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

K. Deiningera; S. Jinb; H. K. Nagarajanc

a World Bank, Rural Development Research, Washington, DC, USA b Michigan State University, Agricultural, Food and Resource Economics, East Lansing, USA c National Council for Applied Economic Research, New Delhi, India

PLEASE SCROLL DOWN FOR ARTICLE

Routledge
Taylor & Francis Group

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

K. DEININGER*, S. JIN** & H. K. NAGARAJAN***

*World Bank, Rural Development Research, Washington DC, USA, **Michigan State University, Agricultural, Food and Resource Economics, East Lansing, USA, ***National Council for Applied Economic Research, New Delhi, India

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. We use panel household data from India, together with state-level variation in the land reform implementation, to address some of the deficiencies of earlier studies. Results suggest that land reform had a significant and positive impact on income growth and accumulation of human and physical capital. Policy implications are drawn, especially from the fact that the observed impact of land reform seems to have declined over time.*

I. 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, for example, 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

Correspondence Address: S. Jin, Michigan State University, Agricultural, Food and Resource Economics, 213E Agricultural Hall, East Lansing, 48824, USA. Email: jins@anr.msu.edu

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 realise considerable gains from the 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 programmes to redistribute land to poor and landless rural wage labourers were initiated to deal with the latter. The fact that responsibility for implementing these programmes was not with the centre 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 organised as follows. Section II 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 III 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 IV. Section V concludes by drawing out implications for policy and future research.

II. 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.

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 labour (Carter, 1984; Eswaran and Kotwal, 1985; Feder, 1985; Benjamin, 1995), a farm structure based on owner-operated units is more efficient than one based on wage labour (Berry and Cline, 1979; Binswanger et al., 1995). Although market mechanisms can, in principle, help to equalise 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, for example, those for labour 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 favour of historical justice, have provided a justification for redistributive policies in many countries. The goal was to establish a foundation for an inclusive and broadbased 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 at the end of World War II redistributed between 30 per cent and 40 per cent of the cultivated area, affecting approximately 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). Land reforms immediately after independence in African countries, for example, Kenya and Zimbabwe were quite effective (Scott, 1976; Gunning et al., 2000; Deininger et al., 2004) but often abandoned for political reasons (Kinsey and Binswanger, 1993). In Latin America, reform efforts have distributed large amounts of land (Barraclough, 1970; Eckstein and Horton, 1978; Jarvis, 1989) but often failed to improve productivity or help overcome deep-rooted structural inequalities (de Janvry and Sadoulet, 1989). Following a decline of interest in the topic during the late 1970s, it has received renewed attention recently,[3] partly due to the fact that, even if accompanied by high levels of growth, macroeconomic reforms in countries characterised by high land inequality often failed to narrow the gap between the rich and the poor, and the fact that 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 led countries as diverse as Brazil, Bolivia, South Africa, the Philippines, Venezuela and Zimbabwe to renew their land reform efforts.

Table 1. Global extent and characteristics of land reforms

Country	Area		Beneficiary households			Area per household (ha)	Implementation period
	Total area (1000 ha)	Percentage of arable land	Number (000s)	Percentage of rural households			
Africa							
Egypt	390	15.4	438	10.0		0.89	1952–1978
Kenya	403	1.6	34	1.6		11.85	1961–1970
Zimbabwe	2,371	11.9	40	3.1		59.28	1980–1987
Asia							
Japan	2,000	33.3	4,300	60.9		0.47	1946–1949
Korea, Rep. of	577	27.3	1,646	45.5		0.35	1948–1958
Philippines	1,092	10.8	1,511	24.2		0.72	1940–1985
Taiwan, China	235	26.9	383	62.5		0.61	1949–1953
Central America							
El Salvador	401	27.9	95	16.8		4.22	1932–1989
Mexico	13,375	13.5	3,044	67.5		4.39	1915–1976
Nicaragua	3,186	47.1	172	56.7		18.52	1978–1987
South America							
Bolivia	9,792	32.3	237	47.5		41.32	1953–1970
Brasil	13,100	11.3	266	5.4		49.32	1964–1994
Chile	9,517	60.1	58	12.7		164.09	1973
Peru	8,599	28.1	375	30.8		22.93	1969–1979

Source: Deininger (2003).

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 the 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 of 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, 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 million 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

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

State	Tenancy legislation			Ceiling legislation		
	Area (%)	Population (%)	No. of laws	Average age	Area (%)	Population (%)
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	NA	NA	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 1–4; Besley and Burgess (2000) for columns 5 and 6.

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 approximately 2.5 million hectares under programmes to redistribute of ceiling surplus land, and 7.35 million hectares under tenancy reform, implying a direct transfer of 5.45 per cent of the area to about 5.35 per cent 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 per cent 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 benefitting, 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, for example Kerala or West Bengal, 12.5 per cent and 10.8 per cent of the population benefited from transfer of 8.5 per cent and 6.4 per cent of the land area, respectively, plot sizes for land transferred remained considerably below the state average. While some states (for example, Gujarat or Tamil Nadu) provided beneficiaries with plots of about average size, in most of the states the fact that the share of beneficiaries 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 per cent and 2.3 per cent, 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 organisation, 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 were 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 mobilisation 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 1995–1996 and 2003–2004, that is 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, for example, 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, 2007). 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).

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 recognising that, over and above the direct

distribution of land through public sector action, the existence of land reform legislation can have an important and 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 different types of reform is quite different. Although tenancy reform requires some intervention, mainly to disseminate information and reduce the transaction cost of registering tenants in the field, implementing ceiling legislation requires a much higher level of government effort. In addition to the 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., 2008), indirect effects of ceiling legislation could be quite large. Indeed, in the case of West Bengal where, market transactions transferred more land than was acquired and redistributed as above-ceiling land by government (Bardhan and Mookherjee, 2007).

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-labour 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-labour 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). In addition, artificial subdivision of land holdings has been reported to lead to conflicts, sub-optimal patterns of land utilisation, 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 the supply of 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 under-investment 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 sell 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.

III. Data and Estimation Strategy

Use of a nationwide survey provides us with household level information on the evolution of income, consumption and accumulation of human and physical capital assets that can be combined with 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.

Household Characteristics

The household-level data used in our analysis are from two rounds of the ARIS/REDS[10] 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 1968–1971 to evaluate the impact of an agricultural development programme 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 the sample was expanded to fewer 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 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, that is 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 per cent in 1982 to 49 per cent 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 per cent to 35 per cent. The size of the average household remains the same, around 6.0, with about 3.7 in the age 14–60 years category, 0.2 compared to 0.4 aged above 60 years, and 2.1 compared to 1.8 below the age of 14 years. The share of female-headed households remains, with 6.8 per cent, 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 per cent for the sample during the period under concern. This aggregate 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 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 cent per year.[15] With a Gini coefficient of 0.60 in 1982, inequality in assets is higher than income

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 per capita (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 per capita (Rs)	1112.68	1291.18	1151.03	896.98	1090.01
Value of total assets per capita (Rs)	2037.64	2688.29	2284.84	1221.26	1865.33
Value of total physical assets per capita (Rs)	1601.81	1965.86	1855.65	970.09	1525.18
Gini of total assets per capita	0.60	0.54	0.56	0.55	0.64
Number 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 per capita (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 per capita (Rs)	1513.63	1433.60	1516.24	1101.53	1769.30
Value of total assets per capita (Rs)	8898.93	6711.18	8074.75	2826.97	13983.61
Value of total physical assets per capita (Rs)	7735.20	6173.72	7000.31	2538.33	11898.17
Gini of total assets per capita	0.56	0.55	0.53	0.59	0.54
Number of observations	7,476	1,705	2,479	1,307	1,985

Source: Own computation from NCAER ARIS-REDS surveys. Numbers are weighted by weighting factors for the corresponding period.
Notes: OBC, other backward classes; SC, scheduled caste; and ST, scheduled tribe.

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%).

Estimation Strategy

Our strategy to test the hypotheses outlined within section II, 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, the authors: (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, that is who were below the age of 8 years in 1982, a year when the legal process was more or less complete, and above the age of 16 years in 1999. The estimating equation is:

$$E_{ji} = \alpha + \pi_k R_{ks} + \gamma \boldsymbol{H}_i + \rho \boldsymbol{Z}_j + \zeta \boldsymbol{S}_s + \eta(A_i R_{ks}) + \varphi L_s + \delta \boldsymbol{D}_s + \varepsilon_{ji} \qquad (1)$$

where E_{ji} denotes years of education completed by member j in household i, $\boldsymbol{Z}_j$ is a vector of member characteristics including age and gender, $\boldsymbol{H}_i$ 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 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), $\boldsymbol{D}$ 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:

$$\Delta O_i^Q = \Omega + \theta \boldsymbol{H}_i + \psi_k R_{ks} + \tau_k(A_i R_{ks}) + \sigma L_s + \omega \boldsymbol{D}_s + \xi_i \qquad (2)$$

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, $\boldsymbol{H}_i$ is a vector of time-invariant household characteristics such as caste and initial endowments, for example, the size of the household or its land, R_{ks} L_s and $\boldsymbol{D}$ 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. Ω, θ, ψ_k, τ_k, σ and ω are parameters or vectors of parameters to be estimated and ξ_i is an error term. If land reform helps overcome credit market imperfections that previously had 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:

$$\Delta O_i^Q = \Omega + \theta \boldsymbol{H}_i + \psi_k R_{ks} + v_k(R_{ks} \times T) + \sigma L_s + \omega \boldsymbol{D}_s + \xi_i \qquad (3)$$

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 $v_k < 0$.

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.

IV. 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 materialise 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.

Land Reform and Human Capital Accumulation

The authors begin 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 (columns 1 and 2) and ceiling reform (columns 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 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 (columns 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 socioeconomic 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 scheduled caste (SC) or scheduled tribe (ST) caste are predicated to have educational attainment that is lower by more than one year (0.4 to 0.6 years for other backward classes (OBCs)) 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 equalisation 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

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)
OBC 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

Notes: Absolute value of *t* statistics in parentheses. *significant at 10 per cent; **significant at 5 per cent; ***significant at 1 per cent. Regional dummies included throughout but not reported. OBC, other backward classes; SC, scheduled caste; and ST, scheduled tribe.

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)
OBC 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

Notes: Absolute value of t statistics in parentheses. 1982 weights are used throughout. R^2 is for second stage regression only. *significant at 10 per cent; **significant at 5 per cent; ***significant at 1 per cent. Regional dummies included but not reported. OBC, other backward classes; SC, scheduled caste; and ST, scheduled tribe.

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 per cent and 90 per cent range of per capita assets amounts to more than 1.3 years.

Growth Effects of Land Reform Legislation and Implementation

Table 5 reports results from estimating equation (2) for our three dependent variables, that is growth of per capita consumption, income and assets. The highly significant coefficient on the inverse Mills ratio points towards significant attrition effects. However, consistent across all three measures, tenancy reforms (columns 1–3) and ceilings (columns 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 per cent of rural households, is estimated to have increased the growth rate for per capita income, per capita consumption and total assets by 0.9, 0.7 and 1.2 percentage points respectively.[20] Comparing this to overall growth rates implies that land reform accounted for as much as one-third of growth observed 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 per cent, 0.3 per cent and 0.4 per cent 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.

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

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)
OBC 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

Notes: Absolute value of t statistics in parentheses. 1982 weights are used throughout. R^2 is for second stage regression only. *significant at 10 per cent; **significant at 5 per cent; ***significant at 1 per cent. Regional dummies included but not reported. OBC, other backward classes; SC, scheduled caste; and ST, scheduled tribe.

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.

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 effects 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, for example, on sub-leasing.

The literature suggests that such negative long-run consequences of land reform legislation are not uncommon. In the Philippines, for example, 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 labour and land (reform) policies instituted in the 1960s have contributed to large-scale subsidy-dependent agricultural mechanisation that substituted capital for labour, prompting a highly concentrated and capital-intensive way of production. De-regulation of land rental and rural labour markets are seen as key to achieving 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, 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.

V. 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 realised 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 liberalisation, 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 (for example, through elimination of credit constraints) and the broader impact on the local economy (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 – for example, 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 (for example, through elimination of credit constraints) and the broader impact on the local economy (for example, 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 (for example, increase in labour 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 (for example, 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.

Notes

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 five (to obtain an estimate of the number of rural households).
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., 2008).
5. The amount of land donated voluntarily and distributed under the Bhoodan movement amounted to 0.7 million 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, that is tenancy reform and distribution of above-ceiling land, are in addition to any lands transferred through *zamindari* abolition.
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 per cent 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.
8. In some cases, for example, West Bengal, tenancy protection was combined with effectively implemented anti-eviction legislation.
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'.

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. States were grouped 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.

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.

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.

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).

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 0.26, 0.20, and 0.32 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.

References

Acemoglu, D., Johnson, S. and Robinson, J. (2004) Institutions as the fundamental cause of long-run growth. NBER working paper 10481 (Cambridge, MA: National Bureau of Economic Research).

Aghion, P. and Bolton, P. (1997) A theory of trickle-down growth and development. *Review of Economic Studies*, 64(2), pp. 151–172.

Appu, P. S. (1997) *Land Reforms in India: A Survey of Policy, Legislation and Implementation* (New Delhi: Vikas Publishing House).

Balisacan, A.M. and Fuwa, N. (2004) Going beyond crosscountry averages: growth, inequality and poverty reduction in the Philippines. *World Development*, 32(11), pp. 1891–1907.

Bandiera, O. (2003) Land reform, the market for protection, and the origins of the Sicilian mafia: theory and evidence. *Journal of Law, Economics, and Organization*, 19(1), pp. 218–244.

Banerjee, A. and Iyer, L. (2005) History, institutions, and economic performance: the legacy of colonial land tenure systems in India. *American Economic Review*, 95(4), pp. 1190–1213.

Banerjee, A.V., Gertler, P.J. and Ghatak, M. (2002) Empowerment and efficiency: tenancy reform in West Bengal. *Journal of Political Economy*, 110(2), pp. 239–280.

Banerjee, A.V. and Ghatak M. (2004) Eviction threats and investment incentives. *Journal of Development Economics*, 74(2), pp. 469–488.

Bardhan, P., Bowles, S. and Gintis, H. (2000) Wealth inequality, wealth constraints and economic performance, in: A.B. Atkinson and F. Bourguignon (eds) *Handbook of Income Distribution* (Amsterdam: North-Holland), pp. 541–603.

Bardhan, P. and Ghatak, M. (1999) Inequality, market imperfections, and collective action problems. Center for International and Development Economics Research (CIDER) working paper: C99/108, University of California, Berkeley.

Bardhan, P. and Mookherjee, D. (2006) Land reform, decentralized governance, and rural development in West Bengal. Stanford Center for International Development Working Paper No. 314 (Stanford, CA: Stanford University).

Barraclough, S.L. (1970) Agricultural policy and land reform. *Journal of Political Economy*, 78(4), pp. 906–947.

Barro, R.J. (2000) Inequality and growth in a panel of countries. *Journal of Economic Growth*, 5(1), pp. 5–32.

Benjamin, D. (1995) Can unobserved land quality explain the inverse productivity relationship? *Journal of Development Economics*, 46(1), pp. 51–84.

Berry, R.A. and Cline, W.R. (1979) *Agrarian Structure and Productivity in Developing Countries* (Baltimore: Johns Hopkins University Press).

Besley, T. and Burgess, R. (2000) Land reform, poverty reduction, and growth: evidence from India. *Quarterly Journal of Economics*, 115(2), pp. 389–430.

Binswanger, H.P. and Deininger, K. (1997) Explaining agricultural and agrarian policies in developing countries. *Journal of Economic Literature*, 35(4), pp. 1958–2005.

Binswanger, H.P., Deininger, K. and Feder, G. (1995) Power, distortions, revolt and reform in agricultural land relations. *Handbook of Development Economics*, 3B, pp. 2659–2772.

Bobrow-Strain, A. (2004) (Dis)Accords: the politics of market-assisted land reforms in Chiapas, Mexico. *World Development*, 32(6), pp. 887–903.

Borras, S.M., Jr. (2005) Can redistributive reform be achieved via market-based voluntary land transfer schemes? Evidence and lessons from the Philippines. *Journal of Development Studies*, 41(1), pp. 90–134.

Bourguignon, F. and Verdier, T. (2000) Oligarchy, democracy, inequality and growth. *Journal of Development Economics*, 62(2), pp. 285–313.

Boyce, J.K., Rosset, P. and Stanton, E.A. (1998) Land reform and sustainable development. Political Economy Research Institute Working Paper Series No 98 (Amherst, MA: University of Massachusetts).

Bradstock, A. (2005) Changing livelihoods and land reform: evidence from the Northern Cape province of South Africa. *World Development*, 33(11), pp. 1979–1992.

Burgess, R. (2001) Land and welfare: theory and evidence from China. Working paper (London: London School of Economics).

Cardenas, J.C. (2003) Real wealth and experimental cooperation: experiments in the field lab. *Journal of Development Economics*, 70(2), pp. 263–289.

Carter, M.R. (1984) Identification of the inverse relationship between farm size and productivity: an empirical analysis of peasant agricultural production. *Oxford Economic Papers*, 36(1), pp. 131–145.

Carter, M.R. and Zimmerman, F.J. (2000) The dynamic cost and persistence of asset inequality in an agrarian economy. *Journal of Development Economics*, 63(2), pp. 265–302.

Chau, N.H. (1998) Land reforms in the presence of monitoring costs and international trade. *Review of International Economics*, 6(4), pp. 564–579.

Conning, J.H. and Robinson, J.A. (2007) Property rights and the political organization of agriculture. *Journal of Development Economics*, 82(2), pp. 416–447.

de Janvry, A. (1981) The role of land reform in economic development: policies and politics. *American Journal of Agricultural Economics*, 63(2), pp. 384–392.

de Janvry, A. and Sadoulet, E. (1989) A study in resistance to institutional change: the lost game of Latin American land reform. *World Development*, 17(9), pp. 1397–1407.

Deininger, K. (2003) *Land Policies for Growth and Poverty Reduction* (Oxford and New York: Oxford University Press).

Deininger, K. and Ali, D.A. (2007) Do overlapping property rights reduce agricultural investment? Evidence from Uganda. World Band Policy Research working paper 4310 (Washington DC: World Bank).

Deininger, K., Hoogeveen, H. and Kinsey, B.H. (2004) Economic benefits and costs of land redistribution in Zimbabwe in the early 1980s. *World Development*, 32(10), pp. 1697–1709.

Deininger, K., Jin S. and Nagarajan, H.K. (2008) Efficiency and equity impacts of rural land market restrictions: evidence from India. *European Economic Review*, 52(5), pp. 892–918.

Deininger, K. and Olinto, P. (2001) *Redistribution, Investment, and Human Capital Accumulation: The Case of the Philippines* (Washington, DC: World Bank).

DeSilva, S. (2000) Skills, partnerships and tenancy in Sri Lankan rice farms. Yale Economic Growth Center Discussion Paper 819.

Durlauf, S.N. (1996) A theory of persistent income inequality. *Journal of Economic Growth*, 1(1), pp. 75–93.

Eastwood, R., Kirsten, J. and Lipton M. (2006) Premature deagriculturalisation? Land inequality and rural dependency in limpopo province, South Africa. *Journal of Development Studies*, 42(8), pp. 1325–1349.

Eastwood, R., Lipton, M. and Newell, A. (2008) Farm size. *Handbook of Agricultural Economics*, 4, pp. 2659–2772.

Eckstein, S.D. and Horton, G.D. (1978) Land reform in Latin America: Bolivia, Chile, Mexico, Peru and Venezuela. World Bank Staff working paper 275.

Eswaran, M. and Kotwal, A. (1985) A theory of contractual structure in agriculture. *American Economic Review*, 75(3), pp. 352–367.

Fabella, R.V. (2003) The comprehensive agrarian reform program and Coase theorem. *Philippine Review of Economics*, 40(1), pp. 109–114.

Feder, G. (1985) The relation between farm size and farm productivity: the role of family labor, supervision and credit constraints. *Journal of Development Economics*, 18(2–3), pp. 297–313.

Foster, A.D. and Rosenzweig, M.R. (1996) Comparative advantage, information and the allocation of workers to tasks: evidence from an agricultural labor market. University of Pennsylvania.

Foster, A.D. and Rosenzweig, M.R. (2004) Agricultural productivity growth, rural economic diversity, and economic reforms: India, 1970–2000. *Economic Development and Cultural Change*, 52(3), pp. 509–542.

Galor, O. and Zeira, J. (1993) Income distribution and macroeconomics. *Review of Economic Studies*, 60(1), pp. 35–52.

Gersbach, H. and Siemers, L. (2005) Land reforms and economic development. Discussion Paper 5184 (London: Centre for Economic Policy Research).

Government of India (2006a) *Ministry of Rural Development Annual Report 2006/07: Bharat Nirman through Rural Development* (New Delhi: Government Printer).

Government of India (2006b) *Towards Faster and More Inclusive Growth: An Approach to the 11th Five-Year Plan* (New Delhi: Planning Commission, Yojana Bhavan).

Guinnane, T.W. and Miller, R.I. (1997) The limits to land reform: the land acts in Ireland, 1870–1909. *Economic Development and Cultural Change*, 45(3), pp. 591–612.

Gunning, J.W., Hoddinott, J., Kinsey, B. and Owens, T. (2000) Revisiting forever gained: income dynamics in the resettlement areas of Zimbabwe, 1983–1996. *Journal of Development Studies*, 36(6), pp. 131–154.

Haque, T. (2001) Impact of tenancy reforms on productivity improvement and socio-economic status of poor tenants. Policy Paper 13 (New Delhi: National Centre for Agricultural Economics and Policy Research).

Jarvis, L.S. (1989) The unraveling of Chile's agrarian reform, 1973–1986, in: W. Thiesenhusen (ed.) *Searching for Agrarian Reform in Latin America* (Boston: Unwin Hyman), pp. 240–275.

Jeon, Y.D. and Kim, Y.Y. (2000) Land reform, income redistribution, and agricultural production in Korea. *Economic Development and Cultural Change*, 48(2), pp. 253–268.

Kaushik, A. (2005) *Nature of Land Market Interventions in India* (Uttar Pradesh: Institute for Sustainable Development Noida).

King, R. (1977) *Land Reform: A World Survey* (London: G. Bell and Sons).

Kinsey, B.H. and Binswanger H.P. (1993) Characteristics and performance of resettlement programs: a review. *World Development*, 21(9), pp. 1477–1494.

Lipton, M. (1993) Land-reform as commenced business – the evidence against stopping. *World Development*, 21(4), pp. 641–657.

Mearns, R. (1999) Access to land in rural India. Policy Research working paper 2123 (Washingon DC: World Bank).

Moog, R.S. (1997) *Whose Interests are Supreme? Organizational Politics in the Civil Courts in India* (Ann Arbor, MI: Association for Asian Studies).

Nugent, J.B. and Robinson, J.A. (2002) Are endowments fate? CEPR Working Paper 3206, London.

Otsuka, K. (1991) Determinants and consequences of land reform implementation in the Philippines. *Journal of Development Economics*, 35(2), pp. 339–355.

Rezende, G.C.D. (2005) Politicas trabalhista e fundiaria e seus efeitos adversos sobre o emprego agricoloa, a etrutura agraria e o desenvolvimento territorial rural no Brasil. Texto para discussao no. 1108 (Rio de Janeiro: Instituto de Pesquisa Economica Aplicada).

Scott, J.C. (1976) *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia* (New Haven, CT: Yale University Press).

Thangaraj, M. (2004) *Land Reforms in India. Tamil Nadu – An Unfinished Task*, Vol. 9 (New Delhi, Thousand Oaks, CA and London: Sage Publications).

Vollrath, D. (2007) Land distribution and international agricultural productivity. *American Journal of Agricultural Economics*, 89(1), pp. 202–216.

Wooldridge, J.M. (2001) *Econometric Analysis of Cross Section and Panel Data* (Cambridge, MA: MIT Press).

World Bank (2005) *World Development Report 2006: Equity and Development* (Washington, DC: The World Bank and Oxford University Press).

Yugandhar, B.N. (1996) *Land Reforms in India. Andhra Pradesh – People's Pressure and Administrative Innovations*, Vol. 3 (New Delhi, Thousand Oaks, CA and London: Sage Publications).