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CLASS, CASTE AND LANDHOLDING IN THE ANALYSIS OF THE RURAL ECONOMY

by

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Summary

This paper is an investigation into the methodology of rural economic analysis in India. To understand the behaviour of the heterogenous rural population, it is necessary to identify groups with different positions in the production system, different endowments and different motivations. In the literature on rural India, several alternative approaches can be found. Of these, three of the most frequent breakdowns of the population are by size of landholding, by caste, and by class. This paper attempts to assess the relative merits of each of these three approaches, using preliminary data from a survey in rural Bihar. The reason for doing so is as an input into a larger study, being carried out by the A.N. Sinha Institute of Social Studies, Patna, and the ILO, of the dynamics of poverty and employment in Bihar. Conclusions from this preliminary study are being used to help design the subsequent programme of analysis.

Four different aspects of behaviour were selected for investigation: labour force participation (separately for males and females); the incidence of indebtedness to moneylenders, landlords and employers; the level of agricultural technology used by cultivators; and school enrolment. Each of these phenomena showed distinct relationships with land, class and caste taken one at a time. But since land, class and caste are intercorrelated, it was necessary to examine the relative importance of each in a multivariate context. This multivariate analysis suggested the following conclusions: (i) landholding, while usually relevant, was the weakest of the three variables. Distinct effects could be identified associated with tenancy vis-à-vis ownership; (ii) caste, although weaker than casual empiricism would suggest, had

significant effects on most aspects of behaviour, and dominated female labour force participation. However, some results were unexpected and difficult to explain; (iii) class was the most consistent, and in a majority of cases the strongest factor, and results conformed well to expectations.

The conclusion drawn is that on balance, this analysis favours the class breakdown by a short head. As there are also theoretical reasons for preferring a class breakdown, it therefore seems reasonable to argue that this should be the starting point for rural economic analysis in Bihar. Nevertheless, both landholding and caste are shown to have independent effects (and independent effects of demographic and regional factors were also found), so these should also be taken into account in any detailed analysis.

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Preface

This paper was prepared as part of the A.N. Sinha Institute of Social Studies/ILO research project on the dynamics of poverty and employment in Bihar. It is based on early household survey results, which come from a brief questionnaire used for a census of households in a dozen villages of the Bihar Plains. This census was conducted with the limited objective of providing an accurate sampling frame, and this restricts the empirical analysis. Nevertheless, a range of inferences can be drawn, and although they should be regarded as preliminary, we are circulating them in working paper form for comments and discussion purposes.

Computational work for this paper was undertaken by Claude Castor. Comments on an earlier draft by Ajit Ghose, Janine Rodgers, ANSISS staff and participants in an ILO seminar have been of great help in revising the text.

I. Introduction

For the analysis of rural economic processes, a number of alternative and competing research programmes can be found in the literature, each with its own underlying model of social relationships. For some, especially those schooled in neo-classical techniques of analysis, the conditioning factors are resource allocations and opportunity costs - in rural areas often well captured by a variable such as landholding. For those who take a more sociological perspective, the division of society into groups with distinct behaviour patterns is more promising, and they would tend to start economic analysis in rural India with a breakdown of the population by caste. Those who adopt a structuralist model will also tend to break the population down into groups, but class rather than caste groups, defined by position in the existing pattern of production relations.[1]

A cursory glance through the pages of Economic and Political Weekly or through other empirically-based publications covering rural economic issues, gives many examples of analyses dominated by relationships with class, caste or land. Land ownership (or operational holding) is by some margin the most popular, either as an explanatory variable or as a basis for classification, being applied, for example to analysis of poverty (Dandekar and Rath, 1971; ILO, 1977), credit and tenancy (Khasnabis and Chakravarty, 1982), female labour supply (Saradamoni, 1982), yield and productivity (Bhalla and Chadha, 1982), technology choice (Oberai and Singh, 1982), and many other issues. This popularity is perhaps not surprising, given the range of economic phenomena for which land can proxy. But the importance of caste position is also widely acknowledged, not only in the writings of anthropologists and sociologists (e.g. M.N. Srinivas), but also in economic analysis, e.g. of irrigation adoption (Jayaraman, 1981) or of tenancy (Bliss and Stern, 1982).

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[1] There is also a widespread tendency to classify households by income groups. While interesting as a descriptive measure, this suffers from various inadequacies as a basis for analysis, and we do not discuss it here.

Class breakdowns, either in the strict Marxian sense of "conscious" groups in antagonism with others over the appropriation of the surplus, or in the broader sense of a group defined by a specific position in a set of production relations, are found in empirical work mainly in analyses of general economic processes (e.g. Djurfelt and Lindberg, 1975; Bhaduri, 1973) but also in certain specific analysis, e.g. of health (Banerji, 1982). In addition, many authors use occupational breakdowns which could form a starting point for class analysis.

There is a widespread view among economists and sociologists working in India that this type of class analysis is not applicable to the Indian situation. The argument in support of this thesis is mainly based on two counts. Firstly, that the Marxian class categorisation is based on West European experience and is, therefore, not applicable to a vastly different Indian situation; and secondly, that the institution of caste in India undermines the concept of class in explaining the dynamics of Indian socio-economic phenomena. Even some Marxist economists tend towards this view (see, e.g. Gupta, 1981). But caste structure in India owes its origin to the primacy of production relations in ancient India. D.D. Kosambi (1965), for example, traces its origin to the Aryan transition from a pastoral to a food-producing economy in the post-Vedic era. And, since then, instead of withering away, it has survived and adapted to changes in the social formation. In a sense it also represents a rigidified traditional class structure, a system of hierarchy developed in ancient India and since then partially and unevenly adapting itself to changes in the forces of production. This change has been rather slow, but there are some areas in India where caste identity has significantly weakened since Independence.

But in many areas, including Bihar, caste identity remains important, and caste and class remain inter-related. At the same time, both caste and class breakdowns are correlated with landholdings, by virtue of the definition of class, and for historical reasons in the case of caste. As a result, any empirical analysis which demonstrates a relation with one of these phenomena will, in all likelihood, show a relation with the others; it becomes statistically difficult to separate out the distinctive effects of each of the variables concerned, and each researcher finds

his or her model verified. Certain castes, large landowners and "capitalist" farmers may all be found to be innovative - but if the three groups largely overlap, the attribution of innovation to class, caste, or landholding size may be due to the researcher's "core beliefs" (see Lakatos, 1978).

The stronger the correlation between class, caste and land hierarchies the more difficult this problem is to solve. Some classes may be defined as owning land, others as landless. Brahmins may never be found undertaking agricultural labour; landless Bhumihars may be essentially non-existent. But there are also distinct degrees of freedom which permit independent effects to be assessed in a multivariate framework. This article adopts such an approach in order to explore some of these issues, drawing on preliminary data from a survey in rural Bihar.[1] Four different phenomena could be investigated using these data: (a) the labour force participation rate of the adult population; (b) the incidence of "traditional" debt - that is, debt to moneylenders, landlords and other traditional sources; (c) the level of technology used in cultivation; and (d) the enrolment of children in school. In each of these four cases we explore the relative merits of land, class and caste in explaining variations in behaviour between households.

The first, and perhaps most controversial issue, is to spell out the relevant characteristics of land, caste and class; this we attempt in the next section. In section III we present data on the interactions between these variables, before turning, in section IV, to the bivariate relationships between our four dependent variables and caste, class, and land. In section V we discuss the determinants of the four dependent variables, and specify and estimate multivariate models. Some general conclusions are drawn in section VI.

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[1] A brief description of the survey is given in Annex II. As noted in the preface, only preliminary data were available for this paper, and the results may need revision in the light of more detailed information which will be available in late 1983.

II. Concepts and Definitions: Land, Caste and Class

Appropriate specifications of caste, class or land are of course critical to evaluating their explanatory power. To some extent, the best formulation will vary with the phenomenon one is trying to explain, and this is allowed for below - especially with respect to land. But for purposes of comparison, it seems appropriate to aim for the best all round specification, and to vary it only when absolutely necessary. In each case, then, a specification which seems best both theoretically and empirically has been sought, subject to constraints on the degree of disaggregation for caste and class.

1. Land

Both caste and class are by definition classificatory, while land is continuous. Comparability would in one sense be increased by converting land to a classificatory variable; but the relationships with land are conceptually continuous, so this option was not used, except in tabulations (where it cannot be avoided).

This point apart, three major issues arise in the specification of a land variable: (i) adjusting the area for the number of "users"; (ii) allowing for land quality; and (iii) allowing for variations in control over land.

(i) Land area: In rural Bihar the household is the most convenient unit for economic analysis, so that total land per household would seem to be the obvious starting point, especially when land is a proxy for total wealth. When analysing labour supply patterns, however, the influence of land on availability of work has to be adjusted for the number of potential workers in the household - that is, land per adult or a similar measure will be more appropriate than total land. In cases where land acts as a proxy for income, total household size may be better as a deflator, suggesting the use of land per capita. The choice of denominator thus varies from case to case, and the specifications adopted for multivariate analysis reflect this (and are discussed again in section V). For tabulation purposes in section III, however, we simply used land size per household in conventional size groups - 0 to 1 acre, 1 to 2.5, 2.5 to 5, 5 to 10, 10 to 20 and more

than 20. There is no particular logic to these groups, other than comparability with other studies.

(ii) Land quality: Substantial differences in soil type and land height exist, and considerably affect land use and crop yields; but in the available data they could not be taken into account. However, the most important single aspect of land quality is irrigation, and on this data were available. In multivariate analysis this was allowed for by treating irrigated and unirrigated land as two distinct types of assets. The alternative is to use some weighting scheme on the basis of land productivity, but the weights are necessarily to some extent arbitrary. A single variable measuring total land owned is sometimes used in section V below, and in this case a weight of 0.5 is assigned to unirrigated land.

(iii) Land control: The key distinction here is between land owned and land cultivated. The latter measure, which excludes land leased out and includes land leased in, may be more appropriate for some purposes (e.g. measuring scale factors in technology use). But ownership gives a better measure of the overall asset situation, especially after the exclusion of land lost to usufruct mortgage and other forms of loss of control. It was therefore concluded that ownership should be the basic criterion, and that the lesser control over land implied by tenancy would be best expressed in a separate variable measuring area leased in.

For some purposes, the fact of owning or leasing in land may have an effect which differs from that due to the area owned or leased in. The difference can be quite pronounced - the fact of leasing in may imply a position of dependency, while a larger area leased in may be associated with higher incomes and greater job opportunities, which may ultimately offset the adverse dependency effect. A dummy variable for leasing in land was therefore used in cases where the "dependency" effect was likely to be significant.

2. Caste

The theory of caste gives three possible bases for stratification; the theoretical (i.e. traditional) hierarchy; perceived actual status and

activity groups; and the model of the "dominant caste". None of these is entirely satisfactory. Attempting to rank castes is a minefield, grouping castes on the basis of similarities and differences an equally controversial exercise. "Dominance" is not always objectively definable, and often seems to be an ex post rationalisation in caste terms of a social structure based primarily on class considerations, allied with numerical dominance, effective control of the land, and a reasonably high ritual position (Srinivas, 1968).

The simplest, universally acceptable breakdown in Bihar is three-fold: "forward", "backward" and "scheduled" castes. Forward castes - Brahmin, Bhumihar, Rajput and Kayasta - are those which have been historically dominant, and which continue to be prominent in the upper echelons of both urban and rural areas. Scheduled Castes - harijans - constitute the lowest level of the hierarchy, while backward castes are a heterogenous intermediate case. To these three categories Muslims must be added as a separate group. A fifth group, Scheduled Tribes, was represented in the region but not in the sample.

A more detailed disaggregation is also used in the analysis below. Our basic class disaggregation identifies nine groups. Since the explanatory power of any classification scheme increases with the number of groups identified, comparability required an equivalent disaggregation of castes. Nine caste groups were therefore formed, as follows:

1. Forward 1 (Brahmins + Kayasta)
2. Forward 2 (Bhumihars + Rajput)
3. Backward I
4. Backward II - Yadav
5. Backward II - Koiri
6. Backward II - Kurmi
7. Backward II - Other
8. Scheduled castes
9. Muslim

There are a large number of ways in which nine caste groups could be formed. This version attempts to minimise heterogeneity within groups with respect to rural economic behaviour, subject to

there being clear boundaries to each group, and also subject to there being a sufficient number of households in each category. The most mixed group in the four-category breakdown are the "backward" castes - something of a misnomer, since many of these castes are in no way backward. Three particularly prominent and numerous agricultural castes, often locally dominant, are separated out - Koiri, Kurmi and Yadav (the latter traditionally dealing with livestock - "milkmen" - but in practice often agriculturalists). Remaining backward castes are again divided, using the official classification, into "other backward II", and "backward I". Both of these groups include service, trading and specific occupational castes, but the backward I group is generally much less well endowed with skills, land or capital, and is much more often found in agricultural wage labour.

It was also considered necessary to break the "forward" caste group into two because Brahmins and Kayastas (there were very few Kayastas in our sample) are traditionally non-agriculturalists, and their ritual position seems likely to strongly influence their economic behaviour.

The remaining two groups, scheduled castes and Moslems, are also fairly heterogenous. The bulk of scheduled castes are found in agricultural labour, but some retain caste occupations (Dhobi, Dom, Halkhor). However, in our sample the vast majority of scheduled castes were Musahars, Dusadhs and Chamars, and there was no obvious basis for differentiation; it was therefore felt better to retain a single group. Similar considerations applied to Moslems, who are heavily represented among agricultural labour, but who are also dominant in some areas and are then prominent among larger cultivators and landlords. But while a form of "caste" also prevails among Moslems, we were unable to find a convincing basis for subdividing the group.

3. Class

A definition of class in terms of antagonistic, conscious groups identified by a position in an exploitative set of production relations is traditional in some currents of Marxian thought (e.g. Rudra, 1978). But such an approach does not adequately capture the semi-feudal

social formation which dominates much of rural Bihar (Prasad, 1979). A feature of rural Bihar is the coexistence of various forms of exploitation (rent, usury, different forms of labour) and of a number of social groups, quite distinct in the system of production relations, but not necessarily directly antagonistic in the sense that there is no direct contradiction between them. And in so far as group consciousness exists, it is caste- rather than class-based, even though one can reasonably argue that this consciousness is ultimately the result of the relationship which arises from the mode of appropriation of surplus. To capture the key characteristics of this social formation, a fairly detailed class breakdown has been developed, based on the generation of surplus value in agriculture and its appropriation through the labour process.

Among households which supply physical labour in agriculture, those where any member of the household works in agricultural operations on other people's lands in return for some payment either in cash, kind or land, or for debt servicing, are termed "agricultural labour" households. These households are directly exploited and command the lowest status in the agricultural community. Above this level are those peasant households which neither hire labour out nor hire in labourers for agricultural operations, and conduct their agricultural activities with the help of the members of their households or with exchange labour. These are termed "poor-middle peasant" households. They are neither exploiting nor directly exploited through the labour process. Some or all may nevertheless be exploited (i.e. the surplus value they generate may be partly appropriated) through rent[1] or usury or adverse terms of trade. Their status is higher than that of agricultural labourers.

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[1] However, it should be noted that not all those paying rent necessarily belong to the exploited class because a tenant may cultivate his leased-in land by employing labourers and pay rent out of the surplus thus obtained. Alternatively, a tenant can sublease his land and thereby becomes an exploiter. So as a tenant one can be either an exploiter or exploited. Therefore, tenants as such do not constitute a class in the Marxian sense, and have not been distinguished in our scheme.

The next class consists of peasant households which while supplying physical labour in agriculture themselves, also hire in labour for agricultural activities. This class can be divided into three. First there are those who lease out some land. These are termed as landlords. Non-peasant landowners who lease out land, and also other non-peasant households who do not work on the land themselves, but cultivate only through hired labourers, are also termed as landlords. This group is somewhat mixed, since it classifies petty leasers-out with large landowners who lease out a few plots, but in the classification we give priority to the qualitative position vis-à-vis the means of production. Note that the term "landlord" is a little misleading, since many of those concerned do not have large landholdings and cannot be regarded as "lords". However, this terminology is now traditional, and to depart from it might be confusing.

Among the remaining peasant households, there are some who deem it below their dignity to allow female household members to work physically even on their own farms. These are termed "big peasant" households. The remaining households (where both men and women work) are termed "middle peasant" households. The logic of this subdivision rests on the nature of use of family labour, which is important both in itself and in the implied degree of reliance on hired labour.

The important point to note about this classification is that it does not depend directly on land area owned or cultivated, but only on the way the household utilises labour and land. Some anomalies still remain. For instance, those who are forced to lease out their land because age or illness prevents them from cultivating it will be classified as landlords - correct up to a point but only half the story. Households with no female members of working age cannot, by definition, be classified as middle peasants. So further disaggregation would no doubt improve the classification; but given the need to limit the number of categories formed, we would argue that the landlord-big peasant-middle peasant breakdown captures the main features of the class system.

Agricultural labour households also need to be subdivided because the nature of their terms of employment varies, as does their relation to the means of production. A crucial differentiation in the labour process

is between "free" and "unfree" labour - actually a continuum (Thorner and Thorner, 1962). Attachment to a single employer - work only for that employer combined with indebtedness to him, or the leasing of land from him - is taken as an indication of relative lack of freedom ("permanent" labour for a single employer alone is not sufficient, because it may merely reflect a freely entered long term contract). As regards access to the means of production, "proletarian" or "free" labour is free from the means of production in a double sense, that is not only free from bondage or serfdom, but also "free" from the means of production. This distinction calls for a second subdivision of the agricultural labour class, and the cultivation of own or tenanted land provides a critical dividing point. This gives the following four classes of agricultural labour:

- attached, not cultivating (ALNA = Agricultural Labour, Not cultivating, Attached)
- not attached, not cultivating (ALNF = Not cultivating, Free)
- attached, cultivating (ALLA = cultivating Land, Attached)
- not attached, cultivating (ALLF = cultivating Land, Free)

Our classification of peasants and landlords above gave:

- poor-middle peasants (POORMIDP)
- middle peasants (MIDP)
- big peasants (BIGP)
- landlords (LANDLD)

Finally, we must add a class of non-agriculturalists (NONAG), to give a total of nine classes.

In disaggregating castes, above, we found the simplest breakdown to be fourfold: forward, backward and scheduled castes, and Moslems. For comparability, we also need a similar level of disaggregation for class, if we are to compare results at the four caste group as well as the nine caste group level. The most obvious grouping was:

- Agricultural labour (ALNA, ALNF, ALLA, ALLN)
- Poor-middle peasants (POORMIDP)
- Middle and big peasants (MIDP, BIGP)
- Landlords (LANDLD)

The non-agricultural class does not fit in well here; it could be aggregated with the poor-middle peasants (few non-agriculturalists hire in labour) or with the larger class of middle and big peasants, or omitted altogether. We chose the last option.

III. Interactions between Caste, Class and Land

Although conceptually distinct, caste, class and landholding overlap statistically and in some respects definitionally. If this correlation is too large, it will undermine attempts to assess the independent socio-economic effects of these three classifications. Tables 1, 2 and 3 give the pattern of interactions between these three variables observed in our survey.[1]

Table 1 shows the breakdown of caste by class. It can be observed that forward castes are essentially big peasants and landlords, while scheduled castes are essentially agricultural labourers. Backward castes are spread across the class groupings, but each subgroup identified tends to concentrate in one or more classes. Backward castes I are essentially agricultural labourers; Yadavs and Koiris are mainly peasants, especially poor-middle and middle peasants. Two-thirds of Kurmis are big peasants and landlords, but "other backward II" are widely distributed with a relatively high proportion of non-agriculturalists. Moslems are spread across the classes, with the largest concentration (about half) among non-attached agricultural labour.

The inter-relation is therefore strong; but it is by no means perfect. Every caste is represented in at least seven classes out of nine; and while certain groups are almost absent - such as Bhumihar and Rajput agricultural labour, or scheduled caste big peasants or landlords - over 90 per cent of the cells in table 1 have at least one observation, and 74 per cent have at least five cases. There is therefore plenty of variation, and one can quite sensibly look for independent effects of caste and class in multivariate analysis.

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[1] Figures in the tables are absolute numbers with (underneath) row percentages, the latter weighted.

Table 1: Caste by class
Absolute numbers and (in brackets) percentage distribution of households

Caste	Class									
	ALNF	ALNA	ALLF	ALLA	POORMIDP	MIDP	BIGP	LANDLD	NONAG	Total*
Brahmin + Kayasta	11 (3.4)	1 (0.3)	13 (3.9)	0 (0.0)	6 (1.8)	3 (0.9)	189 (58.7)	86 (26.6)	14 (4.4)	322 (12.7)
Bhumihar + Rajput	4 (1.6)	0 (0.0)	2 (0.6)	0 (0.0)	6 (2.7)	1 (0.5)	182 (75.2)	44 (18.1)	3 (1.3)	242 (9.6)
Backward I	131 (31.8)	32 (7.8)	85 (20.7)	73 (17.7)	28 (6.8)	10 (2.5)	22 (5.2)	9 (2.2)	21 (5.1)	412 (16.3)
Yadav	13 (8.9)	2 (1.7)	33 (22.8)	10 (6.8)	25 (17.1)	39 (26.8)	21 (14.3)	1 (0.6)	2 (1.1)	144 (5.7)
Koiri	9 (6.1)	0 (0.0)	22 (15.5)	3 (2.4)	44 (31.1)	26 (18.4)	18 (12.6)	15 (10.9)	4 (3.1)	140 (5.5)
Kurmi	3 (4.7)	0 (0.0)	7 (9.3)	1 (1.1)	7 (10.5)	6 (7.9)	40 (56.0)	7 (9.2)	1 (1.1)	71 (2.8)
Other backward II	18 (9.8)	0 (0.0)	22 (11.6)	7 (3.7)	29 (15.2)	15 (8.0)	22 (11.8)	27 (14.1)	48 (25.8)	188 (7.4)
Scheduled castes	239 (34.5)	37 (5.3)	127 (18.3)	229 (33.1)	20 (2.8)	10 (1.4)	5 (0.8)	9 (1.2)	18 (2.6)	693 (27.4)
Moslem	106 (33.3)	3 (1.0)	57 (17.8)	20 (6.4)	28 (8.8)	5 (1.6)	41 (13.0)	26 (8.3)	31 (9.8)	319 (12.6)
Total	534 (21.1)	76 (3.0)	366 (14.5)	344 (13.6)	192 (7.6)	115 (4.5)	539 (21.3)	223 (8.8)	142 (5.6)	2531 (100.0)

* Percentages in this column are based on the column total, elsewhere they are based on the row total. Likewise tables 2 and 3.

Table 2 gives land ownership by class, using total household landholdings in conventional size groups. The relationship between class and land ownership is strong. Where agricultural labourers own land, they are concentrated in the less than 1 acre group, especially attached labour. Big peasants tend to own more land than middle peasants, who tend to own more land than poor-middle peasants. Landlords, however, although relatively better represented in the larger land ownership categories, tend to be scattered across all land-holding sizes, and indeed the same is some extent true of big and middle peasants as well, so that the table has a triangular pattern. There is therefore a fair degree of independent variation in the data; obviously it will be difficult to statistically distinguish between the effect of landlessness, and the effect of belonging to classes which are 90 per cent or more landless, such as non-cultivating agricultural labour or non-agriculturalists. But landlessness is also found in other groups, so that if there is a distinct effect of lack of land ownership, as opposed to that of belonging to a non-cultivating wage labour class, it should be possible to isolate it. For those with land there is considerable variation in several classes, so that distinct land and class associations should be identifiable.

The relationship between caste and land (table 3) is much more diffuse. Forward castes are very broadly scattered across the land size groups, with Brahmins particularly well represented in larger landholdings, contrary to the general impression in Bihar that Bhumihars dominate. Kurmis show up strongly in intermediate holdings - 2.5 to 10 acres. Scheduled and backward I caste landholdings tend to be low. But as in the case of table 1, only six cells are empty, and if we exclude the largest land ownership group (with only 20 observations) only two cells are empty, so that plenty of independent variation exists.

We may conclude that the relationships between caste, class and land, while strong - especially between class and land - are by no means total, and leave substantial scope for analysing their independent effects. Nevertheless, in the multivariate analysis below, caution will be required because of the likelihood of multicollinearity and thus reduced efficiency and reliability of econometric estimates.

Table 2: Land ownership by class
Absolute numbers and (in brackets) percentage distribution of households

Land ownership group (acres)	Class									
	ALNF	ALNA	ALLF	ALLA	POORMIDP	MIDP	BIGP	LANDLD	NONAG	Total
0	527 (48.4)	74 (6.8)	98 (9.0)	212 (19.5)	22 (2.0)	5 (0.4)	15 (1.4)	1* (0.1)	134 (12.3)	1087 (43.1)
0-1	7 (1.0)	2 (0.2)	217 (31.8)	119 (17.5)	124 (18.2)	52 (7.6)	100 (14.7)	54 (7.9)	7 (1.1)	682 (27.0)
1-2.5	1 (0.3)	0 (0.0)	42 (14.5)	13 (4.4)	37 (12.8)	36 (12.4)	115 (39.5)	46 (15.8)	1 (0.3)	291 (11.5)
2.5-5.0	0 (0.0)	0 (0.0)	7 (3.3)	0 (0.0)	7 (3.0)	15 (6.8)	138 (63.4)	51 (23.4)	0 (0.0)	217 (8.6)
5.0-10.0	0 (0.0)	0 (0.0)	1 (0.9)	0 (0.0)	2 (1.2)	2 (1.5)	99 (68.3)	41 (28.1)	0 (0.0)	145 (5.8)
10.0-20.0	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.6)	64 (77.9)	17 (20.5)	0 (0.0)	82 (3.2)
20+	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (8.5)	6 (31.4)	12 (60.1)	0 (0.0)	20 (0.8)
Total	534 (21.2)	76 (3.0)	366 (14.5)	344 (13.6)	192 (7.6)	113 (4.5)	536 (21.3)	221 (8.7)	142 (5.6)	2524 (100.0)

No. of missing observations = 7

* One case of a "landlord" who leased in all the land that he leased out, and owned none.

Table 3: Land ownership by caste
Absolute numbers and (in brackets) percentage distribution of households

Land ownership group (acres)	Caste									
	Brahmin + Kayasta	Bhumihar + Rajput	Backward I	Yadav	Koiri	Kurmi	Other backward II	Scheduled castes	Moslem	Total
0	24 (2.2)	8 (0.7)	251 (23.1)	31 (2.9)	15 (1.4)	8 (0.7)	87 (8.0)	477 (43.8)	187 (17.2)	1087 (43.1)
0-1	38 (5.6)	59 (8.7)	126 (18.4)	70 (10.3)	79 (11.5)	12 (1.7)	61 (8.9)	181 (26.6)	57 (8.3)	682 (27.0)
1-2.5	52 (18.0)	68 (23.4)	26 (8.9)	20 (6.9)	30 (10.2)	11 (3.6)	22 (7.4)	22 (7.4)	36 (12.5)	291 (11.5)
2.5-5.0	80 (36.8)	51 (23.7)	3 (1.6)	18 (8.1)	11 (5.1)	20 (9.4)	7 (3.4)	6 (2.9)	20 (9.1)	217 (8.6)
5.0-10.0	77 (52.8)	23 (15.8)	0 (0.0)	3 (2.1)	4 (2.8)	16 (10.7)	7 (5.1)	1 (0.9)	14 (9.8)	145 (5.8)
10.0-20.0	40 (48.5)	24 (29.3)	6 (6.9)	2 (2.1)	1 (1.4)	4 (4.6)	2 (2.1)	0 (0.0)	4 (5.1)	82 (3.2)
20+	8 (41.5)	8 (41.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.1)	2 (8.8)	0 (0.0)	1 (4.4)	20 (0.8)
Total	318 (12.6)	241 (9.6)	412 (16.3)	144 (5.7)	140 (5.5)	70 (2.8)	188 (7.5)	692 (27.4)	319 (12.6)	2524 (100.0)

No. of missing observations = 7

IV. Correlations between Economic Phenomena, Caste, Class and Land: Empirical Observations

Four quite different dimensions of economic behaviour have been chosen for analysis in this paper:

(i) Labour force participation: this is an indicator of individual participation in the production process. The measure we have used is a simple one: the proportion of adult household members (aged 15-59) reporting participation in the conventionally defined labour force in the one-year reference period.

(ii) Traditional debt: this is a plausible indicator of the existence of semi-feudal mechanisms in the rural economy, and of the persistence of usury as a significant form of exploitation. It is measured by a dummy variable, whether or not the respondent's household was in debt to traditional sources at the time of the survey. The definition of traditional sources includes landlords, employers and moneylenders, but excludes loans from relatives, friends, and formal institutions.

(iii) The level of agricultural technology: this is an indicator of agricultural modernisation. Four indicators of agricultural technology were available in our survey, all in the form of dummy variables: the use of "modern" (canal, tubewell) irrigation, the use of high yielding seed, the use of chemical fertiliser, and the use of a tractor or power-tiller. The first three of these indicators were added together to form a composite variable (in which each component is given equal weight). This is an unsophisticated but nevertheless usable first indicator of technology level.[1]

(iv) School enrolment: this can be regarded as a measure of potential access to non-agricultural job hierarchies, and as an important element in social mobility. It is measured as the proportion of those aged 5 to 24 reporting attendance in school or college. The upper age

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[1] After being included in earlier tests, the tractor-power tiller variable was eventually excluded from the index, because it is much more scale-dependent than the others. Some forms of irrigation are also scale-dependent, but much less so, and a market for irrigation water often reduces this effect further. In practice, the exclusion of tractors had little effect on the results.

limit was set high enough to capture virtually all students, at the cost of diluting the coverage of primary and secondary school enrolment.

The variables chosen reflect data availability rather than a representative selection of patterns of behaviour. In addition, they are not entirely independent. High school enrolment tends to be associated with higher levels of agricultural technology; high labour force participation among those aged 15 to 24 will be associated with lower educational enrolment in this group; traditional debt is likely to be incompatible with high levels of agricultural mechanisation, often financed through institutional credit; etc. Nevertheless the variables are sufficiently distinct to give a reasonable idea of the range of relationships found with caste, class and landholding.

Before discussing the theory of these relationships in more detail, it is as well to show, through two-way tabulations, that the relationships are indeed present in our data. We present such tabulations in tables 4 to 7.

Table 4 gives the pattern of labour force participation in relation to each of our three explanatory variables. All three show a clear pattern. The highest labour force participation rates are observed for scheduled castes in the caste breakdown, for agricultural labour operating land in the class breakdown and for the landless in the land breakdown; the lowest rates are observed for the forward castes, big peasants and landlords, and for those with most land. The relationship with land is monotonic and regular; the relationships with caste and class suggest distinct patterns for particular subgroups. For instance, Kurmis, among backward castes, have low labour force participation rates; middle peasants, among classes, relatively high. But the very sharp difference between middle peasants (82 per cent participation) and big peasants (46.3 per cent) is essentially definitional, because female labour force participation is by definition zero in the latter group. In the more detailed analysis of the next section we allow for this by estimating separate male and female female labour force participation functions.

Table 4: Labour force participation (%) by caste, class and land

Caste		Class (**)		Land owned (***)	
Brahmin (+ Kayasta)	44.4	ALNF	84.3	0	80.7
Bhumihar + Rajput	45.4	ALNA	82.7	0-1	75.0
Backward Caste I	79.9	ALLF	79.9	1-2.5	61.7
Yadav	82.9	ALLA	89.6	2.5-5	49.9
Koiri	72.4	POOR -MIDP	76.0	5-10	44.1
Kurmi	49.9	MIDP	82.0	10-20	42.0
Other Backward II	64.4	BIGP	46.3	>20	36.6
Scheduled Castes	89.4	LNDLD	43.5		
Moslems	64.3	NONAG	53.4		

Table 5: Percentage of households with "traditional" debt by caste, class and land

Caste		Class (**)		Land owned (***)	
Brahmin (+ Kayasta)	33.2	ALNF	73.5	0	77.4
Bhumihar + Rajput	29.2	ALNA	100.0	0-1	63.4
Backward Caste I	77.2	ALLF	73.2	1-2.5	46.0
Yadav	57.4	ALLA	88.9	2.5-5	31.4
Koiri	47.4	POOR -MIDP	61.6	5-10	19.3
Kurmi	28.6	MIDP	51.3	10-20	17.4
Other Backward II	55.9	BIGP	32.5	>20	8.5
Scheduled Castes	79.0	LNDLD	24.1		
Moslems	64.0	NONAG	52.3		

** ALNF etc.: AL= agricultural labour; third letter: N=not cultivating, L=cultivating; fourth letter: A=attached, F=free.
MIDP=middle peasant/ BIGP= big peasant/ others self-explanatory.

*** Land in acres. Greater than lower limit of group, less or equal to upper limit.

Results for traditional debt are given in table 5. The pattern is qualitatively similar to that for labour force participation, with a particularly strong monotonic negative relation with land ownership. Traditional debt is one component of the definition of attachment of labour, which explains the very high figures for the two classes of attached labour (ALNA and ALLA), but even unattached labour is distinctly more likely to be indebted to traditional sources than any of the peasant classes. There is a steady decline in the incidence of traditional debt as one moves from poor-middle peasants to landlords. Among castes we find a mixed pattern for the backward castes, with both the lowest and one of the highest figures; but otherwise the expected results - low for forward castes, high for scheduled castes - can be observed.

In table 6, we see once again a fairly steady, this time positive, relation between agricultural technology and land ownership. The class breakdown, however, is not monotonic; there is a clear peak in technology among the middle peasantry, declining again among big peasants and landlords. Unattached agricultural labour has the lowest technology level; landlords also have low levels, while there is little difference between the other classes. Among different castes the pattern is much less clear. The highest technology indices are found among three backward castes, especially Kurmis. Then come scheduled castes and only afterwards forward castes. This pattern is not entirely unexpected - Kurmis and Koiris are widely reputed to be innovative - but the relatively high ranking of scheduled castes is contrary to expectations and the pattern is surprisingly mixed.

Table 7 shows strong relationships between all three explanatory variables and school enrolment. Again the relation with land is positive and (almost) monotonic; with class there is a steady rise in enrolment as one moves from agricultural labour to landlords, with appallingly low school enrolment among non-cultivating agricultural labour households. Among castes the high figures for forward castes and low for scheduled castes are in line with expectations. Moslems and backward castes I also show very low enrolment rates. Again, backward castes are very heterogenous, with the enrolment rate for Kurmis as high as the highest rate recorded for any caste.

Table 6: Technology Index by caste, class and land

Caste		Class (**)		Land owned (***)	
Brahmin (+ Kayasta)	2.22	ALNF	--	0	1.89
Bhumihar + Rajput	2.16	ALNA	--	0-1	2.18
Backward Caste I	1.90	ALLF	1.96	1-2.5	2.15
Yadav	2.36	ALLA	2.26	2.5-5	2.37
Koiri	2.39	POOR -MIDP	2.28	5-10	2.51
Kurmi	2.79	MIDP	2.38	10-20	2.55
Other Backward II	1.94	BIGP	2.29	>20	2.56
Scheduled Castes	2.30	LNDLD	2.00		
Moslems	1.99	NONAG	--		

Table 7: School enrolment by caste, class and land (%)

Caste		Class (**)		Land owned (***)	
Brahmin (+ Kayasta)	53.2	ALNF	9.5	0	12.2
Bhumihar + Rajput	54.1	ALNA	2.3	0-1	27.3
Backward Caste I	13.0	ALLF	19.6	1-2.5	43.3
Yadav	23.3	ALLA	16.6	2.5-5	53.8
Koiri	45.2	POOR -MIDP	35.9	5-10	61.7
Kurmi	54.1	MIDP	39.5	10-20	61.1
Other Backward II	29.7	BIGP	50.4	>20	76.8
Scheduled Castes	17.7	LNDLD	58.0		
Moslems	19.2	NONAG	26.5		

** ALNF etc.: AL= agricultural labour; third letter: N=not cultivating, L=cultivating; fourth letter: A=attached, F=free.
MIDP=middle peasant/ BIGP= big peasant/ others self-explanatory.

*** Land in acres. Greater than lower limit of group, less or equal to upper limit.

Overall, these four tables indicate that the relationships with caste, class and land are strong. In the case of land, the relationship is usually monotonic. Patterns of association with caste and class are not always simple, but there are clear, often substantial differences between the various groups. What cannot be judged from these tabulations, however, is the extent to which these three sets of relationships are independent. As we saw above, there are distinct correlations between the explanatory variables; how much of the measured relationship with land might actually be a relationship with class, and vice versa? To explore this at the level of disaggregation above would require a four-way tabulation with 9 x 9 x 7 = 567 cells - not a practical proposition with a sample size of 2,500. Instead, in the next four sections we explore this issue using multivariate techniques.

V. Multivariate Analysis

In this section we report on the specification and estimation of linear models, using ordinary least squares, for each of the four dependent variables. In addition to exploring the relative effects of caste, class and land, our data permit the inclusion of some additional variables from the survey, mainly related to household structure. We also allow for differences between North and South Bihar, through a dummy variable for region. Space does not permit a thorough discussion of the theory underlying the models for each dependent variable; some of the key theoretical issues are briefly raised in discussing the specification of each model.

(i) Labour force participation

The literature on labour force participation is abundant, although largely focused on the rather limited issue of individual decision-making in response to changing wages and opportunity costs.[1] Broadly one can identify four groups of variables to explain labour force participation:

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[1] For a survey of the literature, see Standing (1978).

(a) Measures of the returns to labour, and of the opportunity cost of working time. Variables which are commonly used as proxies for the returns to labour include household structure, wages, education levels and fertility levels. In our data, land ownership captures this relationship to some extent, in that returns to labour on own land rise with landholding. The sign of the relation between land ownership and labour supply cannot always be predicted, however, because the relationship between labour force participation and the opportunity cost of time varies with class position, depending on the relative strength of income and substitution effects. The underlying theory is presented in more detail in Annex I.

Total land per household did not seem appropriate for this model; the substitution effect operates mainly through the number of potential workers, suggesting that the land variable should be specified as land per adult. The income effect would ideally also allow for children, but it is reasonably well captured by land per adult and this measure was retained for all three land categories (irrigated owned, unirrigated owned, and leased in). One additional hypothesis which we felt worth testing was whether an overall household wealth effect would be present - the expectation being that this would be associated with lower labour force participation. This was tested by adding a variable measuring total land owned.

Household size and structure affect returns to labour in several ways. For instance, the larger the number of adults in a household, the lower may be the marginal contribution of each, and the higher the probability that the least productive members will drop out of the labour force. Similarly, given sex segmentation the larger the fraction of the adults who are of the same sex, the lower may be the returns to labour force participation by members of that sex. Larger numbers of children may imply higher adult labour supply (an income effect) or lower (a substitution effect because of the demands on time of child-care). If the substitution effect is present, it is more likely to affect women.

These three factors were reflected in the model with three variables: total number of adults; proportion of adults male; and total number of children. A case could be made that the impact of children is likely to

be differentiated by age, but tests with an age breakdown suggested that it did not add statistically to the model, and this was not pursued.

(b) Job opportunities and position in the production system. While overlapping conceptually with (a), this is analytically distinct; the access to jobs varies discontinuously across different groups of the population, and in consequence so does labour force participation. The most obvious example of this is sex differentiation, and in the statistical analysis below we have analysed male and female labour supply separately, although retaining identical sets of explanatory variables. This apart, differentiation is best captured by class position. The expectation is for labour classes to have higher levels of labour supply than peasant households, because the latter's position in the production system permits them to substitute hired for household labour. Landlords would be expected to have the lowest labour supply of all. Attached labour, if subjected to control by employers, might be expected to have particularly high levels of labour supply.

Another, related issue, which is not picked up in the class stratification, is tenancy. The amount of land leased in is included above. But it can be argued that the fact of leasing in is qualitatively different from the amount leased in - the fact of leasing in being associated with a qualitative difference in work access (but also in social dependency), suggesting a positive effect on labour supply - while for the amount leased in negative income effects may dominate.

(c) Social, geographical and cultural factors. Many such factors could be identified. In our data they are represented by caste and by region (North and South Bihar are distinguished).

(d) Personal characteristics in terms of health, aptitudes, needs for income, etc. These are not captured in our data.

Results for males are given in table 8, and for females in table 9.

The structure of these (and subsequent) tables is as follows: several alternative specifications are given in the different columns. All specifications include the region (a dummy variable: North Bihar = 1), household structure and land variables. In column 1 (run number 1) no other variables are included; run 2 includes caste but

Table 8: Male labour force participation regressions
(9 categories for caste and class)

Run number	1	2	3	4	5
Constant	1.174 (61.21)	1.204 (56.23)	1.148 (41.51)	1.152 (37.58)	1.147 (37.05)
Region	0.0237 (2.80)	0.0245 (2.75)	0.0217 (2.56)	0.0234 (2.64)	0.0237 (2.67)
Proportion male (age 15-59)	-0.392 (13.53)	-0.395 (13.62)	-0.396 (13.92)	-0.401 (14.13)	-0.401 (14.14)
Adults in hhold (age 15-59)	-0.0229 (9.53)	-0.0217 (8.83)	-0.0198 (8.08)	-0.0204 (8.35)	-0.0190 (6.91
No. of children (less than 14)	0.0075 (3.48)	0.0077 (3.61)	0.0075 (3.54)	0.0077 (3.68)	0.0080 (3.78)
Irrigated land owned per adult	-0.0068 (0.97)	0.0004 (0.051)	0.0096 (1.31)	0.0113 (1.50)	0.0212 (1.81)
Unirrig. land owned per adult	-0.0240 (5.44)	-0.0188 (4.02)	-0.0025 (0.51)	-0.0020 (0.40)	0.0027 (0.41)
Leased in land per adult	-0.0083 (0.64)	-0.0075 (0.58)	0.0073 (0.55)	0.0100 (0.75)	0.0106 (0.79)
Leased in land (dummy variable)	0.0181 (1.75)	0.0120 (1.13)	-0.0029 (0.20)	-0.0029 (0.21)	-0.0040 (0.28)
Total land owned	---	---	---	---	-0.0033 (1.16)
Caste dummies*					
Brahmin (+ Kayasta)	---	-0.071 (4.27)	---	-0.003 (0.18)	-0.003 (0.15)
Bhumihar + Rajput	---	-0.044 (2.52)	---	0.024 (1.16)	0.025 (1.20)
Yadav	---	-0.016 (0.81)	---	0.011 (0.52)	0.011 (0.52)
Koiri	---	-0.065 (3.21)	---	-0.021 (0.98)	-0.021 (1.00)
Kurmi	---	-0.040 (1.49)	---	0.008 (0.28)	0.009 (0.33)
Other backward caste II	---	-0.017 (0.94)	---	0.038 (1.99)	0.039 (2.00)
Scheduled caste	---	-0.034 (2.62)	---	-0.048 (3.72)	-0.047 (3.70)
Moslem	---	-0.043 (2.77)	---	-0.027 (1.73)	-0.027 (1.76)

* Excluded caste group: Backward castes I.

Table 8: Male labour force participation regressions (cont'd)
(9 categories for caste and class)

Run number	1	2	3	4	5
Class dummies**					
ALNF	---	---	0.055 (2.41)	0.079 (3.25)	0.080 (3.27)
ALNA	---	---	0.034 (1.11)	0.057 (1.76)	0.057 (1.76)
ALLF	---	---	0.040 (1.85)	0.057 (2.52)	0.056 (2.51)
ALLA	---	---	0.056 (2.52)	0.087 (3.60)	0.088 (3.62)
POORMIDP	---	---	0.003 (0.13)	0.006 (0.24)	0.006 (0.24)
BIGP	---	---	-0.013 (0.58)	-0.021 (0.89)	-0.021 (0.88)
LANDLORD	---	---	-0.121 (4.72)	-0.125 (4.69)	-0.125 (4.67)
NONAG	---	---	-0.016 (0.56)	-0.028 (0.91)	-0.027 (0.90)
R squared	0.115	0.125	0.153	0.166	0.166
N	2306	2306	2306	2306	2306

** Excluded class : Middle peasants (MIDP)

Significance tests for groups of variables

Land variables					
R square change	0.015	0.007	0.001	0.001	0.002
F	9.55	4.54	0.62	0.79	0.88
(significance)	(0.00)	(0.001)	(0.65)	(0.53)	(0.49)
Caste variables					
R square change		0.010		0.012	0.012
F	---	3.13	---	4.22	4.24
(significance)		(0.002)		(0.00)	(0.00)
Class variables					
R square change			0.038	0.041	0.041
F	---	---	12.79	13.88	13.88
(significance)			(0.00)	(0.00)	(0.00)

not class; run 3 includes class but not caste; and run 4 includes both caste and class. In this way we can examine how the inclusion of each set of variables affects the relationship with the others. The coefficient is reported, and under it, in brackets, the corresponding t value.

Caste and class are introduced as a series of dummy variables. In each case the coefficient can be interpreted as the difference from the omitted group - in the case of caste, the omitted group is "backward castes I"; in the case of class, it is middle peasants (except in the case of female labour force participation, where both middle and big peasants are excluded, because the difference between them is definitionally related to female labour force participation). The land variables were entered in linear form after tests with non-linear functions indicated that they did not materially improve the results.[1] At the bottom of the table we give statistical tests for the significance and contributions of the groups of land, caste and class variables taken together. The R^2 change indicates their contribution to explaining variance in the dependent variable, when added last; the F value tests this contribution for statistical significance and the significance level is given in brackets as a proportional confidence level: (0.05) means significant at the .05 (5 per cent) level; (0.00) means significant at better than the .001 (0.1 per cent) level.

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[1] In tables 4 to 7, there are some signs of non-linearity in the bivariate relationships with land. In order to test for this, quadratic terms in the land variables were added to the functions (nine categories for class and caste). The results were mixed. In brief, for labour force participation the quadratic terms were all insignificant, separately and jointly. For traditional debt, jointly they were significant at better than .1 per cent, and the land ownership variables were both separately significant. For technology they were jointly significant at better than .01 per cent, but the non-linear effect was concentrated on irrigated land. For school enrolment they were jointly significant at the 5 per cent level, with only non-irrigated land showing a significant separate effect. There is thus some patchy sign of non-linearity, with owned land at least. But from the point of view of this paper, a more significant conclusion is that the introduction of non-linear terms in land did not lead to any changes in the pattern or significance of associations with caste or class, merely tending to slightly reduce coefficients, on average, because of multicollinearity.

The last column, in tables 8 and 9, reports an alternative specification of the land variables. Otherwise it is comparable with column 4.

In table 8 it can be seen that the household structure and region variables are all significant. The proportion male is strongly negatively related to male labour supply, and so is the total number of adults in the household, both results as expected. The positive impact of the presence of children is an indication of a significant income effect. All these results persist across all specifications.

The land variables perform poorly. In run 1 there is some sign of a significant (negative) relationship between land per adult and male labour supply, strong only for unirrigated land, and of a positive relationship with the leasing-in dummy variable. But these effects are weakened by the introduction of caste (run 2) and eliminated by the introduction of class (run 3). In this case the F test for land variables indicates complete insignificance. There is no sign of an aggregate wealth effect with total land owned (run 5).

Both caste and class variables appear significant, but the contribution of class to R^2 (.04) is much higher than that of caste (.01). The only clear caste effect is the low participation of scheduled castes, with less significant signs of low participation among Moslems and high among "other backward II". There is no obvious logic to these results. The class results, on the other hand, fit in well with expectations. All classes of agricultural labour have high labour force participation, the highest being for attached labour with land. Landlords have low participation rates, and there are no significant differences among the peasantry. These results are much the same regardless of whether caste is included in the model (run 4 compared with run 3), whereas the pattern for caste changes substantially when class is included.

Overall, the explanatory power of the equation is low ($R^2 = 0.17$) but this is almost always true of models of male labour supply.

The pattern for female labour (table 9) is quite different. The region variable has the opposite sign to that for males - other things equal, there is more male labour supply in North Bihar, and less female.

Table 9: Female labour force participation regressions
(9 categories for caste and class)

Run number	1	2	3	4	5
Constant	0.705 (22.14)	0.717 (23.17)	0.347 (9.66)	0.558 (13.86)	0.567 (13.91)
Region	-0.118 (6.64)	-0.0784 (5.10)	-0.144 (9.06)	-0.0883 (5.81)	-0.0885 (5.83)
Proportion male (age 15-59)	0.160 (2.83)	0.1226 (2.63)	0.0887 (1.76)	0.0737 (1.61)	0.0710 (1.55)
Adults in hhold (age 15-59)	-0.0633 (12.42)	-0.0346 (8.08)	-0.0397 (8.51)	-0.0317 (7.48)	-0.0345 (7.35)
No. of children (less than 14)	0.0053 (1.16)	0.0089 (2.39)	0.0080 (2.00)	0.0091 (2.52)	0.0086 (2.36)
Irrigated land per adult	-0.133 (9.57)	-0.0347 (2.89)	-0.0500 (3.87)	-0.0220 (1.84)	-0.0400 (2.26)
Unirrig land per adult	-0.111 (12.69)	-0.0325 (4.26)	-0.0299 (3.40)	-0.0165 (2.06)	-0.0250 (2.47)
Leased-in land per adult	-0.206 (7.43)	-0.131 (5.70)	-0.0975 (3.79)	-0.101 (4.33)	-0.103 (4.38)
Leased-in land dummy	0.254 (11.46)	0.0921 (4.89)	0.174 (6.61)	0.0742 (3.03)	0.0770 (3.14)
Total land owned	---	---	---	---	0.0066 (1.38)
Caste dummies*					
Brahmin (+ Kayasta)	---	-0.527 (18.48)	---	-0.393 (12.53)	-0.395 (12.57)
Bhumihar + Rajput	---	-0.549 (18.13)	---	-0.400 (11.61)	-0.402 (11.65)
Yadav	---	0.0830 (2.39)	---	0.138 (3.95)	0.139 (3.96)
Koiri	---	-0.041 (1.17)	---	0.009 (0.26)	0.010 (0.29)
Kurmi	---	-0.433 (9.35)	---	-0.333 (7.05)	-0.336 (7.11)
Other backward caste II	---	-0.277 (8.66)	---	-0.185 (5.61)	-0.185 (5.59)
Scheduled caste	---	0.205 (9.17)	---	0.184 (8.32)	0.184 (8.32)
Moslem	---	-0.210 (7.87)	---	-0.182 (6.87)	-0.181 (6.85)

* Excluded caste group: Backward castes I.

Table 9: Female labour force participation regressions (cont'd)
(9 categories for caste and class)

Run number	1	2	3	4	5
Class dummies**					
ALNF	---	---	0.516 (19.34)	0.224 (7.49)	0.225 (7.53)
ALNA	---	---	0.538 (11.17)	0.173 (3.61)	0.175 (3.65)
ALLF	---	---	0.434 (16.38)	0.209 (7.65)	0.211 (7.72)
ALLA	---	---	0.484 (15.52)	0.208 (6.32)	0.209 (6.34)
POORMIDP	---	---	0.385 (11.91)	0.219 (7.03)	0.221 (7.09)
LANDLORD	---	---	0.017 (0.54)	0.001 (0.04)	0.001 (0.04)
NONAG	---	---	0.048 (1.15)	-0.057 (1.44)	-0.057 (1.44)
R squared	0.222	0.480	0.395	0.508	0.508
N	2351	2351	2351	2351	2351

** Excluded classes: Middle and big peasants (MIDP,BIDP).

Significance tests for groups of variables

Land variables					
R square change	0.152	0.014	0.020	0.006	0.006
F	114.07	15.55	19.31	6.55	5.62
(significance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Caste variables					
R square change		0.258		0.113	0.113
F	---	144.98	---	66.91	67.11
(significance)		(0.00)		(0.00)	(0.00)
Class variables					
R square change			0.173	0.028	0.028
F	---	---	95.21	18.70	18.89
(significance)			(0.00)	(0.00)	(0.00)

The household structure effects are statistically somewhat weaker, especially the proportion male variable, which has the expected positive sign, but is only marginally significant when all other variables are in the model. The effects of the number of adults in the household, and of the number of children, are similar to those for males - there is no sign of labour force withdrawal induced by child-care.

In contrast to the situation for males, all land variables are significant, although they lose a good deal of their explanatory power when caste and class are included. The general effect of total land area is negative, indicating that an income effect is dominant. The dummy variable for leasing in land, however, is strongly positive, in line with expectations. The total land variable does not add significantly to the equation.

Again in contrast to the situation for males, caste performs much better than class in explaining female labour supply.[1] The very low female labour force participation of all forward castes stands out clearly. Kurmis, "other" backward castes II, and Moslems also all have low female participation rates. In contrast Yadavs have high female labour supply (essentially in the care of livestock) and scheduled castes even higher. The pattern is little changed by the introduction of class.

The effects of class are weakened when we also allow for caste, but they remain highly significant. All agricultural labour groups, and also poor middle peasants, have high participation rates; there are no significant differences between landlords, non-agriculturalists, and the excluded group.

The explanatory power of run 4, where $R^2 = .51$, is high for this type of micro-analysis.

(ii) Traditional debt

The literature on the determinants of traditional debt is much less ample than for labour force participation. Four broad groups of determinants can be seen:

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[1] Although since two of the nine classes are excluded, the situation is slightly biased in favour of caste, which retains nine categories as against eight for class.

(a) Need for loans (for health, current consumption, purchase of assets, festivals, and so on). A positive relationship with the incidence of traditional debt can be expected.

(b) Own assets. Negative relationship.

(c) Access to institutional credit. Negative.

(d) Value of loan to lender. Positive. This value may come from some personal control over the borrower, as well as from the more obvious monetary return and security of the loan.

Among the explanatory variables available in the data, land is clearly the main component of (b); to the extent that institutional credit depends on guarantees from own assets, it may also contribute to (c), and, as a proxy for income, to (a). Class will also significantly affect the need for loans, those belonging to labour classes clearly having greater needs because, dependent only on their own labour, they have fewer alternative ways of meeting crises. Upper classes are also likely to control institutional credit (c), but class is most likely to be important in (d), since loans, and associated obligations, are likely to be an important component of interclass relations. Control over the borrower, where the latter works for wages, is likely to be a widespread ingredient of indebtedness (Bhadhuri, 1973). As for caste, its relation to indebtedness is not obvious. Some castes may have greater access to institutional credit, or may tend to be more successful than others in avoiding indebtedness. There is no obvious reason for a direct effect of household size or structure, nor was one found in preliminary tests.

For the specification of the land variable, aggregate assets per household seemed to be the relevant measure. A case can be made, however, that the maximum need for loans rises with household size, so that an alternative specification is to allow for both total assets - the maximum own-resource availability - and assets per capita. Both specifications were tried and are reported below. In addition, the leasing in of land often forms part of a complex of dependency in which debt is also involved, so the "leasing in" dummy variable was also included.

Results are given in table 10; the lay-out of the table is similar to that of tables 8 and 9. The region variable is insignificant throughout. The land variables are highly significant on their own, and remain significant, although substantially weakened, when allowance is made for caste, and especially for class. The pattern is for owned land to reduce debt, as expected. Leased in land, on the other hand, is associated with increased debt, the main effect being concentrated on the dummy variable, whether or not leasing land in. This too is in line with expectations. The use of per capita land measures (run 5) reduces statistical significance without changing the qualitative conclusions.

Caste on its own (run 2) has a quite substantial impact, but when it is combined with class in run 4 the pattern is substantially weakened, while class loses relatively little power when combined with caste. Results in run 4 suggest that all included castes have relatively less traditional debt than the excluded group, backward castes I, but that this is especially true of Yadavs, Koiris and Kurmis. Among classes we find high debt among all agricultural labour groups - especially, not surprisingly, for attached labour, for whom debt is part of the process of attachment, but also for casual labourers. Unattached labourers cultivating land (ALLF) have the lowest values in this group. There is a steady decline in the incidence of traditional debt as we move from poor-middle peasants through (excluded) middle and big peasants, with the lowest values recorded for landlords.

Looking at the contributions to R^2 we can see that class is by some margin the most important factor. Overall, this equation explains about a quarter of the variance in traditional debt. It should be noted, in passing, that with a dummy dependent variable OLS is inefficient, although it is unbiased. With a reasonably large sample, however, this is unlikely to qualitatively change the results.

(iii) Technology

The determinants of technology choice remains an open and controversial topic. Here we cannot look at the dynamic issues, but rather at cross-sectional differences in technology choice. The following appear to be the main factors involved:

Table 10: Traditional debt regressions
(9 categories for caste and class)

Run number	1	2	3	4	5
Constant	0.593 (35.43)	0.730 (27.38)	0.418 (9.27)	0.528 (9.89)	0.535 (9.99)
Region	0.0112 (0.60)	-0.0090 (0.47)	-0.0115 (1.64)	-0.0260 (1.39)	-0.0261 (1.39)
Total land owned irrigated	-0.0372 (8.81)	-0.0229 (5.34)	-0.0156 (3.71)	-0.0153 (3.59)	---
Total land owned unirrigated	-0.0330 (11.37)	-0.0194 (6.44)	-0.0104 (3.42)	-0.0103 (3.45)	---
Total land leased in	-0.0056 (0.68)	0.0032 (0.40)	0.0175 (2.16)	0.0154 (1.90)	---
Irrigated land per capita	---	---	---	---	-0.0324 (1.02)
Unirrig. land per capita	---	---	---	---	-0.0421 (1.77)
Leased-in land per capita	---	---	---	---	0.0929 (1.65)
Leased-in land dummy	0.184 (8.18)	0.135 (6.03)	0.144 (4.83)	0.139 (4.63)	0.139 (4.56)
Total land owned	---	---	---	---	-0.0122 (2.62)
Caste dummies*					
Brahmin (+ Kayasta)	---	-0.297 (8.35)	---	-0.065 (1.63)	-0.064 (1.58)
Bhumihar + Rajput	---	-0.368 (9.87)	---	-0.113 (2.59)	-0.115 (2.63)
Yadav	---	-0.228 (5.27)	---	-0.138 (3.15)	-0.136 (3.09)
Koiri	---	-0.277 (6.30)	---	-0.145 (3.19)	-0.146 (3.21)
Kurmi	---	-0.360 (6.14)	---	-0.175 (2.94)	-0.177 (2.98)
Other backward caste II	---	-0.181 (4.59)	---	-0.040 (0.99)	-0.040 (1.00)
Scheduled caste	---	0.006 (0.22)	---	-0.020 (0.74)	-0.021 (0.76)
Moslem	---	-0.106 (3.20)	---	-0.033 (1.01)	-0.032 (0.98)

* Excluded caste group: Backward castes I.

Table 10: Traditional debt regressions (continued)
(9 categories for caste and class)

Run number	1	2	3	4	5
Class dummies**					
ALNF	---	---	0.323 (6.61)	0.248 (4.76)	0.242 (4.64)
ALNA	---	---	0.593 (8.77)	0.513 (7.29)	0.507 (7.20)
ALLF	---	---	0.226 (4.84)	0.171 (3.51)	0.167 (3.43)
ALLA	---	---	0.327 (6.79)	0.251 (4.80)	0.245 (4.71)
POORMIDP	---	---	0.127 (2.47)	0.105 (2.02)	0.102 (1.97)
BIGP	---	---	-0.078 (1.69)	-0.090 (1.78)	-0.088 (1.74)
LANDLORD	---	---	-0.114 (2.15)	-0.144 (2.59)	-0.132 (2.35)
NONAG	---	---	0.110 (1.92)	0.046 (0.77)	0.040 (0.67)
R squared	0.127	0.195	0.238	0.244	0.245
N	2520	2520	2520	2520	2520

** Excluded class : Middle peasants (MIDP).

Significance tests for groups of variables

Land variables					
R square change	0.127	0.041	0.027	0.023	0.023
F	91.48	32.07	21.79	18.67	15.32
(significance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Caste variables					
R square change		0.068		0.007	0.007
F	---	26.34	---	2.80	2.81
(significance)		(0.00)		(.004)	(.004)
Class variables					
R square change			0.111	0.050	0.045
F	---	---	45.41	20.49	18.73
(significance)			(0.00)	(0.00)	(0.00)

(a) Factors related to scale: pure economies of scale, capacity to absorb risk, access to adequate working capital, etc. These are all closely related to land ownership. The best measure of land under these circumstances is evidently total household landholding (including land leased in). It is also plausible to expect some return to household scale as well, in terms of the total number of household members of working age, since all three aspects of technology included in our index involve higher labour demands.

(b) Differentials in price responsiveness, in market orientation, in propensity to save and invest - the reasons invoked for the differentials usually being cultural, ethnic or caste. In our data, caste differentials can be regarded as reflecting such issues.

(c) Differentials in innovation related to control over the production system and patterns of land utilisation. In this model, those who control the land have little incentive to innovate, whereas less powerful groups can enhance their political influence through accumulation and innovation. This type of issue is reflected in our data by class differentials. Lack of control over land is also reflected in tenancy, so as in the case of traditional debt we distinguish the fact of tenancy (relevant here) from the area leased in (relevant under (a)).

Explanatory variables are similar to those in preceding sections, except that (a) irrigation is part of the dependent variable, so we cannot distinguish irrigated from non-irrigated land in the independent variables; and (b) three classes - ALNF, ALNA and NONAG - do not cultivate by definition, and are therefore excluded.

Results from estimating models along these lines are reported in table 11. Overall, the power of our model to explain technology is low - R^2 reaches a maximum of .10 in run 4. The region variable is significantly negative - i.e. other things being equal, technology levels are lower in North Bihar, although much of this apparent regional difference appears (in run 4) to be an outcome of differences in caste and class composition. The scale effects are all positive and significant, both for potential household labour availability and for land. For land leased in, we can see a positive scale effect of total land

Table 11: Technology index regressions
(9 categories for caste and class)

Run number	1	2	3	4
Constant	2.09151 (34.513)	1.87421 (21.188)	2.29084 (21.61)	2.02418 (15.698)
Region	-0.23555 (-5.049)	-0.14105 (-2.891)	-0.18391 (-3.907)	-0.11415 (-2.34)
Adults in hhold (age 15-59)	0.0512 (4.543)	0.04886 (4.365)	0.04823 (4.256)	0.04644 (4.123)
Total land owned (irrig+unirrig)	0.02214 (4.007)	0.02563 (4.444)	0.0282 (4.721)	0.02769 (4.63)
Total land leased in	0.00981 (0.567)	0.02623 (1.507)	0.02658 (1.486)	0.03448 (1.932)
Leased-in land dummy	-0.03226 (-0.583)	-0.10971 (-1.798)	-0.18004 (-2.745)	-0.19691 (-2.979)
Caste dummies				
Brahmin (+ Kayasta)	---	0.09668 (1.044)	---	0.08936 (0.856)
Bhumihar + Rajput	---	0.05456 (0.571)	---	0.01637 (0.149)
Yadav	---	0.38348 (3.658)	---	0.36383 (3.344)
Koiri	---	0.37057 (3.363)	---	0.31116 (2.728)
Kurmi	---	0.60138 (4.364)	---	0.56231 (3.95)
Other backward Caste II	---	-0.05293 (-0.48)	---	-0.06329 (-0.56)
Scheduled caste	---	0.39612 (4.933)	---	0.37116 (4.561)
Moslem	---	0.04916 (0.512)	---	0.06541 (0.676)

Excluded caste group: Backward castes I.

Table 11: Technology index regressions (continued)
(9 categories for caste and class)

Run number	1	2	3	4
Class dummies				
ALLF	---	---	-0.31618 (-3.082)	-0.28016 (-2.616)
ALLA	---	---	0.06081 (0.576)	0.04475 (0.381)
POORMIDP	---	---	-0.02513 (-0.223)	0.02956 (0.262)
BIGP	---	---	-0.2046 (-2.01)	-0.07827 (-0.695)
LANDLORD	---	---	-0.48376 (-3.857)	-0.34159 (-2.589)
R squared	0.05030	0.08362	0.07358	0.10132
Number of cases	1702	1702	1702	1702

Excluded class : Middle peasants (MIDP)
ALNF, ALNA, and NONAG excluded because not cultivating.

Significance tests for groups of variables

Land variables				
R square change	0.011	0.014	0.018	0.018
F	6.81	8.85	11.17	11.16
(significance)	(0.00)	(0.00)	(0.00)	(0.00)
Caste variables				
R square change		0.033		0.028
F	---	7.67	---	6.49
(significance)		(0.00)		(0.00)
Class variables				
R square change			0.023	0.018
F	---	---	8.50	6.63
(significance)			(0.00)	(0.00)

availability, combined with a negative, significant impact of the fact of leasing - those who lease in small plots of land have lower technological levels than those cultivating own land, but positive scale effects operate once sufficient land is leased in. In contrast to other cases, the relationship with land owned persists essentially unchanged when class and caste are introduced, while those with leased in land are strengthened from non-significance in run 1 to statistical acceptability in run 4.

Out of caste and class, caste is stronger in terms of contribution to R^2. However since the level of disaggregation of class is reduced here because three classes do not cultivate, the F values are similar, suggesting that at comparable levels of disaggregation there would be little to choose between caste and class. In run 2 the highest technology levels are found among Yadavs, Koiris, Kurmis and scheduled castes. Other backward castes do relatively badly, while Moslems and forward castes form an intermediate category. Allowing for class (run 4) does not significantly change these results. Among classes, the non-linear relationship observed in the two-way tabulation (table 6) persists in that unattached agricultural labourers, and landlords, both have significantly lower technology indices than the intermediate groups of peasants. Attached labourers have significantly higher technology levels than non-attached, suggesting that those attached to big and middle peasants benefit from access to the technology used by their employers.

Thus class, caste and land all appear to contribute to technology differentials, although the overall explanatory power is rather low. One likely reason is that the spread of technology depends on public policy variables such as electrification, canal irrigation and the like which we have not considered here.

(iv) School enrolment

Factors determining school enrolment fall into four groups, which roughly correspond to the four groups distinguished for labour force participation.

(a) Measures of the returns to and costs of education. In a purely meritocratic system the returns to education will depend only on personal ability, but in reality family support and associated networks of contacts which facilitate job access imply higher returns to those in upper social groups - probably best captured by caste groups in Bihar, but also reflecting class position. Opportunity costs of education will be influenced by land ownership (which increases the returns to labour), but will also be affected by class position, which will modify the deployment of family labour. The loss of income due to school enrolment may be lower in absolute terms in a labour household, but firstly, it may be larger in relation to total household income, and secondly the return that schooling is likely to bring, in the form of higher future income, will be much smaller than in large peasant or landlord families. In this respect poor-middle peasant households are likely to be similar to labour households. Thus all three of our main explanatory variables are relevant here.

The best specification of the land variable, in these circumstances, is not obvious. As an income measure, land per capita or per adult equivalent might be suitable; as a measure of access to work, land per adult would be better. A wealth effect, in which total household landholdings are relevant, might also be foreseen. Land per adult seemed most appropriate as a synthetic measure, capturing both income and work access aspects fairly well. Since these effects have opposite predicted signs, we can assess which of them is dominant from the sign of the estimated coefficient. In order to test for an aggregate wealth effect, we also introduce an overall measure of landholding in one run.

The age structure of the household will obviously affect the total costs of schooling in relation to household resources; the proportion of household members in the relevant age range (5-24) is likely to be negatively associated with school enrolment.

(b) Access to educational institutions. This is nominally egalitarian, but there will be a tendency for schools to be concentrated in better-off villages; there may also be some caste discrimination, or differential access as between Moslems and Hindus. There is evidently considerable sex discrimination; this is allowed for in the function by

including a variable measuring the sex ratio of the population of school age. Higher proportions of girls are expected to be associated with lower school enrolment rates.

(c) Social and cultural factors, in the form of caste, religious and regional differentials, are likely to be of some importance.

(d) Finally personal characteristics, notably in the form of individual aptitude and ability, are likely to influence enrolment; however data to reflect these are not available in our survey.

Results are reported in table 12. Regional differences are quite significant (lower enrolment in North Bihar) as are the household structure variables: enrolment is strongly associated with the sex ratio among relevant household members, and also (negatively) with the proportion of household members in the relevant age group. All these results persist with little change across all specifications.

Land owned is strongly and positively associated with school enrolment, and the coefficient on irrigated land substantially exceeds that on unirrigated: the income effect appears to dominate. Coefficients are considerably lower when caste or class are also introduced, but statistical significance persists. Leased-in land, however, shows up significantly only in one run, and then with a negative sign. This makes sense; the income effect will be much weaker on leased land, while the access to work effect will remain. In run 5 we test for a separate aggregate landholding effect. The new variable is somewhat short of conventional statistical significance, and it reduces the significance of other land variables. Clearly little is gained.

The caste pattern indicates a distinctly higher school enrolment among forward castes, Koiris and Kurmis, although the difference is sharply reduced when allowing for class in run 4. Yadavs, other backward II, and Moslems are not significantly different from the excluded backward I castes, but scheduled castes, interestingly, have a somewhat higher school enrolment after allowing for their class (and land) position.

The pattern of class relations is fairly predictable. All agricultural labour has low school enrolment, those without land more so than

Table 12: School enrolment regressions
(9 categories for caste and class)

Run number	1	2	3	4	5
Constant	0.234 (9.68)	0.121 (4.37)	0.358 (10.13)	0.288 (7.11)	0.286 (7.06)
Region	-0.0838 (6.17)	-0.0680 (5.03)	-0.0710 (5.54)	-0.0619 (4.64)	-0.0617 (4.63)
Proportion male (age 5-24)	0.300 (14.38)	0.285 (14.54)	0.280 (14.50)	0.278 (14.53)	0.278 (14.55)
Proportion of household members aged 5-24	-0.210 (5.25)	-0.198 (5.23)	-0.198 (5.34)	-0.188 (5.10)	-0.189 (5.13)
Land owned per adult irrigated	0.137 (11.35)	0.0827 (6.83)	0.0639 (5.41)	0.0582 (4.84)	0.0362 (2.07)
Land owned per adult unirrig.	0.0978 (15.42)	0.0623 (9.78)	0.0417 (6.22)	0.0391 (5.87)	0.0314 (3.93)
Land leased in per adult	0.0021 (0.12)	0.0253 (1.60)	-0.0421 (2.60)	-0.0163 (0.99)	-0.0149 (0.90)
Total land owned	---	---	---	---	0.0065 (1.73)
Caste dummies*					
Brahmin (+ Kayasta)	---	0.292 (11.72)	---	0.146 (5.17)	0.144 (5.10)
Bhumihar + Rajput	---	0.319 (12.15)	---	0.146 (4.67)	0.143 (4.54)
Yadav	---	0.067 (2.23)	---	-0.008 (0.26)	-0.008 (0.27)
Koiri	---	0.269 (8.72)	---	0.158 (4.95)	0.159 (4.97)
Kurmi	---	0.286 (7.20)	---	0.159 (3.90)	0.155 (3.82)
Other backward caste II	---	0.118 (4.19)	---	0.019 (0.66)	0.019 (0.65)
Scheduled caste	---	0.035 (1.77)	---	0.056 (2.87)	0.056 (2.87)
Moslem	---	0.062 (2.62)	---	0.025 (1.07)	0.025 (1.09)

* Excluded caste group: Backward castes I.

Table 12: School enrolment regressions (continued)
(9 categories for caste and class)

Run number	1	2	3	4	5
Class dummies**					
ALNF	---	---	-0.242 (7.57)	-0.221 (6.47)	-0.218 (6.40)
ALNA	---	---	-0.301 (6.67)	-0.274 (5.87)	-0.271 (5.82)
ALLF	---	---	-0.162 (5.05)	-0.151 (4.56)	-0.149 (4.50)
ALLA	---	---	-0.205 (6.33)	-0.190 (5.40)	-0.187 (5.34)
POORMIDP	---	---	-0.016 (0.44)	-0.025 (0.69)	-0.023 (0.64)
BIGP	---	---	0.084 (2.68)	0.023 (0.66)	0.020 (0.58)
LANDLORD	---	---	0.131 (3.57)	0.090 (2.34)	0.090 (2.34)
NONAG	---	---	-0.106 (2.55)	-0.088 (2.04)	-0.085 (1.97)
R squared	0.235	0.328	0.352	0.370	0.371
N	2251	2251	2251	2251	2251

** Excluded class : Middle peasants (MIDP).

Significance tests for groups of variables

Land variables					
R square change	0.132	0.041	0.021	0.015	0.016
F	128.87	45.00	24.64	18.18	14.39
(significance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Caste variables					
R square change		0.094		0.018	0.017
F	---	38.92	---	7.83	7.67
(significance)		(0.00)		(0.00)	(0.00)
Class variables					
R square change			0.117	0.041	0.040
F	---	---	50.51	18.24	17.79
(significance)			(0.00)	(0.00)	(0.00)

those cultivating, and attached more so than casual. The peasant classes are not significantly different from one another, but landlords have higher enrolment rates, and non-agriculturalists lower (though not as low as agricultural labour). Judging by the contribution to R^2, class is distinctly superior to both caste and land in run 4, and the pattern is not much different from run 3 (where caste is excluded).

(v) A more aggregated formulation

For purposes of analysis, a breakdown of caste and class into less than nine categories would clearly be more convenient. As we saw above (section II) a case can be made for a four-category breakdown. This four-group classification would perhaps be more widely accepted than the nine-group classification used above. Moreover, it is important to assess the stability of the results with respect to aggregation, since other authors would doubtless choose slightly different detailed groups from ours. The aggregation also permits us to check on some aspects of specification - in two cases, less classes were present in the model than castes; whereas in the traditional debt model, disaggregation of agricultural labour classes was not independent of the presence of traditional debt. Both of these problems are eliminated by aggregation.

For each of the dependent variables, the best function identified above has been rerun in this more aggregated version, and the results are reported in table 13. In this table, the excluded caste group is all backward castes; the excluded class consists of middle and big peasants, and non-agriculturalists.

On the whole, the general pattern is not much changed by this aggregation. The loss in R^2 averages only .02. The contribution to R^2 and the significance levels of the land variables remain more or less similar to the disaggregated version. The class variables mostly maintain or increase their contribution to R^2. But the caste variables do distinctly less well, both in terms of explanatory power, and in terms of the plausibility of the outcomes; for instance, according to these results scheduled castes would have by far the higher technology levels. The caste result can be traced to the heterogeneity of the

Table 13: Regressions for all dependent variables
(4 categories for caste and class)

XX Dependent XX variable XX XX Independent XX variable XX	Male labour force particip.	Female labour force particip.	Tradit-ional debt	Agricul-tural technology index	School enrol-ment
Constant	1.147 (54.31)	0.466 (15.20)	0.428 (17.65)	2.185 (28.11)	0.340 (12.96)
Region	0.0204 (2.38)	-0.0814 (5.41)	-0.0002 (0.01)	-0.160 (3.33)	-0.0765 (5.88)
Proportion male (age 15-59)	-0.397 (14.04)	0.0941 (2.03)	---	---	---
Proportion male (age 5-24)	---	---	---	---	0.278 (14.39)
Number of adults in household	-0.0207 (8.59)	-0.0343 (8.03)	---	0.0483 (4.26)	---
No. of children in household	0.00739 (3.53)	0.00975 (2.63)	---	---	---
Proportion of household mem-bers aged 5-24	---	---	---	---	-0.205 (5.53)
Irrigated land per adult	0.0085 (1.18)	-0.0283 (2.39)	---	---	0.071 (6.08)
Unirrig land per adult	-0.0030 (0.62)	-0.0160 (1.98)	---	---	0.045 (6.71)
Leased-in land per adult	0.0036 (0.28)	-0.0858 (3.70)	---	---	-0.0034 (0.22)
Total land owned irrigated	---	---	-0.0191 (4.59)	) ( ) ( )0.0299( )(5.00)( ) ( ) (	---
Total land owned unirrigated	---	---	-0.0127 (4.17)		---
Total land leased in	---	---	0.0143 (1.79)	0.0170 (0.97)	---
Leased in land dummy	0.0021 (0.20)	0.0957 (5.11)	0.106 (4.82)	-0.117 (1.90)	---

Table 13: Regressions for all dependent variables (continued)
(4 categories for caste and class)

XX Dependent XX variable XX XX Independent XX variable XX	Male labour force particip.	Female labour force particip.	Tradit-ional debt	Agricul-tural technology index	School enrol-ment
Caste dummies*					
Forward caste	-0.003 (0.26)	-0.318 (14.10)	-0.058 (2.11)	-0.170 (2.46)	0.116 (5.98)
Scheduled caste	-0.049 (4.44)	0.206 (10.55)	0.041 (1.73)	0.307 (4.51)	0.022 (1.33)
Moslem	-0.032 (2.32)	-0.145 (6.12)	0.007 (0.24)	-0.105 (0.26)	-0.010 (0.51)
Class dummies**					
Agricultural labour	0.081 (6.59)	0.266 (12.53)	0.296 (11.65)	-0.220 (3.09)	-0.204 (11.15)
Poor-middle peasant	0.016 (0.94)	0.257 (8.48)	0.133 (3.60)	0.036 (0.43)	-0.009 (0.34)
Landlord	-0.108 (6.39)	0.003 (0.092)	-0.083 (2.47)	-0.295 (3.41)	0.082 (3.29)
R squared	0.160	0.481	0.221	0.076	0.349
N	2306	2351	2520	1702	2251

* Excluded caste group: all backward castes.
** Excluded classes : Middle and big peasants, non-agriculturalists.

Significance tests for groups of variables

Land variables					
R square change	0.001	0.008	0.028	0.017	0.022
F	0.54	9.04	22.41	10.50	25.46
(significance)	(0.71)	(0.00)	(0.00)	(0.00)	(0.00)
Caste variables					
R square change	0.008	0.089	0.003	0.018	0.012
F	7.05	132.99	2.98	10.72	13.78
(significance)	(0.00)	(0.00)	(.030)	(0.00)	(0.00)
Class variables					
R square change	0.040	0.039	0.051	0.013	0.052
F	36.57	58.83	55.16	7.93	59.92
(significance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

backward castes. One could doubtless find ways of aggregating castes to produce a better result - but the best aggregation varies with the dependent variable. If, for instance, we try to identify particular backward castes which should be grouped together with forward castes, we would find Koiris and Kurmis for school enrolment, Kurmis alone for female labour force participation, Kurmis, Koiris and Yadavs for traditional debt and perhaps agricultural technology, and no obvious grouping for male labour force participation. Evidently, Kurmis could well be grouped with forward castes - but singling out one backward caste in this way is surely ex post rationalisation, and goes directly counter to the theoretical ranking or grouping of castes.

VI. Conclusions from the Multivariate Analysis

(i) The separate effects of caste, class and land

Land: The effects of land were broadly in accordance with expectations; owned land was positively associated with school enrolment and with technology use, and negatively with traditional debt and female labour force participation. However, the relationships with schooling, debt and female work were much weakened by controlling for caste and class. The leasing in of land had mixed effects. For female labour supply and technology, the area leased in had effects similar to those of the area owned; but the fact of leasing in had the opposite effect, suggesting that some aspect of dependency or of class position was involved (note that tenancy was not taken into account in the class breakdown). This was even more so in the case of traditional debt, where the association with leased-in land was unambiguously positive, in contrast to that with owned land. The insignificant relationship between male labour supply and land, although theoretically possible, is worth underlining because it does not concord with normal expectations.

Caste: The independent effects of caste were usually in line with expectations, though much weaker than casual empiricism would suggest. What is more, they were substantially weakened by aggregation, largely because of the heterogeneity of the backward castes. At the disaggregated (nine caste) level, forward castes show up clearly as having

higher school enrolment, and lower traditional debt and female labour force participation than the excluded caste (backward I). In this they are emulated to varying extents by the "backward" Koiris, Yadavs and Kurmis, with the Kurmis being closest in pattern to the forward castes. Other castes in the backward II category are usually not significantly different from the excluded caste groups. Scheduled castes show, curiously, relatively high education enrolment and technology levels and low male labour supply, and, less surprisingly, high female labour force participation rates. Moslems, who are economically a very mixed group in Bihar, show a distinctive pattern of behaviour only with respect to female labour force participation, which is low, in line with expectations.

Thus some clear, reasonable, caste-associated behaviour patterns can be identified, independent of land and class, although there are also some curious results. The patterns observed could conceivably be reflecting multicollinearity with class, but our results make a prima facie case for retaining disaggregated measures of caste as an explanatory variable, and there may be returns to disaggregating some of the categories (notably scheduled castes and Moslems) further.

Class: The independent effects of class were usually strong and in line with expectations. Unlike the effects for caste, they did not greatly suffer from re-aggregation, suggesting that the nine-class breakdown may be unnecessarily fine. The four agricultural labour classes were usually similar in basic pattern - low for school enrolment, high for traditional debt, and high on labour supply (all compared with the excluded class - the middle peasantry). Some patterns within the agricultural labour group as a whole can nevertheless be seen. Those not cultivating land have even lower school enrolment rates than those who are cultivating; there is also a hint that attached labour households have lower school enrolment than free. Among agricultural labour cultivating land, attached labour has a distinctly higher technology index - perhaps reflecting access to the employers' technology.

The extent to which distinct patterns can be identified within the peasantry - poor-middle, middle (excluded), and big - varies. Female labour force participation is higher among the poor-middle peasants; there are no significant differences with respect to school enrolment,

male labour supply or technology. Traditional debt shows a clear decline as one moves from the poor-middle peasantry, through middle peasants to big peasants.

Landlords, despite their heterogeneity as a group (they include small and large, cultivators and non-cultivators) are clearly distinguished by high school enrolment, and low male labour force participation, traditional debt and technology level. The non-agricultural group is not very different from the middle peasants, having somewhat lower labour supply and school enrolment.

(ii) The relative importance of caste, class and land

The correlations between land, caste and class do, as predicted, affect their apparent relationships with labour supply, traditional debt, and the other issues, discussed above. The results obtained when two or all three are entered in the various models differ, often substantially, from those obtained from bivariate relationships. There is therefore a need to consider all three together, and not separately.

When we do so, we can assess the relative importance of these variables from a number of different indices: contributions to R^2 alone and with other variables; joint F tests for the group of variables; and significance and coherence of the patterns of variation between categories.

The joint F tests, reported at the bottom of tables 8 to 13, suggest that all three variables are important. For class, all F tests are significant at better than the .1 per cent significance level. For caste, all tests are significant at better than 1 per cent, and all except one at .1 per cent. For land, one (male labour force participation) is insignificant, but the others are all significant at .1 per cent.

In terms of contributions to R^2, land is reasonably powerful on its own (the first column of each table), but usually makes the smallest contribution to R^2 when all variables are combined. Class is slightly more consistent than caste on this criterion, class doing better in three cases out of five. Caste is distinctly superior to class in only one case, female labour supply, where the dominance of cultural factors is apparent.

With respect to the coherence and plausibility of the relationships, the patterns observed for land and for class are generally in line with expectations. For land the results can readily be explained as a balance of income, scale and substitution effects (of course almost any results could be explained in these terms, but at least there is nothing really implausible in the outcomes); the leased-in land dummy variable, which is highly significant in three cases, is probably a disguised class effect.

For class there are no real anomalies, and a quite consistent pattern. The non-agricultural group comes out much like the middle peasantry - which is a fair measure of its average status, although there is a good deal of variation within the group. The relative position of other classes accords quite well with expectations.

Outcomes with the caste variable are also often in line with expectations, but there are some exceptions. Scheduled castes in particular have low male labour force participation, high technology levels, and high school enrolment - all unexpected and difficult to explain. The similarities between certain backward castes and the forward castes are not unexpected, but they arise mainly because these "backward" castes are dominant in certain areas of Bihar - so it may be that the important factor is not so much the caste involved, but whether that caste is dominant.

This point is worth elaborating. Our results are based on merged data from a dozen villages. But within a village, the distinction between caste, class and land-based relationships may be virtually impossible to assess. The key issue may, for example, be a conflict between a "backward" trading caste, which has acquired land, and whose class position is that of middle or big peasants; and an upper caste with substantial landholdings, traditionally landlords, but whose control of the village economic system is undermined by the rising power of the peasants. Villagers would undoubtedly view this as a caste conflict, but caste here merely gives labels to the antagonists in an economic conflict. In class terms, this middle peasant-landlord conflict might be found in other villages, but with different castes involved, and at different levels of landholding; the cross-village

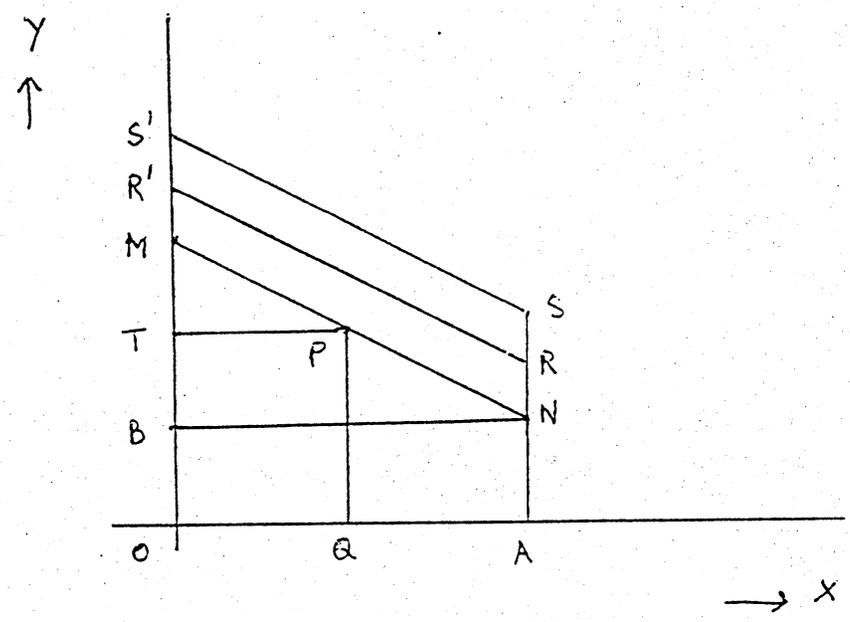
comparisons may then help us identify the key, common underlying issues.

On balance, the empirical evidence favours a class breakdown, by a short head. We would also favour the class breakdown on theoretical grounds, in that it gives a much firmer starting point for analysis of the process of production and distribution. It is therefore reassuring to find that this position is empirically supported, and our results should give cause to ponder to those who argue that class analysis is not relevant in rural Bihar. But the results also show clearly that the independent roles of landholding and caste need equally to be taken into account, and the result for female labour supply suggests that caste may dominate some aspects of behaviour. The approach we have adopted above, in which all variables are introduced simultaneously into a multivariate model, is reasonable as a starting point. But if the primacy of class relationships is accepted, then the analysis can be taken a stage further by disaggregating by class, and exploring relationships with land, caste and other factors within each class. This we intend to do in a subsequent paper.

Annex I

Labour Supply and Land

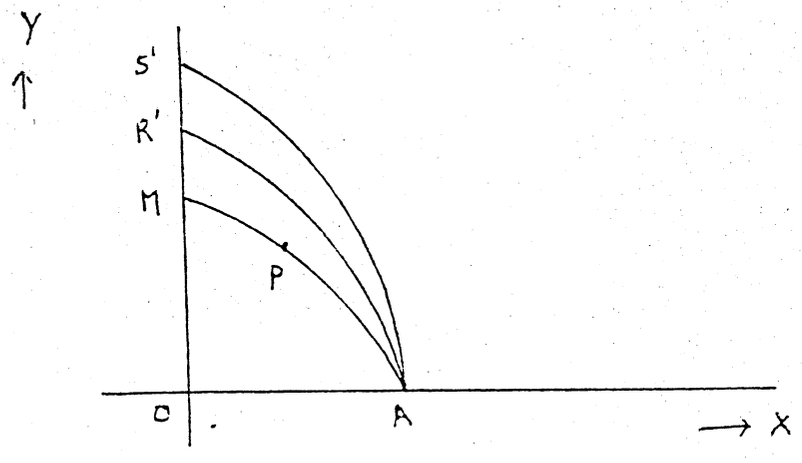
The most simple theoretical model relating labour force participation to cultivable land assets can be put in the following form:



We measure money income along the Y-axis and leisure along the X-axis. The total leisure available to a person per unit of time is OA. Given a certain amount of cultivable land, the net income available to the person is OB if he chooses not to work anywhere, that is, neither in his farm nor outside his farm (in other words, he enjoys the entire available leisure time). Income OB is derived from the use of hired labour or leasing out. The slope of the line MN defines the existing wage rate. If the person's consumer equilibrium is defined by point P, it indicates that the person chooses to be employed for AQ period per unit of time and is able to obtain OT amount of money income. The OT amount of income can be broken in two parts OB and BT. The former is income

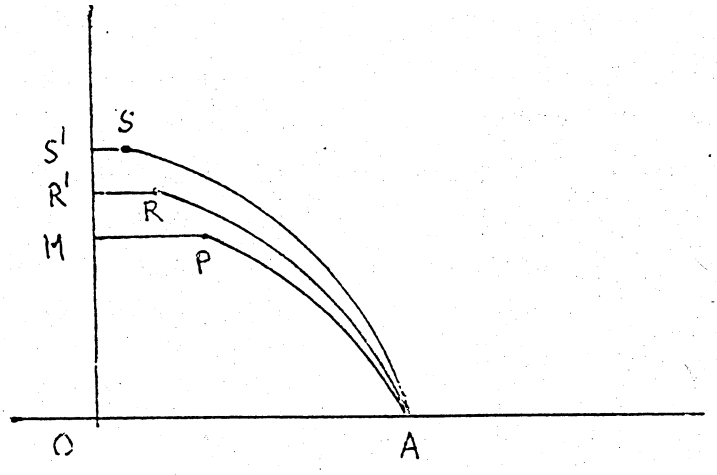
from assets and the latter from employment. In this model, it is immaterial whether the work time, AQ, is on own farm or elsewhere, provided that the marginal return to work on own farm is constant. The participation rate in this case $\frac{AQ}{OA}$. If such is the situation and, say, assets increase by one unit of unirrigated land, the income possibility curve becomes ARR' where RR' is parallel to MN. Normally this will lead to an income effect which means P will shift to the right on line R'R. In other words, the asset consumption curve slopes upward to the right. It leads to a situation which results in a fall in the participation rate. If the increase in assets is in terms of a unit of irrigated rather than unirrigated land the income possibility curve is ASS' where SS' is parallel to MN but SN is greater than RN. The negative asset-effect on the participation rate will be stronger in the case of irrigated land than that in the case of unirrigated land. In our case this model will not be applicable to all classes in the semi-feudal situation that obtains in rural Bihar. The model may be applicable to classes which employ labour from outside their own households such as capitalist farmers, landlords and big peasants.

If the return to work on own land is variable, there will be a substitution effect as well as an income effect. For example, in classes which do not employ labour from outside the household, that is, the poor middle peasants and agricultural labourers, the income possibility curve can be drawn as follows:



AM defines the initial situation; R'A defines the situation when the increase in assets is in terms of one unit of unirrigated land and S'A defines the situation when the increase is in terms of one unit of irrigated land. In this situation the asset-consumption curve may slope upwards to the left, depending on the strength of the substitution effects. The larger the proportion of income which comes from the use of the labour of others, the stronger the income effects relative to substitution effects. Thus the situation of middle peasants is likely to be between that of the capitalist farmers, landlord and big peasants on the one hand and the poor-middle peasants and agricultural labourers on the other. Therefore, in the case of middle peasants one cannot be confident that the participation rate will fall with an increase in landed assets.

There is yet a third situation which applies to the poor-middle peasants and the agricultural labourers in a labour surplus economy. The initial situation is defined by the income possibility curve APM in the diagram given below. The initial equilibrium will be at point P where the marginal product of labour is zero. In such a situation if one unit of unirrigated land increases, the new zero marginal product situation will be defined by R on the curve ARR' and in case of irrigated land the zero marginal product curve will be defined by S on the curve ASS'. Therefore, in such situations, the asset-consumption curve will always slope upwards to the left. The analytical models will be similar even if we take into account households instead of persons.



In a semi-feudal situation, then, such as the one under consideration here, the asset-effect of land on participation is likely to differ among classes. As a result, the net outcome may appear insignificant (strong positive effect for some groups offset by negative effects in other groups). Since the ownership of irrigated land also varies across classes, the net outcome for irrigated vis-à-vis unirrigated land cannot be predicted either; irrigated land can be concentrated among groups with a backward sloping asset consumption curve and irrigated among those with a forward sloping curve, or vice versa.

Annex II

Bihar Survey of Dynamics of Poverty and Employment, 1981-83

This is a multi-round survey of households in 12 villages of the plains of rural Bihar.[1] Data for the present paper come from the first round, consisting of a census of some 2,500 households in these 12 villages, undertaken in August-November 1981. The villages were selected by a mix of random and purposive techniques. They are too few in number to be efficiently used for estimating values for rural Bihar as a whole. However, by a process of stratification according to regional characteristics and village size, elimination of deviant cases from the sampling frame, and selection from a larger village sample of cases which most closely reproduce regional characteristics, we consider that the survey captures some of the most important patterns of rural economic activity in Bihar. Concentration on a small number of villages, rather than the conventional survey approach of more broadly scattered observations, was indicated in order to adequately analyse processes in each village. This paper, however, concentrates on the overall picture provided by the sample taken as a whole.

The census compiled relatively limited information on household size, structure and economic activity, land ownership, agricultural technology, debt, and certain linkages between these factors. Some of the key descriptive statistics from the survey are given below, so as to give a better idea of the make-up of the sample. Results are given unweighted. It is, however, possible to adjust for uneven sampling fractions in different parts of Bihar, and in the regressions and tables presented in the text this is done.

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[1] Hills and plateau of South Bihar are excluded. This survey is being carried out by a team led by Alakh N. Sharma, Bachchoo Sharma and Shaibal Gupta. It is a joint endeavour of the A.N. Sinha Institute of Social Studies and the ILO.

In addition to the limited census data used here, the survey includes five rounds of household data, two of data relating specifically to women, and one of community level data. Full details of survey design will be presented at a later date along with results from later survey rounds.

Table AII-1: Selected descriptive statistics from household census data

1.	Number of observations (households)		2531
2.	Per cent of households with at least one member having self-employment in agriculture as main occupation		43.3
3.	Per cent of households with at least one member having wage employment in agriculture as main occupation		44.2
4.	Per cent distribution of households by land ownership (weighting irrigated land by a factor of 2)	None	45.7
		Some, less than 1 acre	21.4
		from 1 to 4 acres	18.5
		from 4 to 16 acres	11.5
		more than 16 acres	2.9
5.	Per cent of cultivators hiring labour in		56.4
6.	- " -	using canal/tubewell irrigation	42.4
7.	- " -	using high yielding seeds	76.7
8.	- " -	using chemical fertiliser	85.2
9.	- " -	using tractor/power tiller	1.4
10.	Per cent of households presently in debt		78.0
11.	Per cent of households recent in-migrants		0.9

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ILO: World Employment Programme: Population and development - A progress report on ILO research with special reference to labour, employment and income distribution (Geneva, April 1982), 4th edition, Reference WEP 2-21/PR.7. (*)

This report includes a full bibliography. This publication (3rd edition, summer 1981) is available in French. (*)

2. Books and Monographs

[A number of free copies are available for individuals and institutions in less developed countries. Requests for these should be addressed to the Documentalist, Population and Labour Policies Branch, Employment and Development Department, ILO, CH-1211 Geneva 22, Switzerland.]

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R. Anker and M. Anker: Reproductive behavior in households of rural Gujarat: Social, economic and community factors (New Delhi, Concept Publishing Co., 1982). (***)

R. Anker, M. Buvinic and N. Youssef (eds.): Women's roles and population trends in the Third World (London, Croom Helm, 1982). (***)

R. Anker and J.C. Knowles: Determinants of fertility in developing countries: A case study of Kenya (Liège, Ordina, 1982). (***)

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[1] Availability code: * available on request from ILO, Population and Labour Policies Branch; ** available for sale from ILO Publications; *** available for sale from a commercial publisher.

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---: Analysing inter-relationships between migration and employment (Geneva, ILO, 1982). (*)

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