have been controversial politically and often difficult to implement, empirical evidence on their impact is of great interest to policy makers.

In this paper, we use a large household panel data set to make inferences on the impact of such reforms on income, expenditure, and accumulation of physical as well as human capital based on variation in land reform implementation and legislation at the state level. We go beyond the literature in a number of ways,

namely by (i) assessing the long-term impact of reform on growth in monetary income and assets as well as the stock of human capital across generations; (ii) considering ceiling and tenancy reforms -the two main modalities of reform implementation- separately from each other; and (iii) exploring the extent to which reform impacts may change over time.

There are three main results. First, we find a robust positive impact of land reform on income, consumption and asset accumulation. Second, we find differences between tenancy and ceiling reforms both with respect to the magnitude of the estimated effects as well as their distribution among different groups. Finally, we find evidence of a decrease in the impact of reform initiatives over time, something that could be interpreted as implying that, in a dynamic environment and with exogenous constraints on the ability to implement reforms, even policies that have been successful and effective in the past will have to be periodically re-examined, and ways to ensure continued effectiveness explored in detail.

The paper is organized as follows. Section two provides context by putting the land reform debate into the broader framework of the debate on equality of opportunity and productivity of land use, describing the nature and extent of implementation of land reforms in India, and introducing our hypotheses and estimation strategy. Section three discusses data sources and descriptive evidence regarding household characteristics and differences in our outcome variables between states with high and low levels of reform effort. Econometric estimates of the impact of different types of land reform (tenancy and redistribution of ceiling surplus land) on growth and investment in physical and human capital are presented in section four. Section five concludes by drawing out implications for policy and future research.

2. Background and relation to the literature

This section reviews the rationale and level of land reform implementation -globally and in India- highlighting main types of land reform and the quantitative accomplishments under each of them. We use this as a basis to formulate hypotheses on the impact of different types of land reform and their evolution over time and to outline our strategy that will allow us to assess these empirically using the data at hand.

2.1 Land reform in a global context

A large body of empirical literature on agricultural production has shown that, due to the transaction costs involved in supervising hired labor (Carter 1984, Feder 1985, Eswaran and Kotwal 1985, Benjamin 1995), a farm structure based on owner-operated units is more efficient than one based on wage labor (Berry and Cline 1979, Binswanger *et al.* 1995). Although market mechanisms can, in principle, help to equalize the operational land distribution and thus maximize aggregate production, challenges remain. First, transaction costs and borrowing constraints may reduce the number of market transactions well below the optimum. Second, to the extent that transactions in rental and sales markets require transfers of

resources among the parties involved even productivity-enhancing transactions may have undesirable distributional implications. At low levels of development, and especially with high inequality in the land ownership distribution, landlords may be able to reduce the benefits to tenants by exerting market power. At higher levels of development, speculative elements may cause a discrepancy between the market value of land and its underlying ‘fundamental’ value based on profits from agricultural production, thereby preventing movement of land to the most productive producers. Third, with imperfections in other markets, e.g. those for labor or credit, market transactions may not achieve first best outcomes in terms of production. As a result, government interventions that aim to provide the most productive producers with land access can have significant social and economic benefits (Chau 1998, Carter and Zimmerman 2000).

In addition to its potential to increase productivity, land reform can, through its possible effect on credit markets, also affect productive investment. It can have additional impacts by overcoming some of the negative consequences of a highly unequal distribution of asset ownership and economic opportunities. One frequently cited issue is that, with credit market imperfections, the poor may not be able to attain the level of indivisible investment in human or physical capital that would correspond to their innate ability (Galor and Zeira 1993, Gersbach and Siemers 2005). In such situations, exogenous increases of asset endowments can bring the level of investment closer to the social optimum and also be beneficial to the individuals concerned. A second possible reason is that limited access to economic resources is likely to translate into limited political influence, possibly giving rise to a vicious and self-perpetuating circle of high inequality, bad institutions, and low economic growth (Acemoglu *et al.* 2004). Also, a tendency towards segregation may affect communities’ ability to supply local public goods and, to the extent that these are essential inputs into private production, trap the poor in an undesirable equilibrium (Durlauf 1996, Cardenas 2003). This can be pronounced in cases where what is produced are public “bads” such as violence, social unrest, and strife, which are associated with significant economic as well as social costs.¹

The potential productivity and social benefits from a more egalitarian distribution of land, often combined with arguments in favor of historical justice, have provided a justification for redistributive policies in many countries. The goal was to establish a foundation for an inclusive and broad-based pattern of economic development in some of the world’s most unequal societies. The review of land reform episodes in table 1 illustrates that the magnitude of such efforts, in terms of the number of beneficiaries and the size of area redistributed, was enormous.² Well-known land reforms in Japan, Korea, and Taiwan

¹ For a theoretical underpinning for the relationship between distribution and provision of public goods, including social cohesion, see (Bardhan and Ghatak 1999). It has also been shown that, especially in rural environments where other markets are imperfect, such interventions can help improve their nutritional status, risk-bearing capacity, and investment incentives, in addition to enhancing their ability to access credit markets (Burgess 2001).

² The purpose of this table is illustrative, to provide an indication of the orders of magnitude involved. Figures on area redistributed and number of beneficiary households are taken from the cited sources and percentages have been calculated by taking the total area of arable land (from FAO statistics) and the rural population divided by 5 (to obtain an estimate of the number of rural households).

at the end of World War II redistributed between 30% and 40% of the cultivated area, affecting about two thirds of rural households. Although they were drawn out over longer time periods, reforms in Bolivia, Nicaragua, Peru, and Mexico, affected sizeable portions of their countries' arable land endowment and benefited up to a third of the rural population.

Compared to the magnitude of these efforts, evidence on their effect is scant and often focused on outputs rather than impact based on a rigorous counterfactual. In Japan, Korea, and Taiwan, land reforms helped improve productivity and set the stage for an impressive increase in non-agricultural development (Jeon and Kim 2000). In the Philippines, early land reforms that benefited more than 0.5 million households and green revolution technology, improved household welfare (Otsuka 1991, Balisacan and Fuwa 2004) and increased investment and human capital accumulation (Deininger and Olinto 2001). Although quite effective, land reforms undertaken immediately after independence in some African countries, e.g. Kenya and Zimbabwe (Scott 1976, Gunning and et al 2000, Deininger *et al.* 2004) were often abandoned for political reasons (Kinsey and Binswanger 1993). In Latin America, reforms distributed comparatively large amounts of land (Barraclough 1970, Eckstein and Horton 1978, Jarvis 1989) but often failed to improve productivity and were insufficient to help overcome deep-rooted structural inequalities (de Janvry and Sadoulet 1989). Following a relative decline of interest in the topic during the late 1970s, it received renewed attention recently,³ partly due to the fact that, even if accompanied by high levels of growth, macro-economic reforms in countries characterized by high land inequality often failed to narrow the gap between the rich and the poor. More importantly, the task which the original reforms set out to accomplish remains in many respects unfinished (Lipton 1993). Together with a strong political appeal of land redistribution, this has recently prompted countries as diverse as Brazil, Bolivia, South Africa, the Philippines, Venezuela, and Zimbabwe to renew their land reform efforts.

2.2 Land reform implementation in India

In India, land reform, implementation of which is the responsibility of individual states, has occupied a central stage in the policy debate for long time, given inequality in the distribution of productive assets, especially land, which the country inherited from its colonial masters. Reforms had three main elements (Mearns 1999), namely (i) abolition of intermediaries (*zamindars*) shortly after independence; (ii) tenancy laws to increase tenure security by sitting tenants by registering them and often imposing restrictions on the amount of rent they had to pay or the scope for new rental transactions;⁴ (iii) ceiling laws that provided a basis for expropriating land held by any given owner in excess of a state-specific ceiling and

³ For recent contributions on land reform see (Boyce *et al.* 1998, Bandiera 2003, Bobrow-Strain 2004, Borras, Jr. 2005, Bradstock 2005, Eastwood *et al.* 2006).

⁴ Many states combined legislation to improve the situation of tenants with either a complete prohibition of land leasing or provisions to provide tenants who had been on the land for some time with very strong property rights, something that is likely to have limited new supply of land to the rental market (Deininger *et al.* 2007).

subsequently transferring it to poor farmers or landless agricultural workers. While the first of these is considered to have been highly successful, progress on the remainder was initially very slow, accelerating only during the 1970s and slowing down again in the 1980s. Still, both types of intervention resulted in the transfer of rights to almost 10 mn hectares of land, an area more than three times what was involved in the well-known land reforms of Japan, Korea, and Taiwan together (King 1977). With the exception of few states, the political commitment to implement reforms was limited and sometimes outcomes were counter to what had been desired, as with large-scale tenant evictions to prevent them from gaining more permanent land rights in anticipation of tenancy laws (Appu 1997).

Table 2 provides summary statistics for the level of land reform implementation, measured as the share of rural population who received land through tenancy reform, the area transferred as a result of ceiling legislation, or the number of ceiling laws, by state based on a summary report that draws together official data from various annual reports by the Ministry of Agriculture (Kaushik 2005). Over and above the large amounts of land affected by *zamindari* abolition and private initiatives such as donations of land under the Bhoodan movement,⁵ direct land distribution affected about 2.5 mn hectares under programs to redistribute of ceiling surplus land, and 7.35 mn hectares under tenancy reform, implying a direct transfer of 5.45% of the area to about 5.35% of the agricultural population for the country as a whole. Comparing this to what has been involved in other land reforms internationally illustrates the size of India's land reform.⁶ Ceiling and tenancy laws together resulted in the redistribution of about 10% of arable land, about the level of the Philippines, Brazil, or Zimbabwe before 2000, but below Asian countries such as Japan, Korea, and Taiwan (33.3%, 27.3%, and 26.9%) or even El Salvador, Bolivia, and Mexico (27.9%, 32.3%, and 13.5%). In terms of the share of rural households benefiting, India's accomplishment is at the lower end of the scale; while it exceeds what has been accomplished in the pre-1994 period in Kenya, Zimbabwe, and Brazil (1.6%, 3.1%, and 5.4% of the rural population, respectively), it remains considerably below other Asian countries such as the Philippines (24%), Japan (60.9%), and Taiwan (62.5%) or Latin American ones such as Mexico (67.5%), Bolivia (47.5%), and El Salvador (16.8%).

Comparing the share of beneficiary households to that of the area transferred points towards considerable variation across states. In some cases, e.g. Kerala or West Bengal, 12.5% and 10.8% of the population benefited from transfer of 8.5% and 6.4% of the land area, respectively, plot sizes for land transferred remained considerable below the state average. While some states (e.g. Gujarat or Tamil Nadu) provided beneficiaries with plots of about average size, in most of the states the fact that the share of beneficiaries

⁵ The amount of land donated voluntarily and distributed under the Bhoodan movement amounted to 0,7 mn ha by 2004, with focus on Bihar, Orissa, and Uttar Pradesh (Government of India 2006a). While some of these donations may have been motivated by a desire to avoid being affected by ceiling laws, we subsume all of these under the indirect effects of legal measures.

⁶ Note that the two measures considered here, i.e. tenancy reform and distribution of above-ceiling land, are in addition to any lands transferred through *zamindari* abolition.

remains significantly below the area share points towards transfer of above-average plot sizes, as in Maharashtra (27% of area distributed to 10.7% of population), Karnataka (15.4% and 5.3%), AP and MP (3.5% and 2.2% to 0.75% and 0.61% of population, respectively).

With 4.4% and 2.3%, the share of area redistributed overall or share of households benefiting from ceiling laws has been below the figures for tenancy reform. Although some states such as Rajasthan, UP, Bihar, and AP transferred more land (6.6%, 5.8%, 4.4%, and 8.3%) under ceiling legislation than through tenancy reform, results seem to have been biased towards transfer of above-average sized plots of land, suggesting that even where it was possible to acquire above ceiling land by the state, overcoming political pressures in the distribution of such land may have been difficult. In West Bengal, on the other hand, a state that ranks at or near the top for both measures and that counts with a formidable level of grassroots-level organization, land reform land appears to have been transferred in a very pro-poor fashion.

For the country as a whole, an average of 2.1 land reform laws had been passed per state with the mean law being about 13 years old in 1999. Despite the fact that the highest number of laws was passed in West Bengal where reform-induced transfers were also highest, the correlation between number of laws and the share of area transferred through or of rural households benefiting from reform is, with 0.28, low throughout. This supports the notion that legal provisions alone did not automatically translate into action on the ground, consistent with arguments that there is no *a-priori* reason to expect a positive link between passage of laws -which could be a result of an objective need for land reform and political mobilization or even lack of actual progress- and their actual implementation. In fact, in a number of states, high levels of legal activity appear to have been used to deflect attention from lack of progress on the ground.

While not differentiated in the table, a detailed look at the time dimension of reform measures allows a number of conclusions (Kaushik 2005): After a spurt of land transfers in the 1970s and 1980s, progress has slowed down considerably; in fact between 1995/96 and 2003/04, i.e. for almost a decade, progress in awarding land rights to tenants had come to a complete standstill; the increment in ceiling surplus land transferred during the period amounted to only 10,800 hectares. The latter represents about one-tenth of the land declared ceiling surplus, with the remainder being tied up in litigation. This suggests that, unless there are significant changes in the overall parameters, progress in achieving further redistribution of ceiling land could be slow -it would take almost 90 years to dispose of remaining ceiling surplus cases if the current pace is maintained- but also that, by clogging up the court system and preventing it from quickly dispensing justice in other urgent matters, the ceiling legislation may impose external effects

beyond land rental markets (Moog 1997).⁷ While broader changes in the legal framework could make much additional land available, they do not seem to be too likely in the current political environment.

Despite considerable interest in the topic at the policy level and a large literature documenting the way land reforms were put in practice at the state level (Yugandhar 1996, Thangaraj 2004), attempts to quantitatively assess their economic impacts at a national scale are surprisingly scant. One study finds that the number of identifiable land reform laws across states is positively related to the extent of poverty reduction but not agricultural productivity (Besley and Burgess 2000). While this could be used to make the case for land reform as a redistributive measure, e.g. through a wage effect, use of a measure only weakly linked to implementation of reforms is a shortcoming. Studies using data on implementation have only been conducted in individual states, mainly West Bengal. District level data point towards a positive impact of land reform on productivity (Banerjee *et al.* 2002), a finding that receives support from household level evidence taking into account other political factors (Bardhan and Mookherjee 2006). However, as the policy environment in West Bengal is likely to be uniquely conducive to land reform, a national assessment of land reform impact based on actual implementation would be very desirable in view of the continued relevance of the topic in India's policy debate (Government of India 2006b).

2.3 Hypotheses on land reform impact

To provide the basis for our empirical investigation of the impact of tenancy reforms and redistribution of above-ceiling land as the key elements of land reform in India, we formulate hypotheses concerning the impact of such reform on productivity, equity, and investment in the short- and long term, respectively. The above discussion highlights the importance of recognizing that, over and above the direct distribution of land through public sector action, the existence of land reform legislation can have an important indirect effect by encouraging land owners to transfer their land to avoid being subjected to redistributive action and thus be more incentive compatible in the long run (Eastwood *et al.* 2008). In fact, the amount of direct government effort involved in the two main types of reform is quite different. Although tenancy reform will need some intervention, mainly to disseminate information and reduce the transaction cost of registering tenants in the field, implementing ceiling legislation requires higher levels of government effort. In addition to identification of 'above ceiling land', it involves appropriation of land by the state and, provided no litigation ensues, its subsequent redistribution. On the other hand, while indirect effects of tenancy reform, if any, are expected to be negative through a reduction of supply of land to the market (Deininger *et al.* 2007), indirect effects of ceiling legislation could be quite large. Indeed, in the case of

⁷ Two main reasons for court cases are contestation by landlords and instances where beneficiaries were allocated land but were either unable to establish effective possession or were subsequently evicted. A field survey to explore this issue in Andhra Pradesh pointed to at least 20% of beneficiaries who were not able to access the property they had received although the number of those who are able to file court cases calling for their (re)instatement is much more limited.

West Bengal where, market transactions transferred more land than was acquired and redistributed as above-ceiling land by government (Bardhan and Mookherjee 2006).

Hypothesis 1: Tenancy reform reduces tenants' probability of being evicted and often also increases the share of output received by them. Through these mechanisms, and disregarding possible supply response by landowners in repossessing or curtailing land rentals,⁸ it will have a positive impact on investment but a more ambiguous short-term effect on productivity (Banerjee *et al.* 2002). The productivity-impact of an increased output share will be unambiguously positive. By contrast, an exogenous decrease in the eviction probability can, if the threat of eviction had been used as an enforcement device, reduce productivity (Banerjee and Ghatak 2004). The net effect of tenancy reform on productivity in the short term will thus be ambiguous and depend among others on the shape of tenants' utility function and the nature of reform measures. As it also transfers wealth, tenancy reform that benefits producers who had earlier been prevented from making such investments due to credit constraints will increase the level of land-related investment, thus having a positive long term impact on productivity.

Hypothesis 2: Distribution of above-ceiling land entails two effects on farm output: a productivity- and an investment-effect. If there is a negative relationship between farm size and total factor productivity, any transfer of land from large wage-labor dependent units to owner-operated farms will increase productivity. Second, if it targets the poor whose level of investment had previously been constrained by credit market imperfections and if the asset transfer involved in ceiling law implementation is large enough to allow them to access credit markets and/or make indivisible investments, transfer of above-ceiling land will have an impact on investment in physical or human capital (Gersbach and Siemers 2005)

Hypothesis 3: There are three reasons to expect a decrease over time in the impact of land reform legislation. First, assuming that there is a fixed amount of land available for redistribution, administrators will have an incentive to tackle easy cases first, implying that over time the speed of implementation may slow and the unit cost of additional implementation will rise. Second, legislation mandating involuntary land transfers will have negative side-effects, the severity of which will increase over time. An effect that has been widely documented as an immediate consequence of tenancy reforms is tenant eviction and adoption of wage-labor based self-cultivation, fallowing, or a more capital intensive model of operation (Appu 1997). In other contexts, this has been shown to lead to lower levels of productivity while at the same time also reducing equity (Rezende 2005). Also, artificial subdivision of land holdings has been reported to lead to conflicts, sub-optimal patterns of land utilization, and limited investment (Haque 2001), despite its potential to reduce land concentration. Finally, and most importantly, to eliminate the risk of being affected by tenancy reforms, large land owners will stop renting out, thus reducing supply of

⁸ In some cases, e.g. West Bengal, tenancy protection was combined with effectively implemented anti-eviction legislation.

land available for cultivation by small producers and often decreasing productivity. Ceiling restrictions, especially if they apply to institutions as well as individuals, will affect the ability to use land as collateral more broadly and thus can reduce credit access for the entire agricultural sector and lead to underinvestment in rural areas more generally (Fabella 2003).⁹ Third, while the asset-transfer implied in land reform will lead to an immediate increase in beneficiaries' propensity to invest, this positive effect may be counterbalanced by the fact that the land transferred through land reform is often subject to restrictions on transferability through rental or sale. In particular, land that can not sold is of little use as collateral to overcome credit market imperfections (Guinnane and Miller 1997). Restrictions on rental market transfers of land reform will not only reduce incentives for land-related investment but may also lead to allocative inefficiency as former tenants -or their offspring- are no longer able or interested to make the most productive use of the land. The severity of all of these inefficiencies would be expected to increase over time and be most pronounced for tenancy reform where continuation of landlords' residual rights adds to tenure insecurity. Thus, even though available data do not allow us to disentangle cause and effect more specifically, we expect impacts of land reform legislation or implementation to decrease over time.

3. Data and estimation strategy

Use of a nation-wide survey provides us with household level information on income, consumption, and accumulation of human and physical capital assets that can be combined with administrative data on land reform implementation. While having a panel of households allows us to construct measures of changes in key variables such as income and assets, it requires use of weights and attention to attrition. This section describes the data and uses descriptive statistics to identify trends at state and regional levels.

3.1 Household characteristics

The household-level data used in our analysis are from two rounds of the ARIS/REDS¹⁰ survey conducted by India's National Council for Applied Economic Research (NCAER) in 1982 and 1999, respectively. This survey builds on a set of households who were first interviewed in 1968-71 to evaluate the impact of an agricultural development program covering more advantaged areas in all of India's major states. Even though the first round sample, which is stratified by farm size and wealth class, was limited to project areas, coverage of the survey was significantly expanded in 1982 to make it more representative at the national level and expanding the sample to slightly less than 5,000 households (Foster and Rosenzweig 1996). The 1999 sample contains all of the households included in 1982 and replacements for households who were no longer present. If the original household had split, all of the households

⁹ Legislators have often attempted to exempt land that is productively used. As few landlords would agree that their land is not used effectively, these have often undermined efforts for quick redistribution and given rise to protracted legal battles or made for highly discretionary ways of implementation.

¹⁰ ARIS is the acronym for 'Additional Rural Income Survey' whereas REDS stands for 'Rural Economic and Demographic Survey'.

belonging to the same dynasty in the original village plus a sub-sample of successor households outside the village were interviewed, bringing the total to about 7,500 households (Foster and Rosenzweig 2004).

As the original survey was stratified by income to over-sample high- and medium-income households, making figures representative of the total population will require use of sample weights for the respective period which are used in table 3. The listing for a 2006 follow-up round that has just been completed provides a basis to check this empirically. We can not reject the hypothesis that means for all key listing variables in 2006 are the same for the 1982 and the 1999 samples, i.e. that attrition between the two periods was random, we use 1982 weights throughout.¹¹ Moreover, as regressions are based on the subset of about 4,000 panel households (in 1982) with at least one entry in both survey rounds,¹² checking for non-random attrition will be critical to ensure validity of the analysis, especially as the number of households who dropped out is large. Tests suggest that, while there are few significant differences in most variables, attrition is higher among the landless than the rest of the population.¹³ To assess whether this implies that attrition bias is present in our sample and how this may affect results, we apply standard procedures to test -and correct if needed- for attrition bias in a way similar to truncation bias as will be discussed in more detail below.

Table 3 reports descriptive statistics for the sample overall and by the country's four main regions in both periods.¹⁴ We note that there has been a marked increase in educational attainment, as illustrated by the fact that the share of household heads with at least primary schooling completed increased from about 23% in 1982 to 49% in 1999 with the South consistently above the rest. At the same time, population growth in the sample led to a decline in the average land endowment, from 2.1 hectares in 1982 to 1.5 hectares in 1999, and an increase in landlessness, from 26% to 35%. The size of the average household remains the same, around 6.0, with about 3.7 in the 14 to 60 age category, 0.2 compared to 0.4 aged above 60, and 2.1 compared to 1.8 below the age of 14. The share of female headed households remains, with 6.8%, almost the same, though female headship is more pronounced in the South than elsewhere.

Survey data point towards an annual increase of per capita income of 3.02% for the sample during the period under concern. This masks pronounced differences across regions with the South where the larger proportion of heads attained primary or above education having caught up and even replaced the North as the region with the highest income in the second period. Use of the information from the listing allows us

¹¹ This is true for virtually all the variables included in the listing, in particular caste, household size, number of earners, the head's age and educational status, access to irrigated and non-irrigated land, and aggregate per capita income.

¹² In case of splits, we use the mean of the relevant variables over all successor households.

¹³ While means for most of the key characteristics (per capita income and expenditure, head's age, level of education, value and composition of assets, land endowments, and main economic activity) are not significantly different or very close between households who dropped out and those who remained in the sample, panel households are smaller (6.0 vs. 7.1) and less likely to be landless (33% vs. 19%).

¹⁴ We group states into four regions as follows: The North includes the states of Haryana, Himachal Pradesh, Punjab, and Uttar Pradesh; the West includes Gujarat, Maharashtra, Madhya Pradesh, and Rajasthan; the East includes Assam, Bihar, Orissa, and West Bengal; and the South includes Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu.

to compute the Gini coefficient for self-assessed income in a way that includes all households in the sampled villages. Doing so highlights that, with a Gini coefficient of 0.32 in the first and 0.31 in the second period, inequalities in income remain modest and have not appreciably increased between the two periods. The overall improvement in living standards as illustrated by increased income is mirrored by a significant rise in asset values of approximately 6% per year.¹⁵ With a Gini coefficient of 0.60 in 1982, inequality in assets is higher than income inequality as is found in other parts in the world. However, this coefficient has actually decreased to 0.56 in the second period. While overall asset endowments have increased, the broad composition of households' asset portfolio shows greater stability; the house and consumption durables make up the largest share in both periods (57.5% and 56.9%, respectively in 1982 and 1999), followed by financial and off-farm assets (26.7% and 23.2%), and farm assets including livestock (15.8% and 19.9%).

3.2 Estimation strategy

Our strategy to test the hypotheses outlined in section 2.3 follows the literature by using the fact that land reform policy is a prerogative of the states as a source of exogenous variation. However, instead of using the number of land reform laws as has been done in past literature, we use actual information on reform implementation. Furthermore, we (i) use individual- and household level data from a large national panel of households spanning almost 20 years to construct outcome variables; (ii) consider tenancy and ceiling reforms separately; and (iii) include interaction terms between land reform and time as well as initial asset endowments to assess possible variation in the effectiveness of land reforms over time and more specific equity effects of land reform, respectively. While the ideal measure of land reform implementation would have been at the level of the village or individual, lack of such data at this point forces us to rely on more aggregate information instead and include regional dummies throughout.

As a key proposition from the literature on poverty traps is that wealth gaps can, in the presence of credit market imperfections, reduce levels of human capital accumulation, we first examine the effect of land reform on educational attainment. To do so, we use the level of education attained by all individuals in the sample who completed their education after 1982, i.e. who were below the age of 8 in 1982, a year when the legal process was more or less complete, and above the age of 16 in 1999. The estimating equation is:

$$E_{ji} = \alpha + \pi_k R_{ks} + \gamma H_i + \rho Z_j + \zeta S_s + \eta (A_i \times R_{ks}) + \phi L_s + \delta D_s + \varepsilon_{ji} \quad (1)$$

where E_{ji} denotes years of education completed by member j in household i , Z_j is a vector of member characteristics including age and gender, H_i is a vector of household attributes including caste, parents' educational attainment, and initial endowment with land and non-land assets, R_{ks} measures the intensity of

¹⁵ While part of this increase may be due to improvements in the survey instrument that resulted in better measurement of assets in the second period, it is impossible to test this hypothesis as disaggregated data for 1982 were not available.

land reform effort for category k (tenancy reform or ceiling land distribution) in state s ,¹⁶ L_s is the share of land in state s that was under *zamindari* tenure at independence, S_s denotes state-level average spending on education per capita over the period under concern from Besley and Burgess (2000), \mathbf{D} is a vector of regional dummies, and ε_{ji} is an error term. While we expect the relevant elements of γ and ρ to be in line with standard predictions,¹⁷ the main parameters of interest in this equation are π_k , the coefficient on the intensity of land reform effort in category k and ζ , the coefficient on educational expenditures which we expect to be positive. To appreciate whether land reform provided disproportionate benefits to the poor, we interact the level of land reform implementation with the initial endowment of non-land assets (A_i).¹⁸

The equation to assess the impact of land reform on growth of household income, assets, and expenditure, over the 20-year period under concern is written as

$$\Delta O_i^Q = \lambda + \theta \mathbf{H}_i + \psi_k R_{ks} + \tau_k (A_i \times R_{ks}) + \sigma L_s + \omega \mathbf{D}_s + \zeta_i \quad (2)$$

where ΔO_i^Q denotes the growth of indicator O^Q with $Q \in \{Y, X, A\}$, referring to household i 's non-land assets (A), per capita income (Y), or expenditure (X) over the 20-year period, \mathbf{H}_i is a vector of time-invariant household characteristics such as caste and initial endowments, e.g. the size of the household or its land, R_{ks} , L_s , and \mathbf{D} are as defined above, denoting respectively the intensity of implementation of reform type k in state s , share of land in state s under zamindari tenure at independence, and regional dummies. λ , θ , ψ_k , τ_k , σ and ω are parameters or vectors of parameters to be estimated and ζ_i is an error term. If land reform helps overcome credit market imperfections that earlier reduced the scope for investment in general or for the poor in particular, we expect ψ_k and τ_k to be positive and negative respectively.

While the above provides estimates of the impact of reform on a range of outcomes, it does not allow us to test whether this impact might vary over time, something that will be of great policy relevance. However, letting T be the number of years passed since enactment of the median land reform law in a state, we can define a reduced form equation

$$\Delta O_i^Q = \lambda + \theta \mathbf{H}_i + \psi_k R_{ks} + v_k (R_{ks} \times T) + \sigma L_s + \omega \mathbf{D}_s + \zeta_i \quad (3)$$

allows the impact of land reform to vary over time. Although we lack the data to empirically disentangle the different elements that may underlie differential time effects, benefits will either accumulate over time ($v_k > 0$) or decrease ($v_k < 0$). From hypothesis 3, our prediction is that $v_k < 0$.

¹⁶ As indicated above, R_{ks} is the share of the rural population in a state who received land through tenancy reform or the share of area transferred due to ceiling legislation. Both are compiled using annual by the Ministry of Agriculture that regularly include these figures (Kaushik 2005).

¹⁷ Specifically, we expect that higher levels of initial income and assets as well as parents' education will be positively associated with subsequent educational outcomes, and that female members and those from lower caste will have lower levels of educational attainment.

¹⁸ Note that $\eta < 0$ would imply that the poor benefited disproportionately from land reform implementation at the state level while $\eta > 0$ would point towards a regressive distribution of benefits.

From our earlier discussion of the sample it is clear that for (2) and (3), attrition bias may be an issue. We correct for this possibility by using a two-stage approach as suggested in the literature (Wooldridge 2001). Let y_{it} be the dependent variable for household i in survey round t and x_{it} the vector of independent variables where $t=1, 2$ denotes the survey round. With s_{it} as a selection indicator for round t so that $s_{it}=1$ if (x_{it}, y_{it}) is observed and $s_{it}=0$ if (x_{it}, y_{it}) is not observed, a reduced form selection equation for household i to remain in the second round can be formulated as $s_{i2}=1$ if $\beta w_{i2} + u_{i2} > 0$ and $s_{i2}=0$ otherwise, assuming that $u_{i2} | \{w_{i2}, s_{i1}=1\} \sim N(0, 1)$. In practical terms, as initial conditions are good candidates for w_{i2} , we include these in a Heckman two-step estimation. The first step probit estimate of the selectivity equation is used to compute a selectivity term $\lambda(\beta w_{i2})$ that enters second step regressions (2) and (3), in addition to the variables discussed earlier. The significance of λ , the inverse Mills ratio, then provides a test for attrition bias and all reported coefficients will be appropriately corrected.

4. Econometric results

Econometric results indicate that land reform affected economic growth and accumulation of physical and human capital even after the impact of initial endowments and other factors have been controlled for but that the channels for such effects to materialize differ between tenancy reforms and ceiling legislation. While the former has a significant direct effect, most of the overall impact of the latter is estimated to arise indirectly. The impact of land reforms on economic growth and asset accumulation tends to diminish over time, something which, in the case of ceiling reforms, could be responsible for lack of significance of the regression coefficients. Finally, as one would expect, tenancy reform did not benefit the poorest who may have benefited more from ceiling legislation.

4.1 Land reform and human capital accumulation

We start by exploring the impact of land reform on human capital accumulation by those who completed their education after the majority of land reforms had been implemented. Results for about 5,600 individuals in our sample are reported in table 4 for effects of tenancy (col. 1 and 2) and ceiling reform (col. 3 and 4) separately where our land reform measure is included either separately or interacted with initial asset endowments. The highly positive coefficient on implementation of tenancy reforms suggests a significant direct effect of tenancy reforms on long-term human capital accumulation by the next generation. This contrasts with an insignificant coefficient on the share of area distributed under ceiling legislation, supporting the notion that the distinction between different land reform types is important.¹⁹ In all regressions, the highly significant coefficient on public education spending points towards a positive impact on the rate of human capital accumulation. Comparing the estimated impact of such

¹⁹ This interpretation, and an indirect effect of ceiling reforms, is reinforced by the highly significant coefficient on the number of ceiling laws (results not reported).

spending to that of land reform suggests that, even for the state with the highest level of tenancy reform beneficiaries in the sample, the estimated effect of land reform on educational attainment amounts, with 0.60 years, to only between one fourth and one sixth of that of public spending.

Interacting the land reform variable with households' initial level of assets (col. 2 and 4) allows us to make inferences on the distributional impact of this policy. The negative and highly significant coefficient of the interaction terms in both columns suggests that the benefits from tenancy and ceiling reforms accrued disproportionately to those with lower levels of initial asset endowments, suggesting that widely reported attempts to evade ceiling legislation (Appu 1997) or somewhat higher wealth of tenants (DeSilva 2000) did not undermine the pro-poor nature of such reforms. At the same time and consistent with the notion that institutional arrangements can affect outcomes for a long time, the proportion of land under *zamindari* tenure significantly affected socio-economic outcomes even after the system was abolished. Regression results suggest that an individual from a state with the mean level of *zamindari* land (0.48) would have 1.1 years less education than one from a state where *zamindars* did not play any role.

Coefficients on other household or member characteristics suggest, not unsurprisingly, that educational opportunities are affected by parental endowments. An important role of social status in determining access to education is suggested by the fact that members of a SC or ST caste are predicated to have educational attainment that is lower by more than one year (0.4 to 0.6 years for BCs) than comparable non-scheduled, tribal or backward castes. There is also male bias in the provision of education, with male individuals getting two years of schooling beyond what is received by females. The positive coefficients on initial levels of educational attainment suggest persistence rather than equalization of educational differences across generations. According to the point estimate, one additional year of educational achievement by the household head or spouse would be predicted to increase the level of their children's educational attainment by 0.32 and 0.30 years, respectively. The positive coefficients on initial assets indicate that children from wealthy households tended to receive above-average levels of education; in fact, the difference in educational attainment between an individual at the 10% and 90% range of per capita assets amounts to more than 1.3 years.

4.2 Growth effects of land reform legislation and implementation

Table 5 reports results from estimating equation (2) for our three dependent variables, i.e. growth of per capita consumption, income, and assets. The highly significant coefficient on the inverse Mills ratio points towards significant attrition effects. Still, consistent across all three measures, tenancy reforms (col. 1-3) and ceilings (col. 4-6) are estimated to have had a significant and positive direct effect. The results suggest that the magnitude of these effects was quite large; the direct contribution of tenancy reform, which on average affected about 10% of rural households, is estimated to have increased the

growth rate for per capita income, per capita consumption and total assets by 1.1, 0.7 and 1.4 percentage points respectively.²⁰ Comparing this to overall growth rates implies that land reform accounted for as much as one third of growth during the period. The negative and highly significant coefficient on the interaction terms in all but one case suggests that land reforms disproportionately benefited the poor.²¹

The negative and highly significant coefficient on the proportion of a state's land under *zamindari* land tenure suggests a long-term detrimental effect of the *zamindari* system on growth of income, consumption and assets by rural households. Based on coefficients from the tenancy reform equation, growth in a state with mean level of *zamindari* land would be predicted to be 0.8% and 0.6% lower than in one without such land. Initial household characteristics also emerge as key growth determinants. To illustrate, scheduled castes' and tribes' growth rates were lower by 0.8, 0.7, and 1.2 percentage points respectively, other things constant, pointing to a general disadvantage of accumulating assets for this group. Together with a significant and negative coefficient of the landless dummy on asset accumulation,²² this could point towards credit market imperfections. Although we find some evidence of conditional convergence, initial land endowments as well as household size are estimated to have made a positive contribution to subsequent income and asset growth. In all cases, the coefficient estimates are very close to those obtained through OLS which are available from the authors upon request.

4.3 Changes in reform impact over time

One question of interest to policy makers in India is whether it will be useful to maintain land reform legislation in a context where subdivision of land and generational change reduce the amount of land that could be made available through such legislation. To provide insight on this, we use our sample to try and assess whether the effectiveness of land reforms in bringing about growth and asset accumulation has changed over time. Results from adding an interaction of land reform with time are reported in table 6. We note that, while all legal measures are estimated to have had a very significant and positive impact on consumption, income, and asset growth, The negative and highly significant coefficients for all the three welfare measures in the case of ceiling reform and for total assets in the case of tenancy reform point towards a tendency for impacts of reforms to decrease over time.²³ In fact, comparison of the two coefficients points towards a danger for the impact of land reform implementation to vanish or even become negative.

²⁰ These figures are calculated from the results without interaction term of implementation and initial assets (not reported), the coefficient on the tenancy reform implementation is 0.30, 0.20, and 0.38 respectively for income, consumption and assets regressions.

²¹ At the same time, the fact that even for the wealthiest households (log of assets = 13), the predicted effect of land reform is positive, with a point estimate of about half of that for the poorest, suggests that all households benefited from the land reform.

²² The corresponding coefficient is insignificant for consumption in both cases and for income in the ceiling equation, most likely due to the fact that income and consumption are more subject to temporary shocks than household assets.

²³ The fact that the results for assets are more robust compared to income and consumption can be because the latter is more subject to temporary shocks than the former.

What could underlie such a finding? Two possible reasons for a decreasing growth impact of continued maintenance of land reform legislation have been mentioned in the literature. One is a negative external effect of land reform legislation, mainly on the leasing out of land to poor or landless tenants. A second one relates to limits imposed on the rights awarded to land reform beneficiaries which in many cases do not include transferability through leasing or sales, thereby either reducing allocative efficiency or making access to credit and investment more difficult. In the case of tenancy reforms, cultivators may have strong use- but no ownership rights. The implied requirement to pay rent to the landlord can significantly reduce investment incentives, as was indeed found in a recent study from Uganda (Deininger and Ali 2007), an effect that could be exacerbated by additional restrictions, e.g. on sub-leasing.

The literature suggests that such negative long-run consequences of land reform legislation are not uncommon. For example, in the Philippines, a very low land ownership ceiling, together with prohibitions on land leasing, is found to have effectively destroyed both land lease and rural credit markets thus stymieing private investment as well as eventual consolidation of holdings in rural areas and trapping beneficiaries in perpetual poverty (Fabella 2003). In Brazil, analysis suggests that labor and land (reform) policies instituted in the 1960s have contributed to large-scale subsidy-dependent agricultural mechanization that substituted capital for labor, prompting a highly concentrated and capital-intensive way of production. De-regulation of land rental and rural labor markets are seen as a key to achieve a production structure based on smaller units that can in time, and with appropriate policies such as credit for land purchase, also help to address the problem of big *latifundia* (Rezende 2005).

While the aggregate evidence emerging from our data is insufficient to make detailed recommendations on policy, it suggests that certain types of land reform legislation that may, at one point in time, have been very beneficial may, over time, lose their impact. As this is generally associated with a steep decline in new land reform activity, this implies neither a lack of effectiveness of land reform policies nor the need to abandon such policies in a wholesale manner. At the same time, it does suggest that more innovative thinking about ways to achieve the objectives of earlier land reform in a more complex environment will be needed and that some of the relevant policies may need to be rethought. Combining the aggregate picture emerging from our data with household- and community-level evidence on the relative importance of direct vs. indirect benefits, the time profile with which these benefits accrued, and the extent to which operation of other markets was negatively affected, could provide useful insights in this respect and is left to future research.

5. Conclusion

Land reform has been subject of an intense policy debate worldwide, but especially in India where public statements by policy makers continue to express support for such reforms. However, the fact that benefits

may be realized only over a long time horizon and that good measures of implementation are hard to find made empirical analysis difficult. In this paper, we address this by using household-level evidence for a 20-year panel, combined with state-level indicators of actual land reform implementation -rather than the number of laws as used in other studies- to explore the impact of land reform on investment, growth, and poverty reduction over a long time horizon while controlling for initial conditions in a more rigorous way.

Doing so, and distinguishing different forms of land reform and their likely impacts, provides a number of insights. First, by allowing households to increase investment, land reform had a positive impact on accumulation of assets in the form of physical as well as human capital. Partly through this channel, land reform did promote economic growth, a notion that is supported by positive and in most cases significant coefficients in the regressions of income and consumption. Second, and contrary to fears, land reform provided disproportionate benefits to households with lower initial level of assets pointing towards a positive impact on equity. Third, we do find that the impact of reform decreases with time, something that could explain other studies' failure to find significant growth effects.

An obvious question raised by our results is why, if it had a potential to provide large beneficial effects, land reform was not implemented more vigorously. One possible reason is that, as land has long been a determinant of political power and social status (Binswanger *et al.* 1995, Binswanger and Deininger 1997), land prices will reflect more than economic factors and, at least for the individuals concerned, reforms will be a zero-sum game, implying that landowners affected will try to block any efforts to take their land without compensation. Before economic liberalization, limited opportunities for non-land investment are likely to have reinforced this tendency. Anecdotal evidence suggests that indeed, as other economic opportunities expanded, and with the exception of speculative land acquisition in areas designated for infrastructure investment, the role of land as a store of wealth and source of social status has recently declined and activity in land markets, especially those for rental, has increased. While access to household level information allows us to go beyond earlier analyses, the fact that our data do not identify land reform beneficiaries makes it difficult to distinguish between the direct effect of such reform on beneficiaries (e.g. through elimination of credit constraints) and the broader impact on the local economy (e.g. through increased wage rates).

From a policy perspective, our analysis facilitates two main conclusions. First, the positive impact of land reform implies that this measure did address a critical issue in post-independence India and that more determined implementation could have provided higher benefits. Second, the decline in the impact of land reform emerging from our analysis, while expected in an environment where new land transfers have come to a virtual standstill, implies that attempts to increase the welfare of the poor by enhancing their land access will have to start from an assessment of existing opportunities to access land, the obstacles

preventing such access, the political realities of implementation, and the potential economic returns from land compared to the alternatives. It also appears that , in addition to increasing land access, there may be considerable potential for legal and administrative action to help make gains from past reforms permanent -e.g. by allowing transfers of the residual ownership right- and transferable.

While access to household level information allows us to go beyond earlier analyses, the fact that our data do not identify land reform beneficiaries makes it difficult to distinguish between the direct effect of such reform on beneficiaries (e.g. through elimination of credit constraints) and the broader impact on the local economy (e.g. through increased wage rates). A follow-up survey that is currently in the field includes questions on village level land reform implementation and the involvement of individual households that is expected to complement the current analysis in three ways. First, it will allow a distinction between benefits that accrue to beneficiary households directly and those that are due to community-wide effects e.g. increase in labor demand and wage rates. Second, by allowing to at least rudimentarily trace the time profile of such effects, it can allow inferences on the impact of one-time transfers and on the extent and magnitude of possible policy-induced 'second generation' land reform issues. Finally, by comparing the contribution of land to household welfare for different segments in the population to that of other factors (e.g. access to electricity and infrastructure), it will be possible to more precisely assess the relevance of land access and how it may have changed over time. Given the continuing need to overcome deep-rooted social exclusion and lack of access to economic opportunities, exploring these issues in more detail will be an important area for future research.

Table 1: Global extent and characteristics of land reforms

Country	Area		Beneficiary households		Area per household (hectares)	Implementation Period
	Total area (1000 hectares)	Share of arable Land (%)	Number (thousands)	Share of rural Households (%)		
Africa						
Egypt	390	15.4	438	10.0	0.89	1952–78
Kenya	403	1.6	34	1.6	11.85	1961–70
Zimbabwe	2,371	11.9	40	3.1	59.28	1980–87
Asia						
Japan	2,000	33.3	4,300	60.9	0.47	1946–49
Korea, Rep. of	577	27.3	1,646	45.5	0.35	1948–58
Philippines	1,092	10.8	1,511	24.2	0.72	1940–85
Taiwan, China	235	26.9	383	62.5	0.61	1949–53
Central America						
El Salvador	401	27.9	95	16.8	4.22	1932–89
Mexico	13,375	13.5	3,044	67.5	4.39	1915–76
Nicaragua	3,186	47.1	172	56.7	18.52	1978–87
South America						
Bolivia	9,792	32.3	237	47.5	41.32	1953–70
Brasil	13,100	11.3	266	5.4	49.32	1964–94
Chile	9,517	60.1	58	12.7	164.09	1973
Peru	8,599	28.1	375	30.8	22.93	1969–79

Source: Deininger (2003).

Table 2: Shares of rural households and arable land area affected by different land reforms in Indian States

State	Tenancy legislation				Ceiling legislation	
	Area (%)	Pop. (%)	No. of laws	Average age	Area (%)	Pop. (%)
Andhra Pradesh	3.48	0.75	2	17.0	8.34	3.81
Bihar	0.00	0.00	3	18.3	4.42	4.00
Gujarat	15.00	11.20	2	15.5	1.95	0.31
Haryana	0.51	0.01	0	0	1.26	0.26
Himachal Pradesh	0.16	3.19	n.a.	n.a.	0.06	0.05
Karnataka	15.38	5.29	2	14.5	1.71	0.30
Kerala	8.47	12.49	4	10.8	1.30	1.04
Madhya Pradesh	2.15	0.61	1	24.0	2.69	0.71
Maharashtra	27.01	10.68	1	23.0	7.74	1.08
Orissa	0.15	1.43	3	9.0	2.24	1.28
Punjab	1.89	0.04	1	10.0	1.50	0.25
Rajasthan	0.00	0.16	0	0	6.63	0.75
Tamil Nadu	3.65	3.23	5	13.6	2.47	1.24
Uttar Pradesh	0.00	0.00	2	14.5	5.81	3.68
West Bengal	6.41	10.80	5	8.2	14.91	19.73
Total	5.45	5.35	2.1	13.03	4.41	2.27

Source: Kaushik (2005) for columns 1 to 4; Besley and Burgess (2000) for columns (5) and (6)

Table 3: Demographic and economic characteristics of sample households by region and time

	1982				
	All	North	West	East	South
Basic Characteristics					
Household size	5.98	6.01	6.20	6.36	5.38
Share of landless households (%)	25.59%	27.06%	15.12%	26.16%	34.96%
Land endowment (ha)	2.08	1.60	3.14	1.53	1.62
Land endowment p.c. (ha)	0.39	0.29	0.58	0.29	0.30
Head with primary or above	22.88%	23.93%	14.65%	23.85%	29.89%
Share of ST, SC (%)	20.83%	14.53%	25.19%	14.35%	26.41%
Share of OBC (%)	28.59%	45.21%	23.66%	24.61%	22.84%
Income and Wealth					
Total household income (Rs.)	7025.84	9246.61	7693.04	5959.39	5224.08
Per capita income (Rs.)	1297.90	1643.43	1433.23	977.16	1110.19
Per capita income Gini	0.32	0.30	0.29	0.31	0.36
Total household expenditure p.c. (Rs.)	1112.68	1291.18	1151.03	896.98	1090.01
Value of total assets p.c. (Rs.)	2037.64	2688.29	2284.84	1221.26	1865.33
Value of total physical assets p.c. (Rs.)	1601.81	1965.86	1855.65	970.09	1525.18
Gini of total assets p.c.	0.60	0.54	0.56	0.55	0.64
No. of observations	4,979	1,279	1,613	670	1,417
	1999				
	All	North	West	East	South
Basic Characteristics					
Household size	5.91	6.19	6.15	7.22	4.88
Share of landless households (%)	35.40%	51.27%	30.50%	39.58%	26.18%
Land endowment (ha)	1.49	1.18	2.43	0.87	1.22
Land endowment p.c. (ha)	0.28	0.25	0.44	0.16	0.24
Head with primary or above	49.28%	42.44%	40.37%	49.12%	60.51%
Income and Wealth					
Total household income (Rs.)	8808.31	10139.27	7545.40	5148.24	10641.55
Per capita income (Rs.)	2237.32	3441.25	1340.08	935.48	2724.20
Per capita income Gini	0.31	0.31	0.30	0.36	0.28
Total household expenditure p.c. (Rs.)	1513.63	1433.60	1516.24	1101.53	1769.30
Value of total assets p.c. (Rs.)	8898.93	6711.18	8074.75	2826.97	13983.61
Value of total physical assets p.c. (Rs.)	7735.20	6173.72	7000.31	2538.33	11898.17
Gini of total assets p.c.	0.56	0.55	0.53	0.59	0.54
No. of observations	7,476	1,705	2,479	1,307	1,985

Source: Own computation from NCAER ARIS-REDS surveys. Weighting factors for the corresponding period are applied.

Table 4: Land reform implementation and human capital accumulation

	Tenancy reform		Ceiling reform	
Reform implementation	4.812*** (2.65)	29.728*** (4.72)	-8.741 (1.49)	7.161 (1.00)
Reform implementation*initial assets (log)		-3.041*** (4.13)		-2.038** (2.40)
Per capita education spending	4.350*** (4.14)	4.054*** (3.85)	7.905** (2.19)	7.738*** (3.05)
Male dummy	2.035*** (15.90)	2.021*** (15.80)	2.106*** (5.44)	2.094*** (6.04)
Head's education	0.322*** (21.56)	0.320*** (21.49)	0.330*** (5.20)	0.328*** (7.23)
Spouse's education	0.301*** (12.77)	0.306*** (12.99)	0.300*** (3.99)	0.298*** (5.15)
Initial land endowment	0.036* (1.71)	0.032 (1.54)	0.045 (1.05)	0.038 (1.03)
Initial non-land assets (log)	0.438*** (9.63)	0.560*** (10.33)	0.402*** (2.77)	0.510*** (4.39)
SC/ST dummy	-1.272*** (8.80)	-1.229*** (8.49)	-1.140** (2.32)	-1.107*** (2.92)
BC dummy	-0.649*** (5.05)	-0.617*** (4.80)	-0.444 (0.76)	-0.413 (0.93)
Proportion of Zamindari land	-2.300*** (7.18)	-2.556*** (7.84)	-1.527 (1.37)	-1.462* (1.76)
Observations	5589	5589	5589	5589
R-squared	0.36	0.36	0.36	0.36

Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.
Regional dummies included throughout but not reported.

Table 5: Land reform and growth of household per capita income, consumption and total assets

	Tenancy Reform			Ceiling reform		
	Income	Consumption	Total assets	Income	Consumption	Total assets
Reform implementation	0.546*** (5.65)	0.485*** (8.52)	0.352*** (2.87)	0.299*** (3.94)	0.231*** (5.08)	0.275*** (2.83)
Reform *initial assets (log)	-0.034*** (3.04)	-0.033*** (5.07)	-0.003 (0.25)	-0.022** (2.41)	-0.018*** (3.17)	-0.031*** (2.65)
Landless in 1982	-0.007*** (3.83)	-0.004*** (3.69)	-0.018*** (7.77)	-0.006*** (3.23)	-0.004*** (2.92)	-0.017*** (7.13)
Land owned in 1982 (log)	0.002** (2.27)	0.000 (0.81)	0.004*** (3.58)	0.001 (1.15)	-0.000 (0.30)	0.004*** (3.10)
Household size (log)	0.071*** (31.27)	0.005*** (3.31)	0.073*** (25.36)	0.072*** (31.08)	0.006*** (4.19)	0.073*** (24.83)
Income in 1982 (log)	-0.058*** (44.47)	0.004*** (4.83)	0.006*** (3.57)	-0.058*** (43.51)	0.004*** (4.55)	0.006*** (3.45)
Non-land assets 1982 (log)	0.002*** (2.76)	0.000 (0.35)	-0.058*** (56.73)	0.002* (1.82)	-0.001 (1.43)	-0.057*** (54.21)
Consumption in 1982 (log)	0.024*** (10.51)	-0.047*** (33.73)	0.033*** (11.47)	0.024*** (10.52)	-0.046*** (31.63)	0.035*** (11.50)
SC/ST dummy	-0.008*** (4.60)	-0.007*** (6.75)	-0.012*** (5.84)	-0.009*** (4.99)	-0.007*** (6.79)	-0.012*** (5.63)
BC dummy	-0.013*** (8.56)	-0.004*** (3.99)	-0.005** (2.48)	-0.013*** (8.37)	-0.004*** (3.64)	-0.003 (1.46)
Proportion of zamindari land	-0.017*** (4.75)	-0.006*** (2.84)	-0.009** (2.00)	-0.046*** (16.35)	-0.029*** (16.00)	-0.043*** (12.07)
Inverse Mills ratio	0.166*** (12.55)	0.100*** (11.08)	0.151*** (10.44)	0.173*** (14.23)	0.100*** (12.07)	0.156*** (11.6)
Observations	4929	4964	4964	4929	4964	4964
R ²	0.47	0.46	0.59	0.45	0.44	0.58

Absolute value of t statistics in parentheses. 1982 weights are used throughout. R² is for second stage regression only.

* significant at 10%; ** significant at 5%; *** significant at 1%. Regional dummies included but not reported.

Table 6: Change in land reform impacts on growth of household's income, consumption and assets

	Tenancy reform			Ceiling reform		
	Income	Consumption	Total Assets	Income	Consumption	Total Assets
Reform implementation	0.221*** (5.39)	0.167*** (6.19)	0.608*** (11.83)	0.654*** (15.40)	0.647*** (24.47)	0.951*** (17.85)
Reform implementation*Reform age	0.003 (1.08)	0.003* (1.67)	-0.026*** (6.55)	-0.073*** (13.86)	-0.075*** (23.32)	-0.125*** (19.41)
Landless in 1982	-0.007*** (3.49)	0.000 (0.08)	-0.019*** (7.94)	-0.007*** (3.56)	-0.000 (0.11)	-0.017*** (7.54)
Land owned in 1982 (log)	0.002** (2.54)	0.001 (1.00)	0.004*** (3.76)	0.003*** (2.92)	0.001 (1.47)	0.005*** (4.82)
Household size (log)	0.072*** (30.82)	0.004** (2.42)	0.069*** (23.50)	0.068*** (29.89)	-0.000 (0.23)	0.067*** (23.50)
Income in 1982 (log)	-0.058*** (43.68)	0.003*** (4.07)	0.008*** (4.69)	-0.058*** (44.26)	0.004*** (5.44)	0.007*** (4.10)
Non-land assets in 1982 (log)	0.001 (1.08)	-0.001** (2.00)	-0.058*** (69.38)	0.001 (1.64)	-0.000 (1.10)	-0.057*** (69.58)
Consumption in 1982 (log)	0.024*** (10.28)	-0.043*** (29.44)	0.029*** (9.59)	0.020*** (8.97)	-0.047*** (34.05)	0.029*** (9.99)
SC/ST dummy	-0.008*** (4.58)	-0.008*** (6.94)	-0.013*** (6.12)	-0.007*** (3.87)	-0.006*** (5.42)	-0.010*** (4.71)
BC dummy	-0.013*** (8.29)	-0.005*** (4.79)	-0.003 (1.35)	-0.010*** (6.04)	-0.001 (1.07)	0.001 (0.66)
Proportion of Zamindari land	-0.012*** (2.61)	-0.007** (2.53)	-0.031*** (5.52)	-0.035*** (12.43)	-0.025*** (14.32)	-0.024*** (6.87)
Inverse Mills ratio	0.167*** (12.29)	-0.011 (1.51)	0.149*** (10.22)	0.166*** (12.28)	-0.015** (2.25)	0.146*** (10.34)
Observations	4865	4898	4898	4865	4898	4898
R ²	0.47	0.46	0.60	0.48	0.51	0.61

Absolute value of t statistics in parentheses. 1982 weights are used throughout. R² is for second stage regression only.

* significant at 10%; ** significant at 5%; *** significant at 1%. Regional dummies included but not reported.

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