1. INTRODUCTION

Labour income is often a major source of income not only for the landless rural households but also for the 'small' farmers in Asian agriculture. Fluctuations in labour income can be quite marked, owing to fluctuations in both wage rates and employment, across the different seasons. Underlying the seasonal fluctuations in employment are changes in labour demand and supply, in response to changes in wage rates and other relevant explanatory variables. To evaluate the impact of various rural employment generation programmes, therefore, we must have a proper understanding of how labour demand and supply are likely to respond to changes in wage rates (and other relevant variables), and how this response may vary across seasons. In studying the wage-responsiveness of labour, this paper limits itself to the market for casual or daily rated labour, because evidence shows this to be by far the predominant form of wage contract in Indian agriculture (Drèze and Mukherjee 1989).

In conducting this exercise we must be cognizant of the fact that labour supply studies pertaining to Indian agriculture have been predominantly partial equilibrium in nature (Bardhan 1979, Rosenzweig 1980, Walker and Ryan 1990, Skoufias 1993, Kanwar 1999b). But because the demand for labour is often the 'shorter' side of rural labour markets for much of the production period in Asian agriculture, the formulation of partial equilibrium models involving the estimation of labour supply alone may be questionable à priori. This objection becomes especially pertinent because some of these studies report a significantly negative wage response for rural households (Bardhan 1979; Rosenzweig 1980), a result that, given the abysmally low incomes of such households, is somewhat disconcerting.

Similarly, most of the labour demand[1] studies have been of a partial equilibrium nature (Ahmed 1980, Naseem 1980, Wickramasekara 1980, Oberoi and Ahmed 1981, Bardhan 1984a, Evenson and Binswanger 1984, Kanwar 1999a). None of these studies take cognizance of labour supply behaviour. However, labour supply may be the 'shorter side' of the market during periods of intense activity such as sowing and harvest times, when there is often excess demand for prompt agricultural labour.

A lone study which attempts to address the above-mentioned criticism of labour supply and demand studies is Bardhan (1984b). Its results, unfortunately, are obtained under the assumption that the rural labour market clears. In fact, however, situations of excess supply or excess demand for entire agricultural seasons and even the entire agricultural year are not unusual in Asian agriculture. Therefore, the model formulated in this paper allows for a possible nonclearing of the labour market, so that we can *test* the hypothesis of equilibrium in the labour market rather than assume it à priori.

For such estimation to be meaningful, a second issue that we must be mindful of is that of seasonality. Instead of *specific sub-periods of an agricultural season* being characterised by excess labour demand (for instance, sowing and harvest times, as mentioned above) or excess labour supply (for instance, the period between sowing and harvesting), this could be true *across the agricultural seasons*. Thus, it is possible that of the three agricultural seasons in Indian agriculture - i.e. Kharif or the rainy season, Rabi or the post-rainy season and Summer - one or more may be characterised by excess demand, and the others by excess supply. Therefore, we estimate the proposed disequilibrium model for the individual agricultural seasons rather than for the agricultural year as a whole, because it is quite possible that although the agricultural year may be characterised by excess labour *supply* for instance, a particular agricultural season may be characterised by excess labour *demand*.

We also test the hypothesis of downward wage stickiness, i.e. that the speed of wage adjustment in the upward direction exceeds that in the downward direction in the presence of unemployment in developing country rural labour markets. Again, we do this for the individual seasons rather than for the entire agricultural year. The seasonal estimates of the speeds of wage adjustment can be helpful in indicating the likely 'wage-impact' of employment generation policies. These are the varied objectives of this paper. Accordingly, the next few sections set out the model, discuss the data and regressors, and present the results and conclusions.

2. DISEQUILIBRIUM MODEL

We may write the aggregate off-farm or market labour supply function as

$$L^s = X_1 \beta_1 + \in_1 \qquad (1)$$

where L^s is aggregate labour supply, X_1 is the vector of explanatory variables including the real wage rate, β_1 is the parameter vector and $\in_1$ is the error term. Similarly, the aggregate demand for (hired) labour function may be specified as

$$L^d = X_2 \beta_2 + \in_2 \qquad (2)$$

where L^d is aggregate labour demand, X_2 is the vector of explanatory variables including the real wage rate, β_2 is the parameter vector and $\in_2$ is the error term.

A stylized fact of rural labour markets in Asian agriculture is that they often do not clear. Although mostly said to be characterized by excess supply, specific seasons or specific sub-periods within a given season (such as sowing or harvest times) may be characterised by excess demand. This may be modelled using the so-called 'directional method', by hypothesizing that the amount of labour transacted is determined by the shorter side of the market, that is

$$L = \min(L^s, L^d) \qquad (3)$$

The change in the wage rate is hypothesized to be a function of the difference between labour demand and labour supply (Fair and Jaffee 1972):

$$\Delta w = \lambda \left(L^d - L^s\right), \lambda > 0$$

A drawback of this specification is that the speed of wage adjustment is the same irrespective of whether wages are rising or falling. To allow for varying speeds of wage adjustment in the upward and downward directions (Laffont and Garcia 1977), we re-specify this function as

$$\Delta w = \lambda_1 \left(L^d - L^s\right) when L^d < L^s, and \qquad (4)$$

$$\Delta w = \lambda_2 \left(L^d - L^s\right) when\, L^d > L^s \tag{5}$$

where $\lambda_1, \lambda_2 > 0$.

Now note that the supply of labour typically emanates from two distinct groups, cultivator households and landless households, in rural labour markets in India. Although a larger proportion is contributed by the latter group (this being their primary occupation), a fairly substantial proportion is nevertheless accounted for by the former (given their small and impoverished land base). Because cultivator households are producers as well as consumers of their staples, their consumption of leisure or supply of labour is likely to be influenced by various production-related variables as well. This would not be true of landless households, who are not producers by definition. In other words, these two groups are characterised by distinct labour supply functions. To capture this distinction, we specify the aggregate market labour supply functions of these two household groups separately as

$$L^{s1} = X_1^1 \beta_1^1 + \in_1^1 \tag{6}$$

$$L^{s2} = X_1^2 \beta_1^2 + \in_1^2 \tag{7}$$

such that

$$L^s = L^{s1} + L^{s2} \tag{8}$$

where L^{s1} is the aggregate market labour supply of cultivator households, L^{s2} is the aggregate market labour supply of landless households, and L^s is total market labour supply. Equations (6), (7), (8), (2), (3), (4) and (5) define the complete model. Note that when $\Delta w > 0$ we have $L^d > L^s$, so that $L = L^s$ or

$$L = X_1^1 \beta_1^1 + X_1^2 \beta_1^2 + \in_1^1 + \in_1^2 \tag{9}$$

From the system of equations, $L = L^d - (1/\lambda_2)\Delta w$, implying that

$$L = X_2 \beta_2 + \in_2 - (1/\lambda_2)\Delta w \tag{10}$$

Similarly, when $\Delta w < 0$ we have $L^d < L^s$, so that $L = L^d$ or

$$L = X_2 \beta_2 + \in_2 \tag{11}$$

and from the equation system, $L = L^s + (1/\lambda_1)\Delta w$, implying that

$$L = X_1^1 \beta_1^1 + X_1^2 \beta_1^2 + \in_1^1 + \in_1^2 + (1/\lambda_1)\Delta w \tag{12}$$

Equations (9) and (12) give us the market labour supply functions of cultivator and landless households as, respectively

$$L^{s1} = X_1^1 \beta_1^1 + (1/\lambda_1) h_1 + \in_1^1 \tag{13}$$

$$L^{s2} = X_1^2 \beta_1^2 + (1/\lambda_1) h_1 + \in_1^2 \tag{14}$$

where $h_1 = \Delta w$ for $\Delta w < 0$, and 0 otherwise.

Equations (10) and (11) give us the labour demand function as

$$L = X_2 \beta_2 - 1/\lambda_2 h_2 + \in_2 \tag{15}$$

where $h_2 = \Delta w$ for $\Delta w > 0$, and 0 otherwise.

3. ECONOMETRIC MODEL

To obtain consistent estimates of the labour supply and labour demand parameters, we first regress w, h_1 and h_2 on the exogenous variables in the system to derive the estimated values of w, h_1 and h_2 (Amemiya 1974). Using these estimated values, we compute the labour supply and labour demand functions jointly to obtain the iterated seemingly unrelated regression (SUR) estimates. Assuming that they have the right coefficient signs, statistical significance of variable h_1 would signal excess supply, and significance of variable h_2 would signal excess demand, over the sample period (i.e. the agricultural season in question). If the estimate of $1/\lambda_1$ exceeds the estimate of $1/\lambda_2$ that would indicate wage stickiness in the downward direction for that season (because λ_1 measures the speed of wage adjustment in the downward direction whereas λ_2 measures the speed of wage adjustment in the upward direction).

There is no guarantee, however, that the coefficients of variables h_1 and h_2 will have the right signs. We, therefore, also estimate the model by imposing the necessary inequality restrictions as required by the theoretical model (more on the specific restrictions imposed below). Although traditional estimation procedures do not permit the imposition of such restrictions, this is handled relatively easily by Bayesian methods. This procedure combines the sample information (as summarized by the likelihood function based on the given data) and the prior information (the inequality constraints on the parameters) to derive a posterior distribution for the parameters. Given a plausible loss function such as the quadratic, the mean of the posterior distribution for the parameters minimizes expected loss (Judge et.al. 1985). We, therefore, derive Bayesian point estimates of the disequilibrium model as the mean of a truncated posterior t-distribution for the model parameters (for details see Geweke 1986; and Chalfant, Gray and White 1991).

Let $\hat{\beta}$ be the unrestricted parameter estimates (in our case the iterated SUR estimates mentioned above), and $V(\hat{\beta})$ their variance-covariance matrix. Using a Monte Carlo numerical integration technique, a random sample is obtained from a multivariate t-distribution as follows. For replication i, vector w_i is drawn from a $N(0,V(\hat{\beta}))$ distribution and vector z_i from a χ^2_v distribution with υ degrees of freedom. We now compute $\beta_i^a = \hat{\beta} + w_i / (z_i^2 / \upsilon)^{1/2}$ and its antithetic replication $\beta_i^b = \hat{\beta} - w_i / (z_i^2 / \upsilon)^{1/2}$. Omitting those draws β_i which do not satisfy the restrictions, the inequality-constrained parameter estimates and their standard errors are obtained as the mean and standard deviation of the remaining draws that do satisfy the restrictions. If N is the total number of replications and n the number that satisfy the restrictions, the probability that the restrictions hold is given by $\hat{p} = n/N$. The accuracy of this proportion or the numerical standard error of the proportion is given by nse $(\hat{p}) = (\hat{p}(1-\hat{p})/N)^{1/2}$, and the accuracy of the point estimates or their numerical standard error is given by the standard deviation divided by $n^{1/2}$.

4. SAMPLE DATASET

Survey evidence supports the view that the village is the appropriate unit for studying labour demand-supply interactions in Indian agriculture. Thus, reviewing a host of rural labour market studies pertaining to various parts of India, Drèze and Mukherjee (1989) conclude that "The village labour market is largely *closed*; labour hiring across neighbouring villages is rare"[2]. The data used by us were collected by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and pertain to the villages of Aurepalle, Shirapur and Kanzara located in south-central India, for the period 1975-76/84-85 (Walker and Ryan 1990). Aurepalle has red soils with low and variable rainfall. Shirapur has medium to deep black soils but highly variable rainfall and Kanzara has fairly homogeneous black soils and relatively assured rainfall. The original data relate to a stratified random sample of 40 households from each village, comprising 10 landless and 30 cultivator households.

The aggregate off-farm labour supplied and demanded are derived by aggregating across all the households in a given village in a given year. (For labour supplied this is done separately for the groups of landless and cultivator households). The regressors are derived either as averages across all the households in a given village in a given year, or (for the scale variables, namely gross cropped area and nonland assets) as aggregates over all the households in a given village in a given year. Because the demand for labour is a derived demand and therefore (partially) a 'technological relationship', the control variables included in the demand equation are gross cropped area (GCA), percentage area irrigated (PAIRR), nonland assets (NLASS), the coefficient of variation of gross revenue (CVGR) and the real output price (ROP)[3]. In addition are included the number of working members per household (WRKMEM), the number of dependents (DEPMEM), the age of the household head (AGE) and village dummies (D1 = 1 for Aurepalle, 0 otherwise; D2 = 1 for Shirapur, 0 otherwise; D3 = 1 for Kanzara, 0 otherwise). The labour supply equation for cultivator households does not include the regressors GCA, PAIRR, and NLASS, but includes instead the more relevant socio-economic variables such as age of the household head (AGE), education of the household head (EDU) and caste (CASTE), as well as WRKMEM and DEPMEM. In the supply equation for landless households, the set of regressors does not contain the production-related variables ROP, GCA, PAIRR, and CVGR, because landless households do not cultivate by definition[4]. All variables in all three equations are in logs excepting, of course, the village dummies D1, D2, D3 and the 'sample separation' variables h_1 and h_2.

The estimations have been done for both the Kharif (or rainy) and Rabi (or post-rainy) seasons, the Summer season being quite unimportant from the cultivation perspective. The Kharif season runs approximately from mid-June to mid-October, and the Rabi season from mid-October to end-February, in our sample villages. The Kharif season was the most important in the agricultural year, accounting for a little over 64% of the yearly revenue from cultivation, whereas the Rabi season accounted for a little over 31% of the yearly cultivation revenue (with the Summer season accounting for less than 5%)[5]. The estimation results for the Kharif season are presented in Tables 1 to 3, and for the Rabi season in Tables 4 to 6. While panel A of these tables presents the iterated SUR estimates, panel B reports the inequality-constrained Bayesian estimates.

5. RESULTS AND INFERENCES

The estimation results are good for both methods. From panel A of Tables 1 to 6 pertaining to the iterated SUR estimates, we note that many of the regressors are significant, and there are no regressors that have counter-intuitive signs *and* are significant. The hypothesis that all explanatory variables are simultaneously zero, or in other words that labour supply and demand are randomly determined, is strongly rejected for all three equations for both seasons[6]. The inequality-constrained Bayesian estimates in panel B of the tables support the iterated SUR results both with regard to signs as well as 'significance' (which may be gauged by comparing the mean of the posterior distribution of the parameters with its standard deviation). Note that to obtain the Bayesian estimates, we only needed to constrain (the coefficient of) the 'sample separation' variable h_1 to be positive; variable h_2 had the right sign even without any restriction. The Bayesian estimates may be preferable insofar as they provide theoretically consistent results. With the caveat, of course, that the probability that the restriction holds is small - only 0.14 for the Kharif season estimates and 0.12 for the Rabi season estimates (Table 7). This need not be cause for undue concern, however, because we worked with a large sample of 100,000 replications which was sufficient to provide accurate estimates as reflected in the small numerical standard errors of the respective probabilities as well as of the parameter estimates.

Kharif season

For the *Kharif season*, the iterated SUR estimates reveal that the aggregate off-farm labour supply of cultivator households is positively related to the real wage rate and this relationship is strongly significant. The aggregate market labour supply of landless households is insignificantly, albeit positively, related to the wage rate. Not only have these results been thrown up by a model that is theoretically more complete, they also differ from the significantly negative wage-responses reported by Bardhan (1979) and Rosenzweig (1980). Returning to the cultivator households' supply results, a higher output price, implying a stronger 'profit effect' discourages hiring-out. Higher skill levels are negatively associated with the regressand. This could either imply that labour is diverted to on-farm production, or else that skilled labour migrates out reducing the local labour pool and hence the market supply for cultivation work[7]. The number of working members per household is highly positively associated with labour supply. Production risk, possibly by depressing the market for cultivation work, appears to discourage hiring-out for such work. The results for landless households' labour supply are comparatively weak, although the regressors are able to explain a fairly large proportion of the variation in the regressand.

The aggregate demand for *hired* labour shows a significantly negative wage response. Again, this is contrary to the result reported by Bardhan (1984b) for another sample of Indian farm households, although it is in agreement with Evenson and Binswanger (1984). The Kharif season was characterised by neither excess supply nor excess demand in the labour market, indicating that the higher labour demand during this season is more or less matched by higher labour supply (whether from higher labour market participation rates and/or greater hours of work)[8]. All the production-related regressors (ROP, GCA, PAIRR and NLASS) exercise a positive influence on labour demand, and most significantly so. An increase in production risk appears to increase labour demand. Taken along with the negative effect that this variable has on labour supply, green revolution policies that have resulted in higher yield risk may, therefore, have a salubrious effect on wage rates and employment.

Finally, the speed of wage adjustment in the downward direction is less than that in the upward direction. If we re-examine the above results using the inequality-constrained Bayesian estimates, we find that all of them are upheld. Additionally, the Bayesian estimates are theoretically consistent, with variable h_1 having the right sign. Therefore, we calculate the speeds of wage adjustment from the Bayesian estimates rather than the iterated SUR estimates. We find that λ_1 = 0.9, implying that a 1% increase in excess supply would depress wages by about 1%. On the other hand, λ_2 = 14.5, implying that a 1% increase in excess demand would raise wages by about 15% in this season.

Rabi season

For the *Rabi season*, the iterated SUR results show that the labour supply function of cultivator households is positively and highly significantly related to the real wage rate. The supply function of landless households, however, is insignificantly though positively related to the wage rate. These differ from the earlier results of Bardhan (1979) and Rosenzweig (1980), as did the Kharif season results. While landed labour supply is still negatively related to skill levels and positively to the number of working members, the output price and production risk variables are no longer significant determinants. Again, the results concerning landless labour supply are weak although they do explain a reasonable proportion of the variation in the regressand.

The demand function is found to be insignificantly wage-responsive. Note that this differs from the Kharif season result, where the demand curve was significantly wage-responsive. This would make for different implications of exogenous shocks. Thus, if the supply curve were to shift 'inwards' because of seasonal out-migration in the Rabi season, an inelastic demand curve would imply a 'large' increase in the wage rate and a 'small' decrease in employment. In comparison, in a situation where the demand curve is relatively elastic, the rising wage rate would induce a cut-back in demand so that equilibrium employment would be relatively smaller.

Neither excess demand nor excess supply are found to be significant, indicating equilibrium in the labour market for the Rabi period. Again, the speed of wage adjustment in the downward direction is less than that in the upward direction. Re-examining these results in the light of the inequality-constrained model, we find them to be upheld. Additionally, the landless households' labour supply is now 'significantly' wage-responsive (in that the mean of the posterior distribution is more than 1.65 times the standard deviation). Also, the wage-coefficient in the demand curve now has the expected sign, whereas it did not in the iterated SUR results (although that was not a problem for it was insignificant). Measuring the speeds of wage adjustment from the Bayesian estimates, we find λ_1 = 1.8 and λ_2 = 11.3. Note that the speed of wage adjustment in the downward direction is twice as high as in the Kharif season, whereas the speed in the upward direction is lower by about a fifth. This is in consonance with the fact that the Rabi season is the relatively slack season when excess labour supply is ruling higher than in the Kharif season, and so is the downward pressure on wages. Thus, estimating the labour supply (labour demand) alone by ignoring the fact that labour demand (labour supply) may be the constraining factor, ignoring the possibility that the labour market may not clear, and ignoring the possibility that the excess demand situation may vary across the busy and slack seasons, may all lead to significant biases in the results obtained. While we have focused on the wage-responses of labour supply and demand in this paper, this is not denying that many of the other results reported in the tables are also of interest; but that would take us beyond the scope of this paper.

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Table 1 Aggregate Off-Farm Labour Supply of Cultivator Households - Kharif Season

	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
Variable	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	0.92	0.478	0.87 (0.004)*	0.516
ROP	-0.69	0.292	-0.77 (0.003)	0.311
AGE	1.83	1.663	1.76 (0.015)	1.767
EDU	-0.93	0.495	-1.02 (0.004)	0.531
CASTE	-2.21	1.616	-2.12 (0.015)	1.752
WRKMEM	3.56	0.943	3.31 (0.008)	1.004
DEPMEM	0.16	0.286	0.02 (0.002)	0.294
CVGR	-1.12	0.399	-1.16 (0.004)	0.433
H_1	-2.12	1.917	1.06 (0.008)	0.943
D1	-7.21	7.077	-6.59 (0.064)	7.527
D2	-7.49	7.028	-6.56 (0.063)	7.464
D3	-6.97	7.075	-6.11 (0.064)	7.516
R^2	0.4071			
Wald statistic (all slopes = 0)	68.408 (P-value = 0.000)			

* The numerical standard errors of the point estimates are reported in brackets.

Table 2 Aggregate Off-Farm Labour Supply of Landless Households - Kharif Season

	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
Variable	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	0.62	0.496	0.49 (0.004)*	0.528
AGE	2.62	2.968	4.09 (0.026)	3.074
EDU	-0.26	0.219	-0.31 (0.002)	0.232
WRKMEM	0.40	0.515	0.34 (0.005)	0.551
DEPMEM	-0.68	0.232	-0.58 (0.002)	0.242
H_1	-2.12	1.917	1.06 (0.008)	0.943
D1	-5.46	11.680	-11.18 (0.102)	12.106
D2	-5.54	11.480	-10.93 (0.101)	11.931
D3	-5.35	11.490	-10.83 (0.101)	11.931
R^2	0.4048			
Wald statistic (all slopes = 0)	34.863 (P-value = 0.000)			

* The numerical standard errors of the point estimates are reported in brackets.

Table 3 Aggregate Demand for Hired Labour - Kharif Season

	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
Variable	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	-0.84	0.493	-0.90 (0.004)*	0.524
ROP	1.03	0.778	1.10 (0.007)	0.827
AGE	-1.84	3.213	-1.76 (0.029)	3.432
WRKMEM	-8.39	2.568	-7.87 (0.023)	2.729
DEPMEM	2.04	0.626	2.03 (0.006)	0.675
GCA	0.97	0.190	0.96 (0.002)	0.202
PAIRR	0.25	0.125	0.25 (0.001)	0.133
NLASS	2.29	0.947	2.23 (0.009)	1.017
CVGR	1.07	0.626	1.00 (0.006)	0.672
H_2	-0.07	0.275	-0.07 (0.002)	0.294
D1	-3.41	11.38	-3.84 (0.103)	12.194
D2	-3.57	11.32	-4.02 (0.103)	12.127
D3	-2.68	11.20	-3.15 (0.102)	12.000
R^2	0.9505			
Wald statistic (all slopes = 0)	91.514 (P-value = 0.000)			

* The numerical standard errors of the point estimates are reported in brackets.

Table 4 Aggregate Off-Farm Labour Supply of Cultivator Households - Rabi Season

	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
Variable	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	1.31	0.543	1.37 (0.005)*	0.597
ROP	-0.68	0.525	-0.51 (0.005)	0.563
AGE	0.72	3.290	-1.09 (0.031)	3.406
EDU	-1.84	0.963	-2.07 (0.010)	1.036
CASTE	1.93	1.656	1.98 (0.017)	1.800
WRKMEM	4.63	1.644	3.87 (0.016)	1.742
DEPMEM	0.60	0.494	0.41 (0.005)	0.523
CVGR	-1.62	1.119	-1.29 (0.011)	1.205
H_1	-1.24	1.013	0.54 (0.004)	0.486
D1	-10.31	16.160	-0.65 (0.153)	16.644
D2	-9.88	16.050	-0.26 (0.152)	16.523
D3	-9.78	16.300	0.11 (0.154)	16.755
R^2	0.4362			
Wald statistic (all slopes = 0)	39.177 (P-value = 0.000)			

* The numerical standard errors of the point estimates are reported in brackets.

Table 5 Aggregate Off-Farm Labour Supply of Landless Households - Rabi Season

Variable	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	0.87	0.558	1.03 (0.006)*	0.606
AGE	1.24	4.758	1.70 (0.047)	5.150
EDU	-0.69	0.383	-0.58 (0.004)	0.413
WRKMEM	1.65	1.024	1.32 (0.010)	1.102
DEPMEM	-0.27	0.453	-0.11 (0.004)	0.478
H_1	-1.24	1.013	0.54 (0.004)	0.486
D1	-1.65	18.670	-2.97 (0.186)	20.228
D2	-1.62	18.350	-2.92 (0.183)	19.883
D3	-1.90	18.310	-2.89 (0.182)	19.843
R^2	0.3591			
Wald statistic (all slopes = 0)	12.075 (P-value = 0.034)			

* The numerical standard errors of the point estimates are reported in brackets.

Table 6 Aggregate Demand for Hired Labour - Rabi Season

	Panel A: Iterated SUR estimates		Panel B: Inequality-constrained Bayesian estimates	
Variable	Coefficient Estimate	Standard Error	Coefficient Estimate	Standard Error
W	0.05	0.451	-0.01 (0.004)*	0.488
ROP	-0.37	0.597	-0.36 (0.006)	0.652
AGE	0.84	2.206	1.08 (0.022)	2.365
WRKMEM	-3.09	1.866	-3.14 (0.019)	2.030
DEPMEM	0.58	0.360	0.68 (0.004)	0.384
GCA	0.49	0.144	0.47 (0.001)	0.154
PAIRR	0.41	0.154	0.39 (0.002)	0.165
NLASS	-0.31	0.429	-0.26 (0.004)	0.461
CVGR	2.08	0.815	2.29 (0.008)	0.871
H_2	-0.17	0.257	-0.09 (0.003)	0.272
D1	15.02	7.167	14.22 (0.071)	7.720
D2	15.37	7.148	14.61 (0.071)	7.701
D3	15.56	7.127	14.88 (0.071)	7.681

R^2 0.8679

Wald statistic (all slopes = 0) 85.439 (P-value = 0.000)

* The numerical standard errors of the point estimates are reported in brackets.

Table 7 Posterior Probabilities of the Inequality Restrictions

Kharif Season estimates

Inequality restriction: $h_1 > 0$

Number of replications = 100,000

Probability that the restriction holds = 0.140

Numerical standard error of the proportion = 0.001

Rabi Season estimates

Inequality restriction: $h_1 > 0$

Number of replications = 100,000

Probability that the restriction holds = 0.118

Numerical standard error of the proportion = 0.001

Notes

[1] We are specifically interested in the demand for *hired* labour. However, some of the studies cited consider the *total* demand for labour, i.e. family plus hired labour. Further, many of these studies are really labour-use studies and not quite studies of the demand for lahour per se, in that they do not include the wage rate in the set of regressors.

[2] Why this may be so is an interesting but separate question.

[3] For which the deflator used was a (household-specific) basket of market-purchased commodities. (The same deflator was also used to derive real wages.)

[4] The units of measurement of the regressors are: w, Rupees/day; ROP, Rupees/kg; AGE, years; EDU, years; CASTE, rank; WRKMEM, number; DEPMEM, number; GCA, acres; PAIRR, percentage; and NLASS, Rupees.

[5] Although these figures are quite representative for Aurepalle and Kanzara individually too, they are somewhat less so for Shirapur. In Shirapur, the Rabi season was relatively more important in revenue terms than for the other two villages. Even so, it was less important than the Kharif season.

[6] For the Kharif season, the cultivator households' labour supply curve has a Wald chi-squared statistic (8 degrees of freedom) = 68.408, the landless households' labour supply curve has a Wald chi-squared statistic (5 degrees of freedom) = 34.863, and the labour demand curve has a Wald chi-squared statistic (9 degrees of freedom) = 91.514. In all three cases, the P-value = 0.000.

For the Rabi season, the cultivator households' labour supply curve has a Wald chi-squared statistic (8 degrees of freedom) = 39.177, the landless households' labour supply curve has a Wald chi-squared statistic (5 degrees of freedom) = 12.075, and the labour demand curve has a Wald chi-squared statistic (9 degrees of freedom) = 85.439. Again, the P-value is 0.000 in all cases except the landless households' supply curve where it is 0.034.

[7] Although the latter explanation is more likely to hold for education above a certain threshold, this conjecture could not really be tested here because of the all-round low levels of formal education.

[8] There is some evidence that excess demand has gone up in the ICRISAT villages in recent times. To capture this we introduced a time-dummy equal to 1 for the '80s and 0 for the earlier period. However, because this did not alter the results obtained otherwise and only reduced scarce degrees of freedom, we decided against including it.