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Gerry Rodgers

INSTITUTE FOR HUMAN DEVELOPMENT
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Phones: +91-11-2335 8166/ 2332 1610 • Fax: +91-11-2376 5410
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I. INTRODUCTION

Caste, class and landholding are three major, visible dimensions of inequality in rural Bihar. In order to understand the pattern of economic development, and the distribution of its benefits, it is necessary to understand the influence of these factors on economic and social structure and behaviour. But to do so poses both theoretical and empirical problems. Each of these variables looks to a different model. Caste is at the heart of sociological model in which society is composed of different groups with different resources and opportunities; class underpins a structural model of production relations, reflecting patterns of control and exploitation; and land, as a factor of production, is a key element of neo-classical economic analysis. But the three variables are so closely interrelated that it is hard to distinguish their effects and an outcome that is correlated with caste will in all probability also be correlated with class and with land.[1]

An analysis of the relative importance and impact of these three factors in rural Bihar was carried out in 1983, using 1981 household survey data.[2] In particular, their impact on several important aspects of economic and social behaviour was examined: labour force participation, the adoption of agricultural technology, indebtedness and school attendance. All three factors were found to be relevant, but the nature and strength of their impact varied from one issue to another. On the whole, class gave the most consistent explanations, but land also had an independent wealth effect and there was often a specific pattern of behaviour associated with particular castes and communities.

Over the past 30 years there has been considerable economic and social transformation in rural Bihar and it is of great interest to explore whether these changes have also affected the underlying model of behaviour. The strengthening of market forces and the opening up of new opportunities has increased inequality in the Indian economy as a whole. Is this the result of new factors, or are new inequalities built on old foundations? Have the new social and economic patterns that have emerged reduced the impact of caste, class or landholding, or changed their relative importance? In order to examine such questions, the present paper returns to the same issues as in the 1983 analysis with new data, in order to analyse both the impact of these three variables today, and the nature of change in the intervening period.

The starting point for this analysis, as in the 1983 paper, is to examine the interactions among caste, class and landholding. Since these three variables are closely correlated, in order to isolate their independent effects we need to examine the nature of the relationship among them, and how they have changed over time.

Subsequently we explore, through multivariate analysis, the influence of these variables and other factors on the same aspects of economic development as were studied in 1983.

II. DATA CONSIDERATIONS

In 1981 a representative sample of 36 villages from rural Bihar was chosen. Twelve of these villages, representative of these 36 (stratified by district and village size), were selected for in-depth study. The data for 1981 come from a census of the households in these 12 villages (2531 households).

In 2009 the same villages were studied, but the design was different. Instead of a census of the 12 villages, we have a sample of 974 households from these villages (from a total population of 5498 households recorded in 2009, so a sample of about 18%).[3,4] Moreover, the sample consists of successor households to a stratified random sample of households taken in a survey of these villages carried out in 1998-99. The main stratification factors in 1998-99 were village size and economic class. Because of the stratification and the attempt to trace households over a 10 year period, this is not a straightforward random sample. For comparability with 1981, it is necessary to weight the sample to reflect sampling proportions in 1998-99 (so results in this paper are based on the weighted data).

The tables below give the patterns of caste, class and landholding in 1981 and (weighted) 2009. Table 1 gives the distribution of households by caste and community. The categories used are those in the 1983 study (where the rationale of this breakdown is discussed).[5] The population composition of villages normally changes quite slowly, so we would expect the caste composition in 2009 to be rather similar to that in 1981.[6] Of course, there can be changes, for demographic reasons - if the population growth of some groups is faster than others, if the pattern of household formation is different between different groups, or if there is migration.

It can be seen that for the 12 villages the broad pattern is similar in 1981 and 2009, but there are some differences, in particular a substantial increase in the share of OBC I from 16

Table 1
Caste and Community: Percentage Distribution of Households, 1981 and 2009

Caste or community	*1981*	*1998-99**	*2009*
Brahmin and Kayasta	12.7	13.9 (14.6)	14.1
Bhumihar and Rajput	9.6	7.8 (8.1)	8.3
OBC I	16.3	19.0 (21.4)	25.5
Yadav	5.7	5.4 (6.2)	6.5
Koeri	5.5	3.4 (2.4)	2.4
Kurmi	2.8	2.9 (2.6)	2.5
Other OBC II	7.4	7.4 (7.0)	4.2
Scheduled Caste	27.4	25.3 (25.3)	25.1
Muslim	12.6	13.8 (12.1)	10.4
Scheduled Tribe	0.0	1.0 (0.3)	1.0
Total	100.0	100.0	100.0

Note : * the first figure refers to data from a census of these villages in 1998; the second figure (in brackets) to data from a sample in 1999.

to 25%, and corresponding smaller declines in the shares of several other categories, notably Muslims, Scheduled Castes, Koeri and other OBC II. The appearance of a Scheduled Tribe population in 2009 is presumably the result of migration, and migration may also account for some of the other changes.

To explore the reasons for these changes, we first look at the census and survey of households from the same villages in 1998-99. Table 1, second data column, gives the caste pattern from a census of the 12 villages in 1998; this is methodologically the same as 1981. On the whole, the pattern in 1998 is fairly close to that in 1981 (average difference 1.3 percentage points), though the proportion of OBC I is somewhat higher than the 1981 figure. In 1999 a stratified random sample of households was taken from these 12 villages. After weighting to compensate for stratification (by class and village size), the pattern by caste (figures are given in brackets in the table) is similar but not identical to the census; there is some increase in OBC I and some decrease in Muslims.

The 2009 sample can be compared with the 1999 sample (i.e. the figures in brackets). Between 1999 and 2009 there is again some change in the caste pattern, averaging 1.1 points. In this case we can investigate the reasons directly, because the sample in 2009 consists of successor households to the households sampled in 1999. Three factors could be responsible: changes in caste classification of the same household; differences between caste groups in the recovery of households in the 2009 sample compared with 1999; and differences in the extent of household splitting between the two years, which would change the number of households in 2009.

Changes in caste classification prove to be quite important. 48 reclassifications were recorded in 974 observations. Of these, 20 were reclassifications into OBC I, mostly from OBC II. This alone would account for almost one third of the increase in the share of OBC

Table 2

Longitudinal Pattern of Sample Households by Caste

Caste	*No of households in 1999*	*Households recovered in 2009*	*Recovery rate*	*Tot no. of households in 2009*	*Ratio sample hhds to hhds recovered in 2009*	*Overall ratio*
Brahmin and Kayasta	166	155	0.93	181	1.17	1.09
Bhumihar and Rajput	88	74	0.84	92	1.24	1.05
OBC I	155	144	0.93	184	1.28	1.19
Yadav	52	46	0.88	57	1.24	1.10
Koeri	30	28	0.93	31	1.11	1.03
Kurmi	28	26	0.93	34	1.31	1.21
Other OBC II	72	59	0.82	72	1.22	1.00
Scheduled Caste	198	174	0.88	224	1.29	1.13
Scheduled Tribe	3	2	0.67	2	1.00	0.67
Upper Muslim	28	23	0.82	28	1.22	1.00
Lower Muslim	71	58	0.82	69	1.19	0.97
Total	891	789	0.89	974	1.23	1.09

I. Some of these reclassifications are no doubt data errors, but some also reflect uncertainties or controversies about the classification of particular castes, and this particularly concerns the distinction between OBC I and OBC II. This factor may also have been responsible for the increase in OBC I between 1981 and 1998.

The difference across castes in recovery rates of households in the 2009 sample also turns out to be substantial (table 2). The recovery rate is particularly low for Muslims, which largely explains the decline in the proportion of Muslim households in 2009, although we do not know whether this is because of out-migration, disappearance of households or incomplete survey coverage. It is higher than average for OBC I, Koeri, Kurmi and Brahmins.

Finally, the extent to which changes in 2009 are due to addition of new households, created in 2009 by splitting of 1999 households, also varies by caste (table 2, 4th and 5th data columns), although the differences are not as large as for the other factors. OBC I and Kurmi have the highest increase, 28-29%, compared with an average of 23%.

So the changes observed arise from a variety of sources, some of them statistical in nature, others reflecting real changes, which might be demographic or classificatory. The most substantial change concerns the share of OBC I, which rises because of a number of real and statistical factors, all operating in the same direction. For other groups, different factors tend to offset each other, and variations are not particularly large, though the apparent underrepresentation of Muslims in 2009 should be noted.

Changes in the class pattern are larger than those for caste (table 3). The class breakdown is, like the caste breakdown, chosen for comparability with 1981, and the rationale is discussed in the 1983 paper. Broadly there are four agricultural labour classes, divided according to whether they are also cultivating land (AL1 and AL2) or not (AL3 and AL4) and whether they are attached or tied to an employer (AL1 and AL3) or not (AL2 and AL4); three peasant classes, distinguished according to their labour relations – poor peasants (P1), who neither hire in nor hire out labour, middle peasants who hire labour in and all family members also work (P2) and big peasants (P3) who hire in labour and who use only male family labour; a "landlord" class (P4) that rents out land and at most supervises agricultural work; and non-agricultural households (in 2009 divided into wage labour, NAW, and self-employment, NAS).[7]

Attached agricultural labour (AL1 and AL3) has all but disappeared since 1981. Non-attached agricultural labour (AL2 and AL4) has risen even more than the decline in attached labour, so overall the share of agricultural labour has slightly increased. By far the biggest increase concerns landless agricultural labour (AL4). There has also been a substantial increase in non-agricultural work, especially non-agricultural wage work. Among the cultivating and landowning classes, there has been some increase in the share of poor peasants (P1) and a decline in the number of big peasants (P3), but the shifts among different groups of cultivators are fairly small given the increase in population pressure on land. The main exception concerns landlords (P4), whose share has declined sharply. However, for this group there is some change of concept between the two surveys, so the numbers are not strictly comparable. In 1981, only large landowners rented out much land, and they mainly did it

in the context of "semi-feudal" production relations, as a means of maintaining dependence among labourers; all those who rented out land were therefore classified as landlords. In 2009, there was much wider renting out of land among smaller cultivators, largely associated with temporary out-migration or non-agricultural work. So the implications of renting out of land are different now. For this reason, only pure rentiers, renting out land but not engaged in other work (except supervision), were included in the "landlord" group in 2009. With the old definition the estimated number of "landlords" would have been much higher. It is not possible to keep the same definition because the underlying social framework has changed. It remains true that the class of landlords has sharply declined, but there is as much renting out of land as before.

Table 3

Class: Percentage Distribution of Households, 1981 and 2009

Class	*1981*	*2009*
AL1 (ALLA)	13.6	1.1
AL2 (ALLF)	14.5	16.8
AL3 (ALNA)	3.0	.5
AL4 (ALNF)	21.1	35.4
P1 (POORMIDP)	7.6	11.2
P2 (MIDP)	4.5	4.4
P3 (BIGP)	21.3	16.9
P4 (LANDLD)	8.8	1.1
NAS (NONAG)*	5.6	2.9
NAW		9.8
Total	100.0	100.0

Note: Class names in 2009 and (in brackets) in 1981
AL1/ALLA=Agricultural labour, cultivating, attached
AL2/ALLF=Agricultural labour, cultivating, not attached
AL3/ALNA=Agricultural labour, not cultivating, attached
AL4/ALNF=Agricultural labour, not cultivating, not attached
P1/POORMIDP= cultivators neither hiring labour in, nor out
P2/MIDP=cultivators hiring labour in, both male and female family members work in agriculture
P3/BIGP=cultivators hiring labour in, only male family members work in agriculture
P4/LANDLD=only supervision of agriculture or leasing out of land (definition more restrictive in 2009)
NAS=non-agricultural self-employment (2009)
NAW=non-agricultural wage employment (2009)
NONAG (non-agriculture) in 1981 (combines NAS and NAW)

Alongside these large changes in class structure, the distribution of land has also shifted (table 4). Landlessness has increased from 43 to 56%, which is not surprising given growing population pressure on land; indeed an even larger increase could have been foreseen given that the number of households, the relevant demographic variable, has increased by some 117%. In fact, much of the adjustment to increased population pressure has come through the subdivision of small plots, but the shift is not even; there is a sharp decline in the largest

Table 4
Land Ownership: Percentage Distribution of Households, 1981 and 2009

Land ownership	*1981*	*2009*
None	43.1	56.0
Less than 1 acre	27.0	21.0
1 to 2.49 acres	11.5	15.1
2.5 to 4.99 acres	8.6	4.7
5 to 9.99 acres	5.8	2.3
10 to 19.99 acres	3.2	.7
20 acres or more	0.8	.1
Total	100.0	100.0

landholdings, but also some decline in the smallest. In contrast there is some increase in the 1 to 2.5 acre range, which might be regarded as a viable family farm in Bihar conditions. So the overall distribution of land, among those who own some, has become somewhat less unequal.

III. TRENDS IN THE INTERACTIONS AMONG CASTE, CLASS AND LAND

We now turn to the interrelationships among caste, class and land, and how they have changed over time.

First, caste and class. Caste is of course a major determinant of position in the social hierarchy, and so is ultimately an important determinant of class position. Table 5 presents the distribution of households by caste group and class, for 2009 and (in brackets) 1981. Apart from the last column, these are row percentages – for each caste group, the table gives the percentages found in each class. The last column gives the percentage distribution of caste groups in 2009s

There are some very interesting patterns here. In 2009. Brahmins (there are very few Kayastas) are largely found in two classes, big peasants (P3) and non-agricultural work, along with a few poor peasants (P1). For these castes there are two major changes compared with 1981 – a decline in the landlord class (P4) and the rise of non-agriculture (NONAG). The end of semi-feudal production relations affected this group most of all, and has led to a substantial reorientation away from agriculture, even if there are still many large farmers. A few households seem to have slipped down the scale to become poor peasants. There is no change in the small numbers of agricultural labourers.

Bhumihars and Rajputs, the other "forward" castes, show a very similar pattern, with three quarters of households in 2009 in the big peasant (P3) and non-agricultural (NONAG) categories. Again there is a big shift towards non-agricultural work since 1981, as for Brahmins, and there is slightly more downward mobility into agricultural labour.

The next group in the social ranking consists of Yadavs, Kurmis and Koeris, all OBC-II agricultural castes found mostly in the different peasant categories. None of these groups has diversified into non-agricultural work to anything like the extent of the forward castes. Kurmis, who were concentrated among large peasants and landlords before (P3 and P4),

Table 5
Caste by Class, 2009 and (in brackets) 1981

		Class									*Total*
		AL1	*AL2*	*AL3*	*AL4*	*P1*	*P2*	*P3*	*P4*	*NONAG*	
Brahmin and Kayasta	Frequency	0	5	0	7	20	1	73	3	35	144
	% within caste group	.0%	3.5%	.0%	4.9%	13.9%	.7%	50.7%	2.1%	24.3%	14.1%
	(% in 1981)	(0.0)	(3.9)	(0.3)	(3.4)	(1.8)	(0.9)	(58.7)	(26.6)	(4.4)	(12.7)
Bhumihar and Rajput	Frequency	0	6	0	2	12	2	41	3	19	85
	% within caste group	.0%	7.1%	.0%	2.4%	14.1%	2.4%	48.2%	3.5%	22.4%	8.3%
	(% in 1981)	(0.0)	(0.6)	(0.0)	(1.6)	(2.7)	(0.5)	(75.2)	(18.1)	(1.3)	(9.6)
OBC I	Frequency	9	55	2	117	27	8	11	1	28	258
	% within caste group	3.5%	21.3%	.8%	45.3%	10.5%	3.1%	4.3%	.4%	10.9%	25.5%
	(% in 1981)	(17.7%	(20.7)	(7.8)	(31.8)	(6.8)	(2.5)	(5.2)	(2.2)	(5.1)	(16.3)
Yadav	Frequency	0	21	0	11	7	13	7	0	6	65
	% within caste group	.0%	32.3%	.0%	16.9%	10.8%	20.0%	10.8%	.0%	9.2%	6.5%
	(% in 1981)	(6.8)	(22.8)	(1.7)	(8.9)	(17.1)	(26.8)	(14.3)	(0.6)	(1.1)	(5.7)
Koeri	Frequency	0	3	0	3	8	1	7	2	2	26
	% within caste group	.0%	11.5%	.0%	11.5%	30.8%	3.8%	26.9%	7.7%	7.6%	2.4%
	(% in 1981)	(2.4)	(15.5)	(0.0)	(6.1)	(31.1)	(18.4)	(12.6)	(10.9)	(3.1)	(5.5)
Kurmi	Frequency	0	5	0	3	3	4	8	0	2	25
	% within caste group	.0%	20.0%	.0%	12.0%	12.0%	16.0%	32.0%	.0%	8.0%	2.5%
	(% in 1981)	(1.1)	(9.3)	(0.0)	(4.7)	(10.5)	(7.9)	(56.0)	(9.2)	(1.1)	(2.8)
OBC II	Frequency	0	9	0	7	4	6	4	1	12	43
	% within caste group	.0%	20.9%	.0%	16.3%	9.3%	14.0%	9.3%	2.3%	27.9%	4.2%
	(% in 1981)	(3.7)	(11.6)	(0.0)	(9.8)	(15.2)	(8.0)	(11.8)	(14.1)	(25.8)	(7.4)
SC	Frequency	2	42	3	162	24	3	11	0	8	255
	% within caste group	.8%	16.5%	1.2%	63.5%	9.4%	1.2%	4.3%	.0%	3.2%	25.1%
	(% in 1981)	(33.1)	(18.3)	(5.3)	(34.5)	(2.8)	(1.4)	(0.8)	(1.2)	(2.6)	(27.4)
Muslim	Frequency	0	23	0	44	8	6	9	1	15	106
	% within caste group	.0%	21.7%	.0%	41.5%	7.5%	5.7%	8.5%	.9%	14.1%	10.4%
	(% in 1981)	(6.4)	(17.8)	(1.0)	(33.3)	(8.8)	(1.6)	(13.0)	(8.3)	(9.8)	(12.6)
ST	Frequency	0	4	0	3	1	1	0	0	1	10
	% within caste group	.0%	40.0%	.0%	30.0%	10.0%	10.0%	.0%	.0%	10.0%	1.0%
	(not present in 1981)										
Total	Frequency	11	173	5	359	114	45	171	11	128	1017
	% within caste group	1.1%	17.0%	.5%	35.3%	11.2%	4.4%	16.8%	1.1%	12.6%	100.0%
	(% in 1981)	(13.6)	(14.5)	(3.0)	(21.1)	(7.6)	(4.5)	(21.3)	(8.8)	(5.6)	(100.0)

Note: * For class definitions see table 3.

have lost some ground. While one third are still found in these groups, the share of middle and poor peasants (P1 and P2) has increased, and 30% now do agricultural wage labour. Yadavs were less well placed than Kurmis before, and remain so, but have lost less ground than Kurmis. The percentage doing agricultural labour has nevertheless increased to a similar extent. Koeris have changed less; they were, and are still mainly cultivators, without a major change in the distribution across different groups.

Other castes in the OBC-II group were already more concentrated in non-agricultural activities in 1981, and this has been maintained. They have the highest share of non-agricultural work of any group. As in the case of the upper castes, the main shift has been away from the landlord category (P4), with some increase in agricultural labour. The shares of other classes have changed relatively little.

Other Backward Classes-I have a different profile. In 1981 a quarter of them were attached agricultural labour (AL1 and AL3), and this class has all but disappeared. There has been some corresponding increase in casual agricultural labour (AL2 and AL4), which now accounts for two thirds of all households, but a few have become small cultivators, and they have also shared in the increase in non-agricultural work. On average, then, their status has somewhat improved.

A similar, but weak pattern can be discerned for scheduled castes. Like the OBC-I they have moved out of attached agricultural wage labour, but most of them have ended up as landless casual labour in 2009. A few have become marginal cultivators or non-agricultural workers, but less than for OBC-I.

Finally, Muslims do not show major changes. Only a small proportion were attached labourers in 1981, but over half were casual labourers; the overall percentage of agricultural labour has risen between 1981 and 2009, but only from 58% to 63%. There is some decline in the landlord category (P4), and a rise in non-agricultural work, but the shift is less strong than for the Hindu forward castes. It is now common to divide Muslims into forward and backward castes, for whom the changes may well be different, but this was not the practice in 1981.

A small number of scheduled tribe households were found in the sample 2009 but not in 1981. Their profile is fairly close to that of OBC I, but the numbers are too small for reliable interpretation.

Overall we can see both continuity and change here. The end of semi-feudal relations has not had much impact at the top of the village hierarchy, as new non-agricultural opportunities (largely outside the village) have provided an economic alternative for the previously dominant groups. The middle castes, which have had a spectacular rise to political power in the State, do not show a similarly spectacular rise in the village hierarchy; on the contrary their position has somewhat deteriorated, on average, with some increase in agricultural labour. And the poorer groups in 1981 have escaped from labour bondage, but have made relatively little progress in either agriculture – a few labourers have become cultivators, but the shift is small – or non-agriculture – again there is some progress, but less than for the better off groups.

Table 6
Caste by Land, 2009 and (in brackets) 1981

		Land owned							*Total*
		None	*less than 1 acre*	*1 to 2.49 acres*	*2.5 to 4.99 acres*	*5 to 9.99 acres*	*10 to 19.99 acres*	*20 acres or more*	
Brahmin and Kayasta	Frequency	28	35	47	16	13	3	0	142
	% of households	19.7%	24.6%	33.1%	11.3%	9.2%	2.1%	.0%	14.1%
	(% in 1981)	(7.5)	(11.9)	(16.3)	(25.1)	(24.1)	(12.5)	(2.5)	(12.6)
Bhumihar and Rajput	Frequency	11	28	26	14	4	1	1	85
	% of households	12.9%	32.9%	30.6%	16.5%	4.7%	1.2%	1.2%	8.3%
	(% in 1981)	(3.3)	(24.5)	(28.2)	(21.2)	(9.5)	(10.0)	(3.3)	(9.6)
OBC I	Frequency	196	37	22	2	1	0	0	258
	% of households	76.0%	14.3%	8.5%	.8%	.4%	.0%	.0%	25.5%
	(% in 1981)	(60.9)	(30.6)	(6.3)	(0.7)	(0.0)	(1.5)	(0.0)	(16.3)
Yadav	Frequency	18	24	18	3	3	1	0	67
	% of households	26.9%	35.8%	26.9%	4.5%	4.5%	1.5%	.0%	6.5%
	(% in 1981)	(21.5)	(48.6)	(13.9)	(12.5)	(2.1)	(1.4)	(0.0)	(5.7)
Koeri	Frequency	5	13	7	0	1	0	0	26
	% of households	19.2%	50.0%	26.9%	.0%	3.8%	.0%	.0%	2.4%
	(% in 1981)	(10.7)	(56.4)	(21.4)	(7.9)	(2.9)	(0.7)	(0.0)	(5.5)
Kurmi	Frequency	7	4	9	2	2	2	0	26
	% of households	26.9%	15.4%	34.6%	7.7%	7.7%	7.7%	.0%	2.5%
	(% in 1981)	(11.1)	(16.7)	(15.3)	(27.8)	(22.2)	(5.6)	(1.4)	(2.8)
OBC II	Frequency	17	17	6	2	1	0	0	43
	% of households	39.5%	39.5%	14.0%	4.7%	2.3%	.0%	.0%	4.2%
	(% in 1981)	(46.3)	(32.4)	(11.7)	(3.7)	(3.7)	(1.1)	(1.1)	(7.5)
SC	Frequency	214	31	9	2	0	0	0	256
	% of households	83.6%	12.1%	3.5%	.8%	.0%	.0%	.0%	25.1%
	(% in 1981)	(69.4)	(26.3)	(3.2)	(0.9)	(0.1)	(0.0)	(0.0)	(27.4)
Muslim	Frequency	69	19	10	8	0	0	0	106
	% of households	65.1%	17.9%	9.4%	7.5%	.0%	.0%	.0%	10.4%
	(% in 1981)	(58.6)	(17.9)	(11.3)	(6.3)	(4.4)	(1.3)	(0.3)	(12.6)
ST	Frequency	4	6	0	0	0	0	0	10
	% of households	40.0%	60.0%	.0%	.0%	.0%	.0%	.0%	1.0%
Total	Frequency	569	214	154	49	25	7	1	1019
	% of households	55.8%	21.0%	15.1%	4.8%	2.5%	.7%	.1%	100.0%
	(% in 1981)	(43.1)	(27.0)	(11.5)	(8.6)	(5.8)	(3.2)	(0.8)	(100.0)

Next we look at the connections between caste and land ownership. Table 6 shows the pattern of landholding with caste, and its change since 1981, in the same way as table 5 did for caste and class.

The relationships are less marked than for caste and class, but are strong nevertheless. In 2009 the two groups of upper castes, Bhumihars and Rajputs, and Brahmins and Kayasta

Table 7
Land Ownership by Caste (2009)

Caste Group	*Land (acres)*	*N*
Brahmin and Kayasta	1.92	144
Bhumihar and Rajput	1.85	85
OBC I	0.27	259
Yadav	1.23	66
Koeri	0.69	25
Kurmi	2.06	25
Other OBC II	0.68	43
Scheduled Castes	0.11	256
Muslim	0.47	106
Scheduled Tribes	0.08	10
Total	0.75	1017

have the largest landholdings, along with Kurmis, with Yadavs not far behind (table 7).

So we see that the more advanced middle castes now have landholdings that are comparable with the historically dominant forward castes. This pattern was already emerging in 1981, but it has strengthened over the last 30 years. In 1981 the largest landholdings were found among forward castes (especially over 10 acres) and Kurmis. In the period up to 2009, all these groups show a steep decline in larger landholdings (from 37% to 11% in the 5 to 20 acre category for Brahmins, from 20% to 6% for Bhumihars and Rajputs, and – somewhat less sharp – from 28% to 15% for Kurmis). Yadavs on the other hand have gained – from 3 to 6%.

In the intermediate land categories, 1 to 5 acres, there have been two factors at work. The first is the decline in larger holdings, especially for Brahmins and Kurmis, which has pushed many households down into this category. Obviously, over three decades this is partly the result of household division and population growth. On the other hand, Yadavs have increased their landholdings, and have moved up from marginal farmer and landless categories. The proportion of Yadavs with more than an acre of land rose from 30% to 37% despite the increase in population pressure. Their share in the intermediate land category has risen from 26% in 1981 to 48% in 2009. For all other groups this proportion was stable or declined.

At the bottom of the hierarchy, landlessness is concentrated among Scheduled Castes, OBC-I, Muslims and to some extent other OBC-II (other than Kurmi, Koeri and Yadav). This pattern has changed very little since 1981. The main change is an increase in landlessness among Scheduled Castes, already 70% in 1981, to over 80% in 2009. There is a corresponding decline in the proportion of SCs with marginal landholdings up to 1 acre.

Landlessness among other groups in 2009 was in the 13 to 27% range. It has risen among the forward castes, though starting from a low level. This is surely connected with the growth of non-agricultural occupations, since as we saw few of these households engaged in agricultural labour. There was also some increase in landlessness among middle castes, except others (OBCII), and Muslims. The small number of Scheduled Tribes is a special

case since they were not present in 1981.

So the overall pattern of landholding is changing, and the average patterns hide different fortunes for different groups. The exclusion from land of the scheduled castes is intensifying, Yadavs are moving up, the forward castes and Kurmis are moving down, while others are broadly maintaining their position.

The last table in this section concerns land ownership and class (table 8). These are of course highly correlated, in part almost by definition – so we can see in the table that agricultural labour households that do not cultivate (AL3 and AL4) are essentially landless. Agricultural labour households who also cultivate some land (AL1 and AL2) are,

Table 8
Class by Land, 2009 and (in brackets) 1981

Class		*Land owned*							*Total*
		None	*less than 1 acre*	*1 to 2.49 acres*	*2.5 to 4.99 acres*	*5 to 9.99 acres*	*10 to 19.99 acres*	*20 acres or more*	
AL1	Frequency	8	3	0	0	0	0	0	11
	% within Class	72.7%	27.3%	.0%	.0%	.0%	.0%	.0%	1.1%
	(% in 1981)	(61.6)	(34.6)	(3.8)	(0.0)	(0.0)	(0.0)	(0.0)	(13.6)
AL2	Frequency	76	70	20	4	0	1	0	171
	% within Class	44.4%	40.9%	11.7%	2.3%	.0%	.6%	.0%	16.8%
	(% in 1981)	(26.8)	(59.5)	(11.5)	(1.9)	(0.3)	(0.0)	(0.0)	(14.5)
AL3	Frequency	5	0	0	0	0	0	0	5
	% within Class	100.0%	.0%	.0%	.0%	.0%	.0%	.0%	0.5%
	(% in 1981)	(97.4)	(2.6)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(3.0)
AL4	Frequency	351	6	3	1	0	0	0	361
	% within Class	97.2%	1.7%	.8%	.3%	.0%	.0%	.0%	35.4%
	(% in 1981)	(98.5)	(1.3)	(0.2)	(0.0)	(0.0)	(0.0)	(0.0)	(21.1)
P1	Frequency	27	54	29	3	0	0	0	113
	% within Class	23.9%	47.8%	25.7%	2.7%	.0%	.0%	.0%	11.2%
	(% in 1981)	(11.5)	(64.6)	(19.3)	(3.6)	(1.0)	(0.0)	(0.0)	(7.6)
P2	Frequency	8	17	16	2	2	0	0	45
	% within Class	17.8%	37.8%	35.6%	4.4%	4.4%	.0%	.0%	4.4%
	(% in 1981)	(4.4)	(46.0)	(31.9)	(13.3)	(1.8)	(0.9)	(1.8)	(4.5)
P3	Frequency	9	40	66	35	15	6	1	172
	% within Class	5.2%	23.3%	38.4%	20.3%	8.7%	3.5%	.6%	16.9%
	(% in 1981)	(2.8)	(18.6)	(21.4)	(25.7)	(18.4)	(11.9)	(1.1)	(21.3)
P4	Frequency	0	2	3	2	3	1	0	11
	% within Class	.0%	18.2%	27.3%	18.2%	27.3%	9.1%	.0%	1.1%
	(% in 1981)	(0.5)	(24.3)	(20.7)	(23.0)	(18.5)	(7.7)	(5.4)	(8.8)
NONAG	Frequency	86	21	17	2	3	0	0	129
	% within Class	66.7%	16.3%	13.2%	1.6%	2.3%	.0%	.0%	12.7%
	(% in 1981)	(94.4)	(4.9)	(0.7)	(0.0)	(0.0)	(0.0)	(0.0)	(5.6)
Total	Frequency	570	213	154	49	23	8	1	1018
	% within Class	56.0%	20.9%	15.1%	4.8%	2.3%	.8%	.1%	100.0%
	(% in 1981)	(43.1)	(27.0)	(11.5)	(8.6)	(5.8)	(3.2)	(0.8)	(100.0)

unsurprisingly, concentrated in the landless or marginal categories; and there is a regular progression in landholding as one moves through the peasant categories, the average rising from 0.68 acres among the poor peasants (P1) to 2.6 acres among large peasants (P3) and 3.8 acres among landlords (P4).

The changes between 1981 and 2009 for each class are mostly driven by change in the distribution of land overall (table 4 above). Poor peasants (P1) are, as in 1981, predominantly in the less than one acre category. However, they show some increase in the 1 to 2.5 acre category and a larger increase in the share of the landless. Middle peasants (P2), who hire in some labour, show only limited change since 1981, with a decline in larger holdings and some increase in landlessness. Large peasants, on the other hand, are clearly found lower down the land hierarchy than before, with over 60% in the 0 to 2.5 acre category, compared with 40% in 1981, and there is now less difference between middle and big (P3) peasants than before.

One phenomenon worth noting concerns the increase in poor and middle peasants who own no land; this of course means that they are renting in land, as is also true of many agricultural labour households. This is a sign of the change in the nature of the rental market. Another significant change concerns non-agriculturalists. In 1981 this group had virtually no land; in 2009 one third have some land. This may reflect a move from agricultural to non-agricultural activities by households who nevertheless keep their land and rent it out.

IV. CASTE, CLASS AND LAND AS DETERMINANTS OF SOCIAL AND ECONOMIC BEHAVIOUR

We now explore the relative importance and impact of caste, class and land on selected aspects of household economic and social behaviour. We limit ourselves to topics which were already examined in the 1983 study, in order to permit direct comparisons. These concerned labour force participation, school attendance, traditional debt and agricultural technology. These four topics offer diverse perspectives on the rural economy. Labour force participation provides information on how households engage in economic activity; school attendance is an important determinant of capability and access to opportunity; traditional debt (indebtedness to employers and landlords) is an indicator of economic and social dependency and agricultural technology can provide information about participation in development and economic change. A discussion of the underlying theory for each of these issues can be found in the 1983 paper and will not be repeated here.

Because class, caste and land are interrelated we really need to use multivariate analysis to assess their relative importance. But it is useful to start by examining the individual two-way relationships. So for each of these topics we first look at the bivariate relationships with caste, class and land and then (in the next section) undertake multivariate analysis, replicating as far as possible the models that were estimated in 1983.

Table 9, 10 and 11 present these bivariate relationships. Each table gives the mean value of the behavioural variables, for each category of caste (table 9), class (table 10) and land (table 11). Comparable figures from 1981 are given in brackets in the next column.

Table 9
Economic and Social Patterns: Mean Values by Caste

Caste group	*Proportion of adults aged 15 to 59 in wide labour force*	*(1981)*	*Proportion of 5 to 24 year olds attending school*	*(1981)*	*Proportion hhd members 12-18 at school*	*Traditional debt*	*(1981)*	*Technology index*	*(1981)*
Brahmin and Kayasta	64.9%	(44.4%)	58.2%	(53.2%)	82.9%	35.2%	(33.2%)	1.18	(2.28)
Bhumihar and Rajput	61.4%	(45.4%)	68.7%	(54.1%)	87.5%	29.8%	(29.2%)	1.06	(2.16)
OBC I	91.2%	(79.9%)	46.7%	(13.0%)	62.2%	49.2%	(77.2%)	0.96	(1.90)
Yadav	93.9%	(82.9%)	58.4%	(23.3%)	76.9%	22.6%	(57.4%)	1.35	(2.36)
Koeri	71.6%	(72.4%)	60.9%	(45.2%)	78.7%	24.9%	(47.4%)	1.27	(2.39)
Kurmi	72.2%	(49.9%)	62.0%	(54.1%)	85.5%	26.7%	(28.6%)	2.00	(2.79)
OBC II	80.1%	(64.4%)	50.3%	(29.7%)	55.3%	34.2%	(55.9%)	1.38	(1.94)
SC	93.5%	(89.4%)	50.0%	(17.1%)	57.2%	44.2%	(79.0%)	1.05	(2.30)
Muslim	86.1%	(64.3%)	48.5%	(19.2%)	50.9%	41.0%	(64.0%)	0.81	(1.99)
ST	92.9%		46.7%		53.0%	30.3%		0.75	
Total	83.9%		53.0%		66.1%	39.8%		1.15	

Table 10
Economic and Social Patterns : Mean Values by Class

Class	*Adult 15 to 59 proportion in wide labour force*	*(1981)*	*pro-portion of 5 to 24 year olds attending school*	*(1981)*	*Proportion hhd members 12-18 at school*	*Traditional debt*	*(1981)*	*Technology index*	*(1981)*
AL1	100.0%	(84.3%)	51.5%	(9.5%)	54.5%	82.5%	(73.5%)		
AL2	93.1%	(82.7%)	55.0%	(2.3%)	62.4%	39.7%	(100.0%)		
AL3	96.1%	(79.9%)	53.5%	(19.6%)	87.0%	52.0%	(73.2%)		
AL4	92.0%	(89.6%)	43.4%	(16.6%)	49.7%	50.9%	(88.9%)	0.98*	(2.11)
P1	81.9%	(76.0%)	55.5%	(35.9%)	74.0%	42.9%	(61.6%)	1.23	(2.28)
P2	89.2%	(82.0%)	57.2%	(39.5%)	76.5%	26.7%	(51.3%)	1.41	(2.38)
P3	71.5%	(46.3%)	57.9%	(50.4%)	84.2%	23.2%	(32.5%)	1.27	(2.29)
P4	48.9%	(43.5%)	64.3%	(58.0%)	100.0%	0.0%	(24.1%)	1.17	(2.00)
NONAG	65.8%	(53.4%)	66.9%	(26.5%)	74.2%	32.2%	(52.3%)	0.79	
Total	83.9%		53.0%		66.1%	39.8%		1.15	

Note: *All agricultural labour categories combined for the technology index (only those households operating some land).

Table 11
Economic and Social Patterns: Mean Values by Land Ownership

Land owned	*Adult 15 to 59 proportion in wide labour force*	*(1981)*	*Proportion of 5 to 24 year olds attending school*	*(1981)*	*Proportion hhd members 12-18 at school*	*Traditional debt*	*(1981)*	*Technology index*	*(1981)*
None	89.3%	(80.7%)	47.5%	(12.2%)	53.7%	48.8%	(77.4%)	0.86	(1.89)
less than 1 acre	82.3%	(75.0%)	60.1%	(27.3%)	74.1%	36.9%	(63.4%)	1.17	(2.18)
1 to 2.49 acres	74.0%	(61.7%)	59.0%	(43.3%)	84.7%	25.5%	(46.0%)	1.32	(2.15)
2.5 to 4.99 acres	73.8%	(49.9%)	58.2%	(53.8%)	83.1%	15.9%	(31.4%)	1.21	(2.37)
5 to 9.99 acres	61.5%	(44.1%)	61.6%	(61.7%)	97.5%	5.8%	(19.3%)	1.73	(2.51)
10- 19.99 acres	61.0%	(42.0%)	60.4%	(61.1%)	100.0%	0.0%	(17.4%)	1.50	(2.55)
20 acres or more	43.3%	(36.6%)	100.0%	(76.8%)	100.0%	0.0%	(8.5%)	2.50	(2.56)
Total	83.9%		53.0%		66.1%	39.8%		1.15	

Labour Force Participation

The measure of labour force participation used is the proportion of household members aged 15 to 59 participating in the labour force, widely defined to include unpaid family labour in family farm or enterprise. There is much greater variation in female labour force participation than male. However, in these two-way tables we take the average for all adults, since cross-tabulations with caste, class and land were only reported for that variable in the 1983 study.[8]

The labour force participation rate shows a strong relationship with all three categorizations of households. By caste (table 9), the rates vary from 61% for Bhumihars and Rajputs to 94% for Scheduled Castes and Yadavs. All forward castes have low participation rates. Middle castes also have quite low rates, in the 70 to 80% range, with the exception of Yadavs. Muslims, OBC I and Scheduled tribes all report participation almost as high as Scheduled castes.

The variation is larger still among classes (table 10), and further differentiation can clearly be seen. All agricultural labour categories show very high participation rates, especially the few remaining attached labourers (AL1 and AL3). Among the peasant categories, the highest rate is found among middle peasants, higher than poor peasants (who may have less opportunities for labour use in own cultivation). In big peasant households labour force participation is low by definition, since in this category women do not work in cultivation. Landlords show very low participation, unsurprisingly since they have rental income. Non-agricultural households have low participation; it is not clear why, so this would merit further investigation.

There is also a strong, monotonic pattern with land (table 11). The landless have by far the highest participation, closely followed by those with less than one acre. Participation then declines steadily with increasing land holding.

It does seem that each of these three factors has some independent influence, but that can only be tested in multivariate analysis. In any case, they are powerful determinants of labour force participation.

Between 1981 and 2009 labour force participation has increased for all groups (essentially due to an increase in female labour force participation). There is some tendency for the increase to be greatest in those caste groups where LFPR was lowest in 1981, but there is little change in the ordering across groups. This latter point is true for all three variables. By caste, there has been only a small increase for scheduled castes, OBC I and Yadavs, who all reported high participation in 1981, and a large increase for forward castes, Kurmis and Muslims, all of whom reported low participation in 1981. But SCs, OBC-I and Yadavs continue to report the highest participation. By class, agricultural labourers and middle peasants continue to show the highest participation rates, and larger cultivators and non-agricultural households the lowest. The increase in participation was by far the greatest in the large peasant class (P3), while the landlord/gentleman farmer group (P4), lowest in 1981, continues to report very low participation, and the same is true to some extent of non-agriculturalists.

The pattern by land also shows clearly the tendency for labour force participation to decline with increasing landholding in both 1981 and 2009, with a flatter pattern in the latter year.

School Attendance

Our main measure of school attendance was the proportion of household members aged 5 to 24 currently attending school or college. This is the same variable as was used in 1981. The age range is probably unnecessarily wide, and in the multivariate analysis we also look at the 12 to 18 age group.

Schooling has been transformed between 1981 and 2009. Not only has there been a substantial expansion of schooling, but also gender differences in school attendance, which were huge in 1981, have declined dramatically. This means that the comparison of overall attendance rates has to be interpreted with care, for new factors may now be involved.

In 1981, there were very sharp differences in school attendance on all three variables, caste, class and land, with very low attendance rates among agricultural labourers, the landless and scheduled castes, OBC-I and Muslims. By 2009 there had been considerable homogenization. By caste the attendance rates varied only from 47% to 69% in 2009 (13 to 54% in 1981); by class from 43% to 67% (2 to 58%); and by land holding from 48% to 100% (12 to 77%). But although the differences have been reduced, they are still there. For instance, there is still a clear gap in attendance in 2009 between landless agricultural labour (AL4) and the rest, and higher attendance rates among landlords and non-agricultural workers. There is a similar gap by land, where the landless have distinctly lower attendance rates, but there is not much difference among other land ownership categories (noting that the high figure for the 20 acres or more group is based on only 4 observations). By caste both middle and forward castes have higher rates, OBC I, SC and Muslims lower (but in the case of Muslims there may be some undercounting of attendance in madarsas).

Larger difference are found in 2009 if we exclude primary schooling from consideration. When we consider school attendance only in the 12 to 18 year age group, the forward castes and Kurmis have particularly high attendance rates, Muslims particularly low.

Traditional Debt

The variable used was whether or not the household reported any loans from landlords or money-lenders. This is the same variable as was used in 1981. The presence of debt is a more useful indicator of dependency than its amount – better off households will be able to borrow more, but may also have a greater capacity to repay.

In 1981 the presence of traditional debt to moneylenders and landlords was seen as an important indicator of dependency in a semi-feudal production relationship. Since semi-feudal mechanisms have been greatly weakened, our expectation was that the importance of traditional debt would also have declined. But this does not seem to be the case. It can be seen in the tables that there is a strong, monotonic relationship between traditional debt and landholding in 2009, with high incidence of debt among the landless and marginal landowners; and consistent with this, a rather strong relationship with class. Almost half of agricultural labourers report traditional debt (and more among the few remaining attached labourers), while the proportion falls to 20-30% among large peasants and non-agriculturalists. These patterns are very similar to those in 1981, with the difference that overall the percentage of households with traditional debt is mostly 20 to 30 percentage points lower in 2009. There is less change in the incidence of traditional debt among forward castes and Kurmis, where it probably never implied the same dependency as among lower castes.

Agricultural Technology

The 1983 study used a technology index which combined the use of modern irrigation, use of HYV seeds and use of chemical fertiliser. A fourth indicator, the use of a tractor or power tiller, was ultimately excluded; at the time it concerned only 1.4% of households. The index was the sum of the three indicators, each expressed as dummy variables.

In 2009, this index would no longer have been useful. Almost all farmers use HYV seeds, fertilisers and modern irrigation. A new index had to be constructed. The issue is discussed in more detail in Annex 1 to this paper. As in 1981 we used the sum of three dummy variables: whether the household reported any use of sprayers (mainly pesticides); whether expenditure on fertilisers was above the mean for the survey (Rs. 1650 per acre operated); and whether any agricultural equipment was owned (pumpsets, threshers, tractors, tillers, etc). The average value of this index, for cultivating households, was 1.15. A measure of expenditure for seed was also examined, but proved not to be a good indicator. High expenditure for seed could reflect the use of advanced varieties, but it could also reflect the inability of poor farmers to keep seed from year to year, and so the need to purchase seed at high prices. A measure of the intensity of irrigation was also tried, but seemed to mainly reflect regional soil and climatic differences.

Table 11 shows that the relationship of the technology index with landholding is fairly strong, rising unevenly from less than 1.0 among those not owning land (those without land are included here if they rent in land for cultivation) to over 1.5 in the three largest categories. This pattern was also seen in 1981. By class, the index is low

for agricultural labour and landlords, which is consistent with expectations; it is highest for the middle peasants than for any other group, with large peasant second. Again the pattern was similar but less strong in 1981. By caste, Kurmis have by far the highest index, and Muslims, OBC I and SC the lowest. This too faithfully reflects the pattern in 1981. In fact, the stability of the social patterns across time, social category and components of the technology index is striking. Semi-feudal relations may have declined, but patterns of differentiation persist.

V. MULTIVARIATE ANALYSIS

The next step is to explore the impact of class, caste and land holding in multivariate relationships, and to investigate how these relationships have changed over the period 1981 to 2009.

In the 1983 study, simple linear models of the determinants of the four variables discussed above were constructed. Each of these models included a dummy regional variable, used as a control for different behaviour patterns in North and South Bihar. Demographic variables were also added to control for the influence of various aspects of household size and composition on the dependent variable. To each of these models were added measures of land, caste and class, using dummy variables for caste and class (since these are categorical variables) and continuous variables for land. The specification of the land variables was adapted to the theoretical relationship with each dependent variable. The full results from the 1983 study are reproduced in Annex 3.

Similar, and in most cases identical models were estimated for 2009, and the results are presented below. The underlying social and economic conditions have changed in the meantime, so comparisons are necessarily subject to caution, even when the models are identical. But since the villages are the same, and the 2009 sample is drawn from the households that were present in 1981 or their successors, it is legitimate to interpret differences between the two analyses in terms of real change in the intervening period. One difference concerns the sample size. Since the 1981 analysis uses a census of the households in the villages, the number of observations is larger, which can have an effect of the statistical significance of estimated coefficients.

These models were estimated using ordinary least squares. One of the dependent variables (traditional debt) is dichotomous, and the others are clustered around a small number of values, so OLS is not the most efficient method to use. But the earlier study used OLS so the same method is used in 2009 for direct comparability. It can be noted that while OLS is inefficient and the standard errors have to be treated with caution, coefficients are unbiased.

Labour Force Participation

The dependent variable is the percentage of women in the household aged 15 to 59 who are in the labour force. Since most of the observed variation is in female labour force participation, this was chosen as a more sensitive dependent variable than the overall labour force participation.

The independent variables in the model, following those used in 1983, are

- Regional dummy variable (North Bihar = 1)
- Proportion of household members aged 15 to 59 who are male (expected sign positive)[9]
- Number of household members aged 15 to 59 (expected sign negative)
- Number of children less than 14 (sign could be positive or negative, depending on whether income or substitution effects dominate)
- Irrigated land owned per adult (expected sign negative because of the wealth effect)
- Unirrigated land owned per adult (expected sign negative because of the wealth effect, but less than for irrigated land)
- Land leased in per adult (expected sign may be negative if there is an income effect, positive if a substitution effect)
- Leased in land dummy (expected sign positive)
- Caste variables (excluded group: OBC I)
- Class variables (excluded group: P2, middle peasants)

Results are given in table 12. There are four alternative specifications: demographic variables and land; demographic variables, land and caste; demographic variables, land and class; and demographic variables, land, caste and class. For each specification the second column gives the t values of the coefficients estimated. At the bottom of the table there are significance tests for the groups of land, caste and class variables, as appropriate.

The regional and demographic variables are included in all the models. The only one that is consistently significant is the number of adults in the household, with a negative effect on female labour force participation. There is some sign of a rather weak regional effect, suggesting female labour force participation a few percentage points higher in North than in South Bihar.

The first specification, which introduces the land variables, shows a significant negative influence on labour force participation of irrigated land (unirrigated land is insignificant), and a positive relationship with the fact of leasing in of land (but no relationship with the amount of land leased). These relationships are much as expected. However, they are greatly weakened by the adding of class and caste effects, especially the latter, and the increase in R square due to land dwindles to almost nothing in the full model.[10]

The second specification adds caste, and this increases the explanatory power of the model considerably. Only SCs have higher participation rates than the excluded caste (OBC-I). The forward castes have much lower participation rates, as do all OBC-II except Yadavs, as well as Muslims. This pattern remains even after the introduction of class variables in model 4, with some reduction in the coefficients.

The third specification replaces caste with class. The overall explanatory power of the model is less than for caste. All agricultural labour groups show high participation, but differences compared with the excluded group of middle peasants are not significant. The low participation rate of women among large peasants is part of the definition of this class, but that is not true of poor peasants and landlords, both with low participation, presumably for different reasons.

Non-agricultural households also report low participation rates. All of these differences are highly significant, and most of them survive the introduction of caste in model 4, though the coefficients and significance are reduced, especially for the large peasant group.

The R square in the fourth model is 0.36, which is extremely high for micro-data. In this model it is caste which makes the largest contribution to explanation, but the independent

Table 12

Multivariate Analysis (OLS), 2009. Dependent Variable: Female Labour Force Participation (mean for each household for women aged 15-59)

Model	*1*		*2*		*3*		*4*	
	Coeff.	*t*	*Coeff.*	*t*	*Coeff.*	*t*	*Coeff.*	*t*
(Constant)	0.78	13.73**	0.81	14.78**	0.77	9.15**	0.85	10.28**
Regional dummy for North Bihar	0.02	0.80	0.07	2.58*	0.02	0.80	0.06	2.29*
Proportion of adults male	0.15	1.60	0.08	0.93	0.17	2.02*	0.10	1.25
No of adults 15 to 59	-0.06	-7.23**	-0.03	-4.33**	-0.04	-5.47**	-0.03	-4.56**
Number of children 0-14	0.01	1.45	0.00	0.23	0.01	0.94	0.00	0.38
Irrigated land per adult	-0.12	-3.69**	0.03	0.97	0.02	0.62	0.03	0.76
Unirrigated land per adult	-0.11	-0.51	0.10	0.51	0.06	0.32	0.08	0.45
Land leased in per adult	-0.07	-0.65	0.02	0.18	0.00	-0.03	0.02	0.20
Leased in dummy	0.15	3.25**	0.07	1.80	0.11	2.36*	0.02	0.50
Brahmin or Kayasta			-0.44	-10.95**			-0.36	-8.20**
Bhuminar or Rajput			-0.51	-10.68**			-0.43	-8.51**
Yadav			0.03	0.57			0.04	0.75
Koeri			-0.20	-2.56*			-0.15	-1.93
Kurmi			-0.20	-2.53*			-0.18	-2.35*
Other OBC II			-0.18	-2.94*			-0.12	-1.95
SC and ST			0.08	2.47*			0.06	1.84
Muslim			-0.09	-2.21*			-0.08	-1.99*
Ag lab attached cultivating					0.14	1.08	0.10	0.80
Ag lab not attached cultivating					0.06	0.96	0.04	0.69
Ag lab attached not cultivating					0.13	0.75	0.01	0.03
Ag lab not attached not cultivating					0.10	1.46	0.00	-0.04
Poor peasant					-0.15	-2.16*	-0.10	-1.47
Large peasant					-0.25	-3.84**	-0.06	-0.93
Landlord					-0.62	-4.51**	-0.46	-3.51**
Non-agriculture self-employment					-0.41	-4.36**	-0.33	-3.69**
Non-agriculture wage employment					-0.35	-4.72**	-0.27	-3.78**
R squared	0.091		0.303		0.247		0.357	
N	925		925		925		925	
Land variables								
R squared change	0.036		0.007		0.008		0.001	
F change	9.1**		2.3*		2.4 *		0.4	
Caste variables								
R squared change			0.213				0.097	
F change			34,7**				16.9**	
Class variables								
R squared change					0.170		0.054	
F change					23.2**		8.4**	

Source: Significance of F and t: ** better than 1%; * better than 5%; Excluded caste: OBC I. Excluded class: Middle peasant.

effect of class is also highly significant, while the importance of land holding, as noted above, is much reduced.

Overall, then both caste and class contribute substantially to the explanation of female labour force participation, with caste distinctly stronger than class; some aspects of the demographic composition of the household also contribute, while landholding has only a weak impact.

How do these results compare with 1981 (Annex 3, section 1)? The demographic effects are much the same as at that time (though in 1981 there was also a significant regional difference with the opposite sign to that found in 2009). On the other hand, the influence of land ownership has weakened. In 1981 land ownership had a significant impact in all specifications of the model, whereas in 2009 this impact becomes insignificant after the introduction of class in the model, although the sign of the relationship remains the same. On the other hand, the significant positive impact of leasing in of land on labour force participation persists in 2009 except in model 4.

The influence of caste is very similar in the two years. The main difference is that the coefficients are mostly lower in 2009, but the pattern across castes is virtually identical. On the other hand, the explanatory power of caste has declined – in model two, caste adds 0.213 to the R squared. The corresponding figure for 1981 was 0.258.

The pattern by class is less similar in the two years. In 1981 the excluded class included large peasants as well as middle peasants, in 2009 only middle peasants. After allowing for this, the main change is that the participation rate of middle and large peasants that has risen relative to other groups (so the relatively high participation rate of agricultural labourers persists, but at much lower significance levels than in 1981, while participation among landlord and non-agricultural households has declined relative to middle and large peasants). Statistical significance is less than in 1981, especially when caste is included in the model, the net contribution to the explanation of the model being not much more than half of that of caste.

To sum up this result, caste continues to dominate the relationship, with class continuing to play an important secondary role, but the influence of the land variables has sharply declined. In 1981 the dominant effect of land was a wealth or income effect; one interpretation of the results would be that today the employment opportunity effect of land ownership offsets the wealth effect, but not enough to generate a significant positive effect of land on labour force participation.

School Attendance

The dependent variable is the proportion of those aged 5 to 24 who report current attendance at school or another educational institution.

- Independent variables, following the model used in 1983, are
- Regional dummy (North Bihar = 1)
- Proportion of household members aged 5 to 24 who are male (in 1981 the expected sign was positive, because of an observed bias against girls; in 2009 it could still be positive if there is some residual bias against girls)

- Proportion of household members who are aged 5 to 24 (expected sign negative, this is a measure of the potential schooling burden on the household)
- Irrigated land owned per adult (expected sign positive because of the wealth or income effect)
- Unirrigated land owned per adult (expected sign positive because of the wealth or income effect but less than for irrigated land)
- Leased in land per adult (expected sign positive because of the income effect)
- Caste variables (excluded group: OBC I)
- Class variables (excluded group: P2, middle peasants)

Results are given in table 13. There are five alternative specifications: demographic variables and land; demographic variables, land and caste; demographic variables, land and class; demographic variables, land, caste and class; and a fifth specification using a different dependent variable (discussed separately below).

There is no significant regional influence in any specification of the model.

The demographic variables are consistently significant across the first four specifications. The first indicates that there remains some bias against girls. On the other hand, the measure of the potential dependency burden in the household does not have any significant effect on the attendance rate.

The land variables are generally significant with the expected sign, notably a positive effect of landholding (the weak effect of unirrigated land reflects the relative unimportance of unirrigated land in these villages today). However, their contribution to the explanatory power of the models is rather small.

Caste has a significant effect in model 2, though the pattern is not strong. Only Bhumihars and Rajputs show a significantly higher attendance rate than the excluded group, OBC I; the other forward and middle castes also all have higher attendance rates, even though they are not significant individually. This pattern persists in the full specification, model 4, but the overall impact of caste is not significant.

In fact it is class that has the greatest explanatory power – significant at 1% in the full specification, even if the individual variations between classes are not significant. There is some indication here that agricultural labour has lower, and non-agricultural households higher attendance than average. These patterns are not much changed by the addition of caste to the model.

On the whole the patterns are mostly in line with expectations, but the relationships are quite weak – the R square for the full model is only 0.074. This contrasts sharply with the results for 1981, when the R square for the full model was 0.37 (Annex 3, section 2). There were also some differences in the pattern compared with 1981. For instance, the potential educational burden (proportion of household members aged 5 to 24) had the expected negative sign in 1981. Land ownership had a much stronger influence in 1981 than in 2009. The pattern for caste in 1981 was similar to 2009, but coefficients were distinctly larger, and the explanatory power much greater. There was also a much more marked pattern by class

Table 13
Multivariate Analysis (OLS), 2009.
Dependent Variable: School Attendance (Mean for Each Household).
Age Group 5 to 24 for Models 1 to 4. Age Group 12 to 18 for Model 5

Model	*1*		*2*		*3*		*4*		*5*	
	Coeff.	*T*	*Coeff.*	*t*	*Coeff.*	*t*	*Coeff.*	*t*	*Coeff.*	*t*
(Constant)	0.43	9.11**	0.36	6.54**	0.44	5.61**	0.37	4.34**	0.78	8.37**
Regional dummy for North Bihar	-0.02	-0.77	0.00	0.00	-0.02	-0.71	0.01	0.20	-0.04	-1.07
Proportion of 5 to 24 year olds male	0.12	2.90**	0.11	2.69*	0.11	2.79*	0.12	2.82**	--	--
Proportion of hhd members aged 5 to 24	0.06	0.73	0.08	1.00	0.08	0.99	0.09	1.05	--	--
Irrigated land/adult	0.11	3.30**	0.07	1.93	0.09	2.24*	0.08	2.05*	0.12	2.43*
Unirrigated land/adult	0.21	1.03	0.21	1.01	0.19	0.91	0.23	1.11	0.16	0.69
Land lease in/adult	0.11	1.59	0.12	1.75	0.07	0.93	0.11	1.34	0.05	0.47
Brahmin or Kayasta			0.09	1.90			0.06	1.23	0.08	1.22
Bhuminar or Rajput			0.20	3.64**			0.18	3.02**	0.13	1.74
Yadav			0.09	1.65			0.07	1.27	0.04	0.48
Koeri			0.14	1.59			0.14	1.60	0.07	0.65
Kurmi			0.10	1.19			0.09	1.07	0.10	0.84
Other OBC II			0.03	0.40			-0.02	-0.22	-0.15	-1.83
SC and ST			0.04	1.04			0.06	1.61	-0.04	-0.77
Muslim			0.00	0.08			-0.01	-0.21	-0.12	-1.98*
Ag lab attached cultivating					-0.08	-0.59	-0.06	-0.42	-0.21	-1.36
Ag lab not attached cultivating					0.01	0.12	0.01	0.20	-0.13	-1.52
Ag lab attached not cultivating					0.07	0.38	0.09	0.45	0.15	0.61
Ag lab not attached not cultivating					-0.09	-1.25	-0.07	-1.02	-0.22	-2.53*
Poor peasant					0.00	0.02	-0.02	-0.20	-0.05	-0.61
Large peasant					-0.01	-0.16	-0.05	-0.68	-0.05	-0.55
Landlord					0.04	0.26	-0.01	-0.07	0.16	0.87
Non-agriculture self-employment					0.12	1.23	0.14	1.41	0.06	0.51
Non-agriculture wage employment					0.13	1.68	0.13	1.57	-0.07	-0.74
R square	0.031		0.049		0.059		0.074		0.154	
N	873		873		873		873		557	
Land variables										
R square change	0.017		0.009		0.007		0.007		0.01	
F change	4.1**		2.6*		2.1*		2.2*		2.2	
Caste variables										
R square change			0.019				0.015		0.028	
F change			2.1*				1.7		2.2*	
Class variables										
R square change					0.029		0.024		0.033	
F change					2.9*		2.5**		2.4*	

Notes: Significance of F and t: ** better than 1%; * better than 5%; Excluded caste: OBC I. Excluded class: Middle peasant

in 1981; in particular, agricultural labour households were considerably disadvantaged at that time, while this effect was much weaker in 2009. The higher school attendance in big peasant and landlord households, compared with middle peasants, has also been reduced. Non-agricultural households showed the biggest change, significantly worse off in 1981 but better off in 2009.

Some of these changes reflect real improvements in relative position (of agricultural labour households and of girls). But the main influence here is the near universalization of school attendance at primary level since 1981, so there is much less difference between households in school attendance and the behavioural models have less explanatory power.

Nevertheless, large differences between households in school attendance persist at the secondary level. So a final model specification, model 5, looked into the determinants of a different dependent variable, school attendance for ages 12 to 18, which broadly corresponds to secondary and higher schooling. The degree of explanation is greater than for the age group 5 to 24: the overall R square is a more respectable 0.154, even though the demographic variables were not included.

Irrigated land ownership continues to have a significant effect, but class and caste contribute more than land to the overall explanation. The caste variables are significant as a group, with forward castes and to a lesser extent the main middle castes doing notably well (which was also true for the previous models), and OBC II and Muslims notably badly (which is different). And the class variables show a stronger pattern of disadvantage for agricultural labour households and advantage for landlords and the non-agricultural self-employed. So some of these patterns are stronger when we only look at secondary schooling.

Nevertheless, overall the 2009 patterns are much weaker than those found in 1981. Differences between social groups remain, but the estimated coefficients have been reduced by one third on average, and statistical significance is much lower. Even for secondary schooling, differentiation has clearly been reduced since 1981.

Overall we might conclude that the inequalities in school attendance that were observed in 1981 have in 2009 been mainly eliminated for younger children and primary schooling, but some of them persist for secondary education, where the disadvantage of agricultural labour, of those with little land and Muslim households is noticeable. And that all three factors, caste, class and land therefore continue to play a role.

Traditional Debt

The dependent variable is a dummy variable taking the value 1 if the household reports any loan from landlords or moneylenders.

Independent variables, following the model used in 1983, are

- Regional dummy (North Bihar = 1)
- Irrigated land owned per adult (expected sign negative because of the wealth or income effect)
- Unirrigated land owned per adult (expected sign negative because of the wealth or income effect but less than for irrigated land)

- Leased in land per adult (expected sign negative because of the income effect)
- A dummy variable, land leased in (expected sign positive because of the dependency effect)
- Caste variables (excluded group: OBC I)
- Class variables (excluded group: P2, middle peasants)

Results are given in table 14. There are four alternative specifications: land alone (with the regional dummy); land and caste; land and class; and land, caste and class.

Table 14
Multivariate Analysis (OLS), 2009.
Dependent Variable: Whether or Not the Household Reports any Traditional Debt

Model	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
(Constant)	0.40	13.07**	0.48	10.70**	0.26	3.01**	0.35	3.60**
Regional dummy for North Bihar	0.05	1.55	0.03	0.76	0.05	1.39	0.01	0.33
irrigated area	-0.05	-6.01**	-0.05	-4.94**	-0.03	-3.03**	-0.03	-2.93**
Unirrigated land owned	-0.04	-0.79	-0.04	-0.77	-0.01	-0.22	-0.02	-0.30
Total land leased in	-0.04	-1.11	-0.04	-1.04	-0.02	-0.64	-0.03	-0.71
Leased in dummy	0.04	0.67	0.04	0.81	0.07	1.12	0.10	1.48
Brahmin or Kayasta			-0.06	-1.14			0.06	1.02
Bhuminar or Rajput			-0.11	-1.79			0.01	0.10
Yadav			-0.21	-3.04**			-0.17	-2.50*
Koeri			-0.21	-1.94			-0.11	-1.05
Kurmi			-0.12	-1.12			-0.07	-0.65
Other OBC II			-0.13	-1.56			-0.04	-0.52
SC and ST			-0.06	-1.30			-0.08	-1.72
Muslim			-0.07	-1.30			-0.04	-0.75
Ag lab attached cultivating					0.48	2.95**	0.43	2.56*
Ag lab not attached cultivating					0.08	0.92	0.06	0.66
Ag lab attached not cultivating					0.22	0.93	0.21	0.89
Ag lab not attached not cultivating					0.21	2.43*	0.20	2.21
Poor peasant					0.13	1.50	0.09	1.01
Large peasant					0.01	0.13	-0.06	-0.68
Landlord					-0.19	-1.09	-0.24	-1.36
Non-agriculture self-employment					0.02	0.15	-0.04	-0.31
Non-agriculture wage employment					0.05	0.51	0.00	0.00
R square	0.044		0.057		0.075		0.086	
N	973		973		973		973	
Land variables								
R square change	0.04		0.027		0.12		0.014	
F change	10.2**		7.0**		3.2*		3.6**	
Caste variables								
R square change			0.013				0.012	
F change			1.7				1.5	
Class variables								
R square change					0.031		0.029	
F change					3.5**		3.4**	

Notes: Significance of F and t: ** better than 1%; * better than 5%; Excluded caste: OBC I. Excluded class: Middle peasant

Landholding has a negative effect as expected, highly significant for irrigated land in all specifications. The other land variables all have the expected sign but none is significant.

Adding caste variables in model 2 does not strengthen the relationship much, and as a group the caste variables are not significant. All included caste groups show a negative sign, implying that the excluded caste, OBC-I, has a distinctly higher propensity to traditional debt than other castes. Yadavs have particularly low indebtedness.

Class variables (model 3) show a much stronger relationship than caste. The pattern is rather consistent, with the rather small numbers of attached agricultural labour households showing the greatest propensity to traditional debt, followed by unattached landless agricultural labour, and then declining through the peasant classes, with no significant relationship for non-agricultural households. This pattern is maintained with little change when caste is added to the model, but the caste pattern is modified and weakened in model 4 compared with model 2, confirming that it is class which is the dominant factor, even if some residual impact of caste remains.

These results are very similar to those obtained in 1981 (Annex 2, section 3), despite the change in production relations and the reduction in the importance of indebtedness. The influence of the land variables was very similar in 1981, with the exception that unirrigated land was more important. As in 2009, in 1981 it was class rather than caste that was the main determinant of indebtedness and the pattern and the pattern by class is very similar to 2009, with a tendency nevertheless for the coefficients to be higher. The caste pattern was less consistent between the two years, but as in 2009 it was much less significant than class. Perhaps the main difference between the two years is in the overall level of explanation – an R square of 0.086 in 2009 compared with 0.245 in 1981, suggesting that while the economic and social relationship has persisted, there has nevertheless been a reduction in the overall importance of traditional debt as a factor in social inequality.

Agricultural Technology

The dependent variable is the technology index, described above and in more detail in an annex. It is constructed with variables that are different from those used in the technology index in 1983, mainly because of changes in the underlying technological parameters, but the underlying concept is similar and it is interesting to compare the results. Only those cultivating land were included in the regression.

The independent variables, following the model used in 1983, are

- Regional dummy (North Bihar = 1)
- Number of adults in the household (expected sign positive)
- Irrigated land owned (expected sign positive)
- Unirrigated land owned (expected sign positive but less than for irrigated land)
- Leased in land (expected sign positive)
- Whether or not land leased in (expected sign negative)
- Caste variables (excluded group: OBC I)

- Class variables (excluded group: P2, middle peasants).

Results are given in table 15. There are four alternative specifications: land alone (with the regional dummy and demographic variable); land and caste; land and class; and land, caste and class.

Table 15

Multivariate Analysis (OLS), 2009. Dependent Variable: Technology Index

Model	*1*		*2*		*3*		*4*	
	Coeff.	*t*	*Coeff.*	*t*	*Coeff.*	*t*	*Coeff.*	*t*
(Constant)	1.19	10.78**	1.15	8.07**	1.53	8.16**	1.40	6.53**
Regional dummy for North Bihar	-0.43	-5.10**	-0.35	-3.72**	-0.42	-4.96**	-0.35	-3.74**
No of adults 15 to 59	0.03	1.65	0.05	2.23*	0.03	1.43	0.04	1.97*
Irrigated land owned	0.06	3.12**	0.05	2.72**	0.06	2.60**	0.05	2.25*
Unirrigated land owned	0.05	0.38	0.07	0.59	0.05	0.39	0.07	0.54
Total land leased in	-0.01	-0.15	-0.03	-0.70	-0.07	-1.25	-0.08	-1.48
Brahmin or Kayasta			-0.05	-0.42			-0.03	-0.22
Bhuminar or Rajput			-0.27	-1.77			-0.26	-1.52
Yadav			0.10	0.71			0.09	0.61
Koeri			-0.16	-0.72			-0.21	-0.91
Kurmi			0.67	2.91**			0.65	2.79**
Other OBC II			0.10	0.51			0.07	0.35
SC and ST			-0.07	-0.54			-0.06	-0.51
Muslim			-0.33	-2.07*			-0.28	-1.73
All agric labour					-0.33	-2.04*	-0.25	-1.50
Poor peasant					-0.16	-0.90	-0.06	-0.36
Large peasant					-0.32	-1.92	-0.21	-1.17
Landlord					-0.43	-1.08	-0.33	-0.82
Non-agriculture self-employment					-0.20	-0.46	-0.10	-0.22
Non-agriculture wage employment					-0.72	-2.89**	-0.58	-2.28*
R square	0.098		0.141		0.119		0.157	
N	450		450		450		450	
Land variables								
R square change	0.022		0.018		0.021		0.019	
F change	3.6*		3.1*		3.4*		3.2*	
Caste variables								
R square change			0.044				0.037	
F change			2.8**				2.4*	
Class variables								
R square change					0.022		0.016	
F change					1.8		1.3	

Notes: Significance of F and t: ** better than 1%; * better than 5%; Excluded caste: OBC I. Excluded class: Middle peasant

The regional dummy is significant, and the number of adults almost so (significant in specifications 2 and 4). The coefficients of the land variables have the expected sign; irrigated land is highly significant, but unirrigated land is unimportant; and cultivation on leased in land is statistically insignificant with a negative sign. These patterns are repeated in all four specifications.

Adding caste in model 2 adds considerably to explanatory power. Kurmis have a notably high technology index, and Bhumihars and Muslims notably low.

Replacing caste with class in model 3 reduces the overall level of explanation. The excluded class of middle peasants has the highest technology index (the coefficients are negative for all other groups), The difference between middle peasants and the agricultural labour class is statistically significant, and so is the difference with non-agricultural wage labour. Large peasants and landlords also have relatively low technology indices. Nevertheless, taken as a whole, the class breakdown is not significant.

With caste and class together in model 4, the coefficients of class are reduced by an average of about 0,10, while caste coefficients are little changed, reinforcing the conclusion that caste is more important that class as an explanatory factor.

How does this compare with 1981 (Annex 2, section 4)? The overall level of explanation in 2009 is somewhat higher, but one cannot read too much into this because the dependent variable is not identical.

In terms of explanation, the negative coefficient for North Bihar remains, along with the positive effect of household size (number of adults).

The effect of land owned is positive in both 1981 and 2009, and significant for irrigated land, but the (negative) effect of land leased in is weaker in 2009.[11]

The caste effects, while strong in both years, are not completely stable. Kurmis and Yadavs had among the highest technology indices in both 1981 and 2009, and Bhumihars, Muslims and to a lesser extent Brahmins the lowest in both years. But there was more variation for the other castes.

Class was more consistent over time. The excluded group, middle peasants, had the highest technology level in both years, and big peasants, landlords and most agricultural labour had the lowest. Nevertheless, the overall level of explanation due to the class variables has declined, and was insignificant in 2009; caste differentials were statistically more important, having increased their contribution to the regression.

VI. CONCLUSIONS

These broad groups of factors, class, caste and land do contribute in a substantial way to explaining the different aspects of household behaviour in rural Bihar that we have examined in this paper. In these regressions the contributions to R squared of caste, class and landholding combined are reasonably large, given that we are using household data with a good deal of random variation:

	Overall R square	*caste, class and land Contribution of*
Female labour force participation:	0.357	0.303
Educational attendance 5-24:	0.074	0.060
Educational attendance 12-18:	0.154	0.146
Traditional debt:	0.086	0.082
Technology:	0.157	0.082

The contribution to explanation of female labour force participation is particularly high.

As we have seen, the three groups of variables are correlated and it is not easy to distinguish their independent effects. Some part of their effect is in fact common, and some part specific. The statistical procedures that we have used to identify the specific effects make a variety of brave assumptions that impose caution in interpreting the results. Nevertheless, the outcomes seem consistent with prior models of behaviour, and many of them have been replicated with different data sets after a 30 year interval.

In 1981, the conclusion was that class was more consistent an influence on economic and social behaviour than caste and land, but "the results also show clearly that the independent roles of landholding and caste need equally to be taken into account". The paper concluded that there was a general case, in the light of these results, for first disaggregating by class and then exploring relationships with land, caste and other factors within each class.

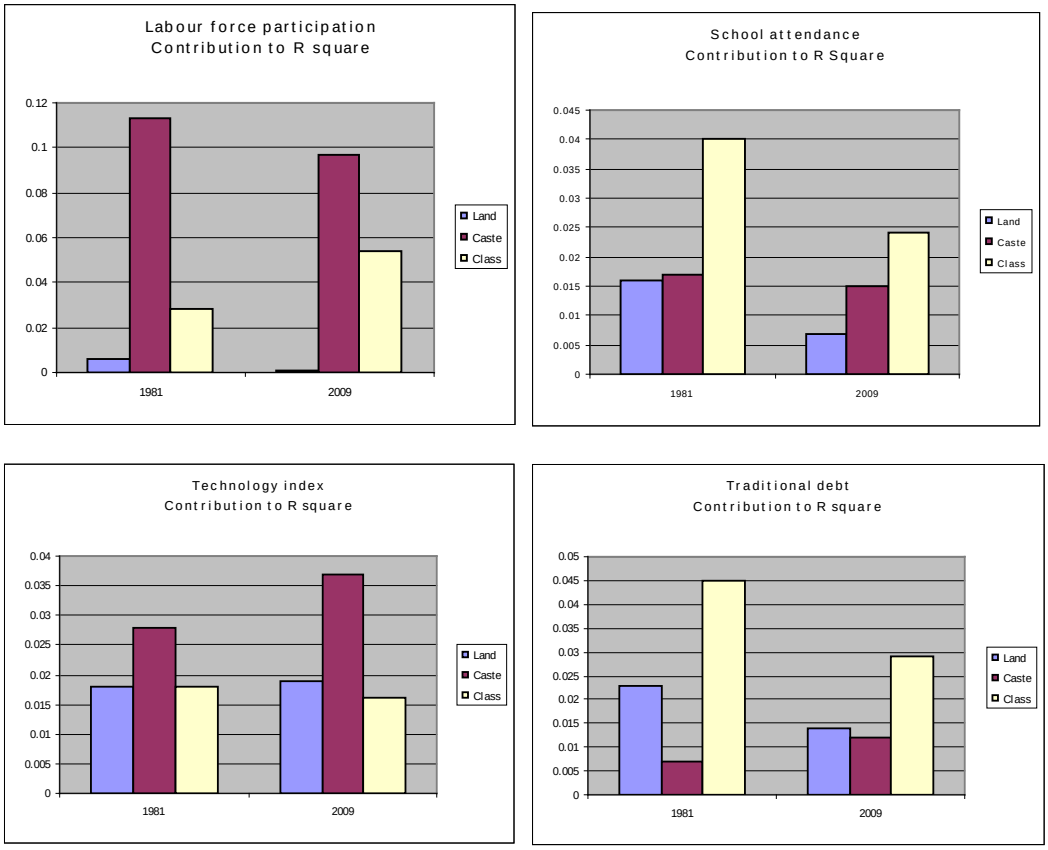
How does that look today? We can draw two types of conclusions from this analysis: the first in terms of the relative contributions of caste, class and land to explaining the variables addressed in the paper; and the second in terms of how these relationships have changed over the last 30 years.

Chart 1 sums up the explanatory power of each of these variables. While they are not strictly comparable, it is interesting to consider the differences in pattern between the two years.

The first conclusion is that in 2009 all three factors have a separate influence in all four issues examined, although the balance changes from one topic to another. Land holding is weakest overall, playing only a small role for labour force participation, and a secondary role for the other three variables. Between caste and class, caste is the more powerful explanation for female labour force participation and technology. For school attendance class is more important, and even more so for traditional indebtedness. In general, when we look at the impact of caste and class together, their coefficients and significance decline, because of the collinearity between them. But both retain explanatory power.

As for the change since 1981, the pattern is different for each of the variables. In the case of labour force participation, caste is the dominant factor in 2009, followed by class, with little effect of land. This ranking is unchanged from 1981, but there are changes within this pattern, for the influence of land has dropped sharply, while caste and class retain explanatory power.

Chart 1
Independent Contribution to R square of Land, Caste and Class



In the case of school attendance, caste has become more important, while both class and land have a weaker effect today than in 1981. The trend is reinforced when we consider attendance above the primary school level, where caste is almost as important as class. The importance of land has declined.

For traditional debt, the pattern is somewhat weaker today but the relationships are similar to 1981, which is surprising given the role indebtedness was believed to play in semi-feudal production relations that have now essentially disappeared. Class remains the most important factor, followed by land and then caste. This ranking is the same as in 1981, although the contribution of caste has increased.

Finally, for technology caste contributes most, followed by land and then class. This is similar to 1981, except that the gap between caste and other factors has increased.

On the whole, the 1981 conclusion, that class is the best starting point, must be questioned today. Class continues to be an important factor, but caste now seems to be at least as powerful, if not more so, overall. Landholding, on the other hand, remains a secondary factor, though one which continues to have a significant influence on some aspects of behaviour.

The apparently growing influence of caste is a noteworthy conclusion, especially since it applies to key development issues such as technology. Note that in this paper we have been using caste as a shorthand for caste and community, and the Moslem community is often relatively disadvantaged (or at least the majority backward "castes" within this community).

One important point should be made in conclusion however: the definition of class which is used here is the same as in 1981. But there have been major changes in the class structure of rural Bihar in the last 30 years, and it can be argued that a reconceptualization of class is required to take this into account. Perhaps more attention needs to be paid today to occupations outside the village, or non-agricultural work within it. In any case, it may well be that with an updated definition of class the relative impact of caste and class will change. Of course, the disadvantage of going down that road is that comparability between 1981 and 2009 would be reduced. Nevertheless it seems to be an important issue to explore in future research.

Notes

1. For a discussion of the historical and theoretical background and the nature of the interactions between caste and class see Prasad Harishankar Prasad (1979) and Alakh Narayan Sharma (2005). See also the author's Pradhan Harishankar Prasad Memorial Lecture on "The changing role of caste and class in Bihar's rural economy", given at the A.N.Sinha Institute of Social Studies in Patna in November 2011.
2. P.H.Prasad and G.B.Rodgers, *Caste, class and landholding in the analysis of the rural economy*, Population and Labour Policies Programme Working Paper 140, Geneva, ILO, August 1983. This paper is available on line on the ILO Library website: http://www.ilo.org/public/libdoc/ilo/1983/83B09_396_engl.pdf
3. This implies a growth of about 2.8% per annum in the number of households, which is high compared with census figures. There may be some artificial splitting of households, driven by entitlements to subsidized foodgrains through the PDS which are given on a per household rather than per capita basis. In addition, one large village shows an implausible increase of 240% in the number of households, which suggests that the geographical definition of the village changed between 1981 and 2009.
4. We also have a sample of households from the other 24 villages in the 36 village sample, but since the 1981 household data was confined to 12 villages, we take the same villages in 2009.
5. Ibid, pp. 5-7. For practical reasons we will refer in this paper to the caste distribution, although this also includes community categories (Muslims and Hindus in our sample).
6. Note that 1983 was the date the earlier study was carried out; 1981 is the date of the survey.
7. These are the variables used in 2009; the corresponding classifications for 1981 are also shown in the table (ALLA, etc).
8. Note that these labour force participation rates are the averages, across households, of the labour force participation rate in that household. They are therefore not equal to the overall labour force participation rate of individuals. Insofar as larger households have lower labour force participation rates, the household estimates will be somewhat higher than the individual estimates. For many purposes the individual estimates are preferable, but in this paper we are looking at household characteristics. Another paper is examining labour force participation in more detail. See J. Rodgers, "Changes in gender relations in rural Bihar: 1980-2010", to be published.
9. For discussion of the theoretical reasons see the 1983 paper. For instance, with respect to this variable is was argued that "given sex segmentation the larger the fraction of the adults who are of the same sex, the lower may be the returns o labour force participation by members of that sex"

10. F tests and R square change related to the contribution of the group of variables concerned when added last to the equation. There is of course an additional joint effect of caste, class and land which substantially raises the degree of explanation of the equation as a whole.
11. In 1981 the amount of land leased in was distinguished from the fact of leasing in, with the effect of the former positive and the latter negative. This pattern was not reproduced in 2009, with all indicators of leasing negative but insignificant.

Annexure 1

Measuring Technological Progress in Bihar Agriculture

In 1981, several indicators were used in an analysis of the determinants of agricultural technology:

- Whether or not there was use of "modern" (canal or tubewell) irrigation (42.6% of cultivating households)
- Whether or not there was use of high yielding seeds (76.7%)
- Whether or not there was use of chemical fertiliser (85.2%)
- Whether or not there was use of a tractor or power tiller (1.4%)

An agricultural technology index was constructed, initially adding together these four variables (converted to dummy variables) for each household; after some tests the last of these indicators was eliminated since it added little to the index and was heavily concentrated in the largest farms. The average value of the index based on the remaining three variables came to just over 2.

The same variables could not be used to study difference between households in 2009, because in the meantime they had become universalized. Virtually all farmers now use modern irrigation, HYV seeds and chemical fertilisers; not all cultivators use tractors, since some residual ploughing is still done by bullocks, but tractors are generally available for rent by the hour at a cost that is more or less equivalent to the cost of ploughing with bullocks. It was necessary to find alternative indicators of technology with some variation across households.

In round 1 of the survey in 2009 there are few satisfactory indicators of technology available. Virtually the only useful measure concerned the ownership of agricultural capital equipment. 24% of households reported such ownership.

However, in round 2 of the survey in 2011 there are several variables that can be used to measure different aspects of agricultural technology.

- First, there is a question as to whether the household concerned has adopted any new agricultural technique.
- Second, there are measures of the amount spent on various types of inputs using capital equipment. These include costs of tractor ploughing, tubewell irrigation and use of thresher/harvester. However, the problem here is that if this equipment is owned (i.e. not rented) expenditure is not a good indicator of use of the equipment. A better indicator of new technology is the use of sprayers, because here substantial costs are necessarily incurred for purchase of pesticides and herbicides. Two possible indicators are, firstly

the total expenditure on spraying per acre cultivated; and secondly, whether there is any use of sprayers, i.e. whether or not the household uses this technology.

- Third, there are various measures of the intensity of irrigation. This is not simple, because different crops require different amounts of irrigation, depending on the soil, the region and the rainfall. For instance, more irrigations of paddy might well be needed in drier regions or on poorer land. Or good winter rains may reduce the need for multiple wheat irrigations. In addition, as noted above, expenditure on tubewell irrigation is not a reliable guide. One measure that seemed usable was the number of times wheat was irrigated, since this appeared to be correlated with the intensity of cultivation. After examining the data, we distinguished farmers who irrigated wheat up to twice from those who irrigated three or more times.
- Fourth, there is expenditure on current inputs such as seed or fertiliser. The type of seed that is used (e.g. particular varieties of hybrids) is a good indicator of technology, but this was not directly asked in the survey. In any case, today there is much more diversity of seed than in 1981, so one cannot simply take use of HYV or hybrid varieties as the indicator. However, it is possible to use the value of seed purchased as an indicator of the sophistication of the seed used. In the survey, the largest number of observations concern wheat, so the cost of wheat seed per acre was used as an indicator. There is a problem here, however, in that poorer farmers cannot afford to keep seed from one year to the next, and are obliged to purchase seed for sowing. On the other hand, farmers with somewhat more resources may keep some seed from year to year, so bringing down the average expenditure for seed, while more commercial or more innovative farmers will buy new seed each year. In an attempt to identify the innovating farmers, we used an indicator which distinguished those spending particularly large amounts on wheat seed per acre cultivated, more than Rs.900 per acre (the average being Rs 687).
- Fertiliser poses less problems and provides a fairly good indicator; it is normally correlated with irrigation and with use of advanced seeds, since both increase the returns to fertiliser. Most farmers use some fertiliser, so a possible indicator is to identify those who are spending more on this input than some threshold amount.
- Fifth, some measure of crop diversification would be a good indicator of innovation. However, preliminary analysis of the data suggested that this would be difficult to capture with the information we have available, other than in the first question above, so no indicator of this type was used.

Technology indicators from 2011 were then merged with household data from 2009.

The following tables give some indication of the pattern of these technology indicators across different population categories.

First we look at the pattern by district, since there are differences between regions of Bihar in agricultural backwardness (Table A-1).

The pattern by district varies considerably from one technology indicator to the next. Expenditure on and use of sprayers is most widespread in Nalanda. Seed cost per acre is highest in Gopalganj, but more cultivators have high expenditure in Nalanda. These two districts also

show the highest rate of adoption of any new technique and the highest fertiliser use. On the other hand, Gaya shows by far the greatest intensity of wheat irrigation. Rohtas, which depends largely on canal irrigation, shows a low intensity of wheat irrigation, as does Gopalganj, where tubewells dominate. So the irrigation indicator is very region-specific. Ownership of agricultural machinery is higher in South than in North Bihar. Nalanda appears the most advanced district overall, while Madhubani is lowest by a considerable margin.

Table A1
Technology Indicators by District

District		*Adopted any new technique in agri-culture?*	*Whether any agric mach-inery owned?*	*Sprayer costs per acre operat-ed 2011 (Rs.)*	*Any expend-iture on sprayer etc?*	*Seed cost for wheat /acre (Rs.)*	*Wheat seed over Rs. 900 per acre?*	*Wheat irrigated 3 times or more?*	*Fertiliser use/acre operated 2011 (Rs.)*
Gaya	Mean	0.06	0.25	93	0.54	735	0.26	0.96	847
	N	52	55	26	26	23	23	23	26
Gopalganj	Mean	0.35	0.13	156	0.46	869	0.27	0.05	2523
	N	78	80	61	61	59	59	59	61
Madhubani	Mean	0.03	0.21	249	0.21	512	0.19	0.26	1300
	N	103	112	75	76	70	70	69	75
Nalanda	Mean	0.35	0.35	727	0.79	659	0.33	0.45	2118
	N	51	54	42	43	40	40	38	42
Purnia/ Araria	Mean	0.24	0.24	189	0.63	701	0.22	0.13	1310
	N	143	147	103	103	89	89	91	103
Rohtas	Mean	0.11	0.28	180	0.62	697	0.29	0.09	2101
	N	81	86	58	58	55	55	57	58
Total	Mean	0.19	0.24	249	0.53	688	0.25	0.23	1696
	N	508	534	365	367	336	336	337	365

Table A-2 shows the relationship with land (operational holdings, including leased in land). Most technology indicators tend to rise with increasing landholding, but the strength of the relationship is quite variable – strong for ownership of machinery and intensity of irrigation, fairly strong for adoption of any new technique and use of a sprayer (but in both these cases the 1 to 2.5 acre group is higher than the 2.5 to 5 acre group), weaker for expenditure on sprayer and seed and weakest for fertiliser use. The more scale neutral the technology, the weaker the relationship, which is in line with expectations. The ability to invest in pumpsets and threshers (and even more so, tractors) is clearly a function of land ownership, whereas even the smallest cultivators can apply substantial amounts of fertiliser.

Table A2
Technology Indicators by Operational Land Holding

Land operated		*Adopted any new technique in agri-culture?*	*Whether any agric machinery owned?*	*Sprayer costs per acre operated 2011 (Rs.)*	*Any expen-diture on sprayer etc?*	*Seed cost for wheat per acre (Rs.)*	*Wheat seed over Rs. 900 per acre?*	*Wheat irrigated 3 times or more?*	*Fertiliser use per acre operated 2011 (Rs.)*
0.01 to 0.99	Mean	0.10	0.12	256	0.41	651	0.21	0.11	1826
acres	N	184	193	117	118	106	106	105	117
1 to 2.49	Mean	0.23	0.23	286	0.58	697	0.26	0.26	1678
acres	N	201	215	152	153	140	140	141	152
2.5 to 4,99	Mean	0.16	0.40	175	0.51	690	0.27	0.30	1492
acres	N	93	96	72	72	66	66	67	72
5 to 9.99	Mean	0.41	0.45	151	0.79	882	0.32	0.37	1566
acres	N	22	22	19	19	19	19	19	19
10 acres or	Mean	0.50	0.63	430	0.80	455	0.20	0.20	2641
more	N	8	8	5	5	5	5	5	5
Total	Mean	0.19	0.24	249	0.53	688	0.25	0.23	1696
	N	508	534	365	367	336	336	337	365

Table A3 shows the distribution of these indicators by class. The picture is fairly complex. Adoption of any new technique rises up to the large peasant category, and is then lower for landlords. This corresponds to expectations. Ownership of agricultural machinery is highest among middle peasants, but remains higher than average for large peasants and landlords. Use of sprayers, on the other hand, is highest among small peasants (but lowest among agricultural labourers who cultivate some land). High expenditure on seed is less common among small peasants and agricultural labourers, and the same is true of intensive irrigation. Finally, fertiliser use is slightly higher among middle and larger peasants. The net outcome is for agricultural labour to have a low technology level, which seems plausible, and – less

Table A3
Technology Indicators by Class

Class		*Adopted any new technique in agri-culture?*	*Whether any agric mac-hinery owned?*	*Sprayer costs per acre operated 2011 (Rs.)*	*Any expen-diture on sprayer etc?*	*Seed cost for wheat per acre (Rs.)*	*Wheat seed over Rs. 900 per acre?*	*Wheat irrigated 3 times or more?*	*Fertiliser use per acre operated 2011 (Rs.)*
Ag labour	Mean	0.11	0.21	260	0.42	589	0.17	0.16	1631
	N	150	157	102	103	89	89	90	102
Poor	Mean	0.16	0.14	286	0.59	704	0.24	0.18	1609
peasant	N	104	111	73	74	67	67	67	73
Middle	Mean	0.20	0.35	263	0.56	666	0.28	0.30	1779
peasant	N	49	51	41	41	39	39	37	41
Large	Mean	0.26	0.28	225	0.56	750	0.30	0.28	1769
peasant	N	191	199	143	143	135	135	137	143
Landlord	Mean	0.07	0.31	93	0.50	727	0.33	0.17	1567
	N	14	16	6	6	6	6	6	6
Total	Mean	0.19	0.24	249	0.53	688	0.25	0.23	1696
	N	508	534	365	367	336	336	337	365

consistently – the same is true of landlords; for other categories the pattern is mixed and varies from one indicator to another.

Finally, table A4 shows the pattern by caste. Kurmis come top on all indicators, and Yadavs are above average for all except one. For other groups the pattern is more mixed, but with a general tendency for SC, ST, OBC I and Muslims to be below average (if Muslims are divided into upper and lower categories, the lower group has particularly low technology indicators). Upper castes show a mixed pattern, generally less advanced than middle castes, with the pattern varying from one indicator to the next.

The four tables highlight the fact that different technology indicators have different patterns, and the strength of their relationships with region, land, class and caste also varies. For instance fertiliser use is more strongly related to caste than to land-holding, while for ownership of machinery the reverse is true. Of course, we are just capturing here the complexity of technology in agricultural production. This can also be seen when we correlate the various indicators among themselves (table A5). There is a reasonably strong relationship between the indicator "adopted any new technique" and other indicators; four correlations out of 8 are significant. Fertiliser use too is widely correlated with other indicators. But most correlations in the table are rather weak.

For purposes of the regression analysis we wished to construct a technology index similar to that used in 1981. We therefore needed to choose three distinct indicators that could be combined in the index.

Table A4

Technology Indicators by Caste Group

Caste group		*Adopted any new technique in agri-culture?*	*Whether any agric mac-hinery owned?*	*Sprayer costs per acre operated 2011 (Rs.)*	*Any expend-iture on sprayer etc?*	*Seed cost for wheat per acre (Rs.)*	*Wheat seed over Rs. 900 per acre?*	*Wheat irrigated 3 times or more?*	*Fertiliser use per acre operated 2011 (Rs.)*
Brahmin/ Kayasta	Mean	0.32	6874	214	0.65	748	0.25	0.15	1650
	N	113	119	82	82	81	81	82	82
Bhumihar/ Rajput	Mean	0.12	3650	160	0.36	790	0.39	0.37	1807
	N	66	71	44	45	41	41	41	44
OBC I	Mean	0.12	862	165	0.52	622	0.21	0.14	1317
	N	89	92	64	64	62	62	63	64
Yadav	Mean	0.21	1875	314	0.55	623	0.26	0.36	1975
	N	42	43	40	40	38	38	39	40
Koeri	Mean	0.08	394	233	0.63	632	0.11	0.35	2016
	N	26	27	19	19	18	18	17	19
Kurmi	Mean	0.55	3300	798	0.84	845	0.42	0.33	3164
	N	20	23	19	19	19	19	18	19
OBC II	Mean	0.17	1628	174	0.53	676	0.27	0.13	1323
	N	29	30	19	19	15	15	16	19
SC	Mean	0.12	874	336	0.38	617	0.19	0.24	1653
	N	77	80	54	55	43	43	42	54
Muslim	Mean	0.08	1212	107	0.48	562	0.13	0.19	1055
	N	39	42	21	21	16	16	16	21
ST	Mean	0.00			0.00	923	0.33	0.00	2006
	N	7	7	3	3	3	3	3	3
Total	Mean	0.19	2796	249	0.53	688	0.25	0.23	1696
	N	508	534	365	367	336	336	337	365

Table A5
Correlations Among Technology Indicators

		Adopted any new technique in agriculture?	*Any agricultural machinery ?*	*Sprayer costs per acre operated 2011*	*Any expenditure on sprayer etc?*	*Seed cost for wheat per acre (Rs.)*	*Wheat seed over Rs. 900 per acre?*	*Wheat irrigated 3 times or more?*	*Fertiliser use per acre operated 2011*
Adopted any new technique?	Pearson R	1	.114*	.114*	.295**	.065	.000	.018	.120*
	N	508	508	365	367	336	336	337	365
Any agricultural machinery ?	Pearson R	.114*	1	.075	.059	.016	.042	.087	.020
	N	508	534	365	367	336	336	337	365
Sprayer costs per acre operated 2011	Pearson R	.114*	.075	1	.435**	-.025	-.001	-.009	.329**
	N	365	365	365	365	335	335	335	365
Any expenditure on sprayer?	Pearson R	.295**	.059	.435**	1	.012	-.090	.115*	.100
	N	367	367	365	367	336	336	336	365
Seed cost for wheat per acre (Rs.)	Pearson R	.065	.016	-.025	.012	1	.741**	-.007	.135*
	N	336	336	335	336	336	336	330	335
Wheat seed over Rs. 900 per acre?	Pearson R	.000	.042	-.001	-.090	.741**	1	.027	.166**
	N	336	336	335	336	336	336	330	335
Wheat irrigated 3 or more times?	Pearson R	.018	.087	-.009	.115*	-.007	.027	1	-.193**
	N	337	337	335	336	330	330	337	335
Fertiliser use per acre operated 2011	Pearson R	.120*	.020	.329**	.100	.135*	.166**	-.193**	1
	N	365	365	365	365	335	335	335	365

Notes: * Correlation is significant at the 0.05 level (2-tailed).; ** Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix suggests that our measure of intensity of irrigation is probably not very useful, since it is negatively correlated with fertiliser use. In fact, irrigation intensity on this measure is only high in Gaya, a district which otherwise has low technology indicators, suggesting that this is a district specific pattern rather than a good indicator of technological level. Of the other variables, we have noted that the interpretation of seed cost is problematic, and this is confirmed by the generally weak correlations.

This leaves fertiliser use, ownership of machinery and sprayer use – the more generic "adopted any new technique" overlaps with all three, so it is probably less useful than the individual measures themselves. So the index that was finally chosen was the sum of three dummy variables: any expenditure on (use of) a sprayer, any ownership of agricultural machinery and high use

of fertiliser. The cut-off for fertiliser use was set at Rs 1650 per acre, which corresponds to the mean of the sample.

The average value of the index was 1.15. In addition to the variations by land, caste and class given in tables 9 to 11 of the main text, there were substantial differences in technology levels across districts, ranging from 1.81 in Nalanda (with Rohtas and Gopalganj also high) to 0.73 in Madhubani (with Gaya and Purnea also low). These regional differences in technology level correspond quite closely to the differences observed in overall development level among the clusters of districts from which the sample of villages was initially drawn; in other words, regional differences have been rather stable over time.

Annexure 2

Technical Note

The estimates presented in section 5 were made using the linear regression procedure of SPSS.

The file used was tab41_60grnew.sav, a file of household data from round 1 of the 2009 survey (3116 observations in 36 villages; for purposes of this analysis 12 villages were selected, with 974 observations). In addition to the initial raw household data a number of variables have been calculated, including some computed in the individual data file tab21_new2.sav.

Observations are weighted by variable newwt. This compensates for different sampling fractions by class and in villages of different sizes in the original sample design in 1998-99.

Variables used for table 12:

Dependent: Femaleproplfwide

Independent:

- Regiondummy (1=North Bihar)
- Propadultsmale (proportion of household adults male)
- Adult15to59_sum (number of adults aged 15 to 59 in the household)
- Children0to14 (number of children aged 0 to 14 in the household)
- Irrlandperadult (irrigated land owned per adult)
- Unirrlandperadult (unirrigated land owned per adult)
- Leasedinperadult (land leased in per adult)
- Leasedindummy (1=some land leased in)
- Caste and community dummy variables (self explanatory, constructed from variable newcaste)
- Class dummy variables (self explanatory, constructed from variable Class)

Variables used for table 13:

Dependent:

- allschoolprop (proportion of 5 to 24 year old household members attending school)
- (for specification 5, prop12to18at school – proportion of 12 to 18 year old household members attending school)

Independent:

- Regiondummy (1=North Bihar)

- Maleprop5to24
- Propofhhd5to24
- Irrlandperadult (irrigated land owned per adult)
- Unirrlandperadult (unirrigated land owned per adult)
- Leasedinperadult (land leased in per adult)
- Caste and community dummy variables (self explanatory, constructed from variable newcaste)
- Class dummy variables (self explanatory, constructed from variable Class)

Variables used for table 14

Dependent: traddebtdummy (Any debt from landlord or money-lender=1)

Independent:

- Regiondummy (1=North Bihar)
- q41_1b (irrigated land owned)
- Unirrland (unirrigated land owned)
- Leasein_sum (land leased in)
- Leasedindummy (1=some land leased in)
- Caste and community dummy variables (self explanatory, constructed from variable newcaste)
- Class dummy variables (self explanatory, constructed from variable Class)

Variables used for table 15

Dependent: newtechindex

This index combines information from round 1 in 2009 and round 2 in 2011. See annex 1 for details.

Independent:

- Regiondummy (1=North Bihar)
- q41_1b (irrigated land owned)
- Unirrland (unirrigated land owned)
- Leasein_sum (land leased in)
- Leasedindummy (1=some land leased in)
- Caste and community dummy variables (self explanatory, constructed from variable newcaste)
- Class dummy variables (self explanatory, constructed from variable Class)

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Institute for Human Development
NIDM Building, IIPA Campus, IP Estate, New Delhi-110 002
Phones: +91-11-2335 8166/ 2332 1610
Fax: +91-11-2376 5410
Email: ijhd@ihdindia.org
Website: www.ihdindia.org