

Female Labour Supply in Rural India: An Econometric Analysis

Purnamita Dasgupta and Bishwanath Goldar

Abstract

Several studies for developing countries have come up with econometric evidence to indicate that an inverse relationship exists between supply of labour and wage rate at low level of wage, especially for women in rural areas. In this paper, this issue is investigated for rural female labour supply in India using NSS data for 1999-00. The results indicate that supply of female labour from below poverty line households in rural areas is inversely related to wage rate and the number of earning members in the family. This may create difficulties in attaining the objectives of the recent National Rural Employment Guarantee Scheme and calls for greater attention to the designing of the scheme, particularly the activities in which employment will be provided.

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1. Introduction

Using employment data from quinquennial rounds¹ of the National Sample Survey (NSS), a number of papers/reports have examined the employment situation in India in the post-reform period in comparison with that in the pre-reform period (see, for instance, Sundaram, 2001a, 2001b; Chadha and Sahu, 2002; Government of India, 2002; Sundaram and Tendulkar, 2002; Dev, 2002; Chadha, 2003; Sundaram and Tendulkar, 2004; Sundaram, 2004; and Bhattacharya and Sakthivel, 2005a, 2005b). A major conclusion that one may draw from these studies is that there has been a marked slowdown in employment growth in India in the post-reform period compared to the pre-reform period, and that this slowdown has been relatively more marked in the case of female employment in rural areas.

In most of the studies a tabular analysis of the NSS data on employment has been presented. There has been very little econometric analysis of employment based on NSS data. One of the econometric studies carried out is by Bhattacharya and Sakthivel (2005b) who estimated the labour demand function for various one-digit industry groups for four years (NSS rounds), namely, 1983, 1987-88, 1993-94 and 1999-00, to assess the impact of output growth and change in real wages on employment. It may be mentioned in this context that a number of studies have used NSS data to undertake econometric analysis of the wage rate. Dutta (2004, 2005), Mishra and Kumar (2005), Duraisamy and Duraisamy (2005), and Srivastava and Singh (2005) have estimated a wage regression model, in which an attempt is made to relate the wages received by an individual to his/her socio-economic characteristics. Kijima and Lanjouw (2005) have estimated econometric models to study the impact of real wage hikes on poverty incidence in rural areas.

Econometric analysis of labour supply in India has been practically absent in research with Indian data. An exception is Bardhan's work (1979), one of the first econometric attempts to estimate labour supply functions for poor agrarian households. Kanwar (1998) has also looked at the hiring-out behaviour of rural households. However, overall, the labour supply aspect has been neglected in the general literature on employment in India. The neglect of the supply aspect seems to be attributable to a commonly held view among researchers that India is a labour surplus economy, supply posing no constraint, and hence the real issues concerning employment are how to create more employment opportunities for the growing working-age population. Accordingly, the policy prescription given is creation of employment opportunities through rapid growth.

¹ 38th round (1983), 43rd round (1987-88), 50th round (1993-94) and 55th round (1999-00).

In most available papers on employment in India (if not all), there is no clear specification of the theoretical framework underlying the analysis presented. Though not clearly stated, it seems that the authors are implicitly assuming that the labour supply curve is flat or upward sloping. However, Bardhan (1979, 1984) finds very little evidence for the standard horizontal supply curve of labour, using data on West Bengal from employment surveys. The wage elasticity of supply in his studies turns out to be rather small across different categories of households. Kanwar (1998), on the other hand, finds that cultivator household labour supply is significantly positively related to the expected real wage rate, while for landless households there is a negative and statistically insignificant labour supply response to the real wage rate.

Another implicit assumption in the studies (at least in some of them) is that due to certain rigidities in the labour market (say, minimum wage regulation), wage rates cannot fall to a level low enough to clear the market, and therefore employment is determined by the short-side of the market (i.e. demand). The fact that the demand for labour falls short of supply at the going wage rate is manifested in unemployment and underemployment.

This paper presents an econometric analysis of female labour supply in rural areas. The analysis is undertaken for the year 1999-00, for which the latest NSS data is available (thick sample). A particular question investigated is whether the supply curve is downward sloping (or forward falling). Separate analyses are carried out for individuals belonging to Below-poverty-line (BPL) and Above-poverty-line (APL) households. The issue investigated is important because if the supply curve is indeed downward sloping then a demand expansion (say, caused by output growth) need not lead to an increase in employment – it may even lead to a fall in employment (see Annex).

The possible existence of an inverted-S shaped supply curve in developing countries is well recognized in the literature. The bottom segment of the curve is downward sloping (or forward falling), which implies that if the wage level is low, then any further decline in wage rate may lead to increase in the supply of labour. This is explained by the compulsion of the families to work more at reduced wages so as to be able to meet their subsistence expenditure requirement. Some recent studies for developing countries have come up with econometric evidence to indicate that an inverse relationship does exist between labour supply and wage rate at a low level of wage, at least for certain categories of individuals. These include Licona (2000) for Mexico, Dessing (2002) for Philippines, Bhalotra (2003) for child labour in Pakistan and El-Hamidi (2003) for female labour in Egypt. An earlier work reporting similar results for Bangladesh is the study by Sharif (1991). To the knowledge of the authors of this paper, there is no study for India, which has focused on the issue of a forward falling (inverted-S shaped) labour supply curve, investigated the relationship econometrically and empirically verified it.² There is, however, a strong possibility of such a relationship existing in rural areas, especially for

² Kanwar (1998) reported a negative and statistically insignificant relationship between labour supply and wage rate for landless workers in rural areas. But, investigation of a forward falling supply curve was not the prime focus of his study.

women. The possibility of there being need-based employment among women in rural India has been noted by Sundaram and Tendulkar (2004).³

The rest of the paper is organized as follows. Section 2 describes briefly the trends in employment and real wages in rural India as a background for this study. Section 3 discusses the model used for the analysis along with data and variables used. Section 4 presents the empirical results. Some concluding remarks are made, and in particular the implications of the empirical findings for the recent National Rural Employment Guarantee Scheme are briefly discussed in Section 5.

2. Trends in employment and real wages for women in rural India

Estimates of employment in the rural area in the 1980s and 1990s reported by Bhattacharya and Sakthivel (2005a) are reproduced in Table 1. The growth rates in employment computed from the employment estimates are also shown in the table.

It is evident from Table 1 that there has been a marked fall in the growth rate of employment in rural areas in the period 1993-94 to 1999-00 as compared to the period 1983 to 1993-94. It may be noted further that the fall in the growth rate of employment was relatively more marked in the case of females than males.

For the employment estimates based on usual principal and subsidiary status, there is virtually no increase in female employment in rural areas at the all-India level. This is corroborated by estimates presented in some other papers. The estimates of rural female employment based on usual principal and subsidiary status presented in Sundaram (2001b) are 104.3 million and 104.1 million for 1993-94 and 1999-00 respectively, thus indicating a marginal decline in rural female employment between the two years. The employment estimates presented in Sundaram and Tendulkar (2004) indicate a marginal increase from 104.7 to 105.1 million between 1993-94 and 1999-00.

³ Sundaram and Tendulkar (2004, p.3) state, "In the case of women, however, both in rural and in urban India, on the average, WPRs (worker-population ratios) of women in the poor households are higher than those in the households above the poverty line, though only marginally so in rural India. In Urban India, the differentials have narrowed but the WPRs for women in poor households continue to be higher than those in the non-poor households. That this should occur despite the considerably higher child-dependency ratio and the higher child-woman ratio in the poor households would suggest the presence of a measure of what may be called compelling need-based participation of women in work force where it is their poverty status that, *ceteris paribus*, drives them to greater work participation." They write further (p.14), "Worker population ratios are lower for males but *higher* for females in poor households *despite higher* child-woman ratio and dependency burden. This suggests the presence of what may be called a compelling need-based participation in work force where it is their poverty status that, *ceteris paribus* drives them to greater work participation. A further accentuating factor is lower returns to female labour compared to male labour."

Table 1: Estimates of Employment in Rural Areas, 1980s and 1990s (all-India)
(million persons)

Year	Rural male	Rural female	Rural persons
Current Daily Status			
1983	134.6	52.4	187.0
1987-88	153.6	59.8	213.4
1993-94	171.5	70.1	241.7
1999-00	179.0	72.2	250.7
Growth rate (% pa)			
1983 to 1993	2.3%	2.8%	2.5%
1993 to 1999	0.7%	0.5%	0.6%
Current Weekly Status			
1983	143.0	60.1	203.1
1987-88	154.5	63.6	218.1
1993-94	180.7	85.4	266.1
1999-00	191.0	89.5	279.7
Growth rate (% pa)			
1983 to 1993	2.3%	3.4%	2.6%
1993 to 1999	0.9%	0.8%	0.8%
Usual Principal and Subsidiary Status			
1983	152.3	87.0	239.2
1987-88	165.3	93.3	258.6
1993-94	188.1	105.0	293.2
1999-00	198.8	105.8	303.7
Growth rate (% pa)			
1983 to 1993	2.0%	1.8%	2.0%
1993 to 1999	0.9%	0.1%	0.6%

Source: Bhattacharya and Sakthivel (2005a), Table 22.2. Growth rates have been computed from their employment estimates.

The slowdown in growth of female employment in rural areas in the post-reform period is attributable to a fall in the workforce participation rates (WPRs).⁴ This is brought out by the estimates of WPRs presented in Table 2.

⁴ As argued by Sundaram (2001b), a part of the fall in female workforce participation rate between 1993-94 and 1999-00 is traceable to increases in student-population ratio. He notes further that the decline in WPRs between 1993-94 and 1999-00 are somewhat exaggerated by the fact that in a number of cases, the 1993-94 levels are outliers when seen against WPRs in the earlier quinquennial surveys.

**Table 2: Age specific usual status (PS+SS) worker-population ratio
– Rural Female (per 000)**

Age	1983	1987-88	1993-94	1999-2000
5-9	23	24	14	7
10-14	224	182	141	96
15-19	433	399	364	304
20-24	483	465	456	409
25-29	540	523	525	491
30-34	577	577	585	555
35-39	606	596	608	579
40-44	611	610	606	586
45-49	589	580	594	566
50-54	526	523	542	515
55-59	476	459	467	450
60+	227	218	241	218
All	330 (346)	323 (333)	328	299

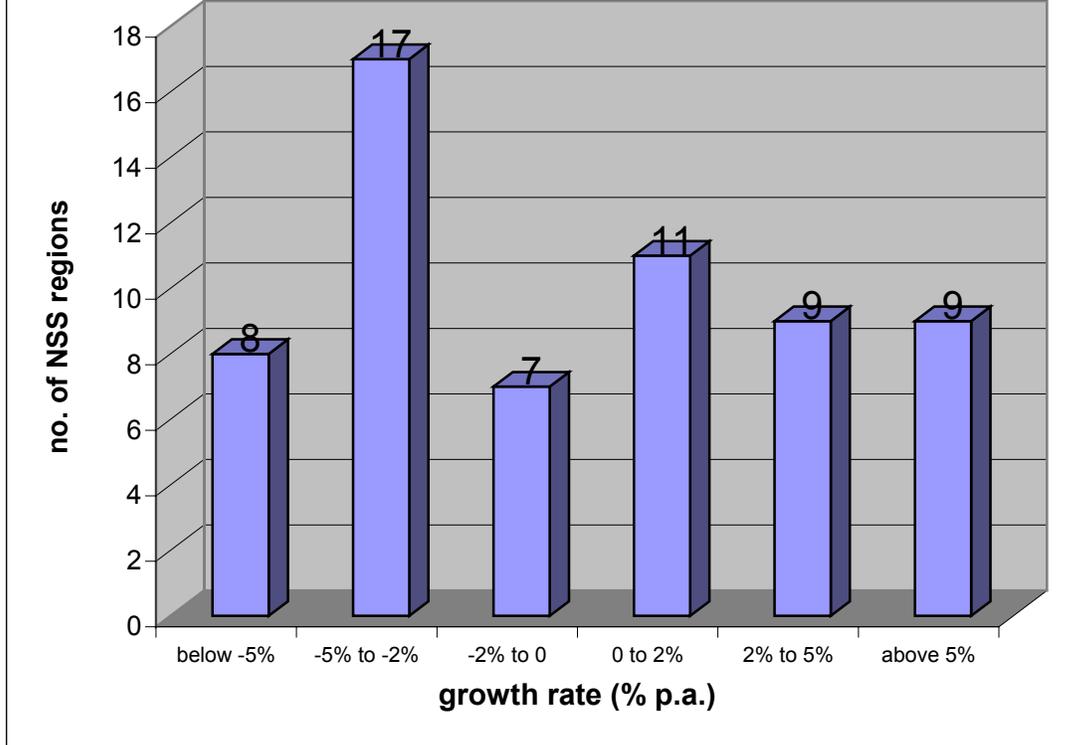
Source: Sundaram (2001b)

Note: Figures in parentheses show the crude WPRs that would have been observed if the age distribution of the surveyed population in 1983 and 1987-88 had been the same as was reported by the 1993-94 survey.

While there has been virtually no increase in female employment in rural areas at the aggregate level, there are marked differences across regions. A study of female employment in rural areas in 1993-94 and 1999-00 across NSS regions (61 regions) reveals that in a number of regions there was a significant increase in employment at a rate of over 5 per cent per annum whereas in a number of other regions, rural female employment fell at a rate over 5 per cent per annum.⁵ A graphic presentation is given in Fig 1.

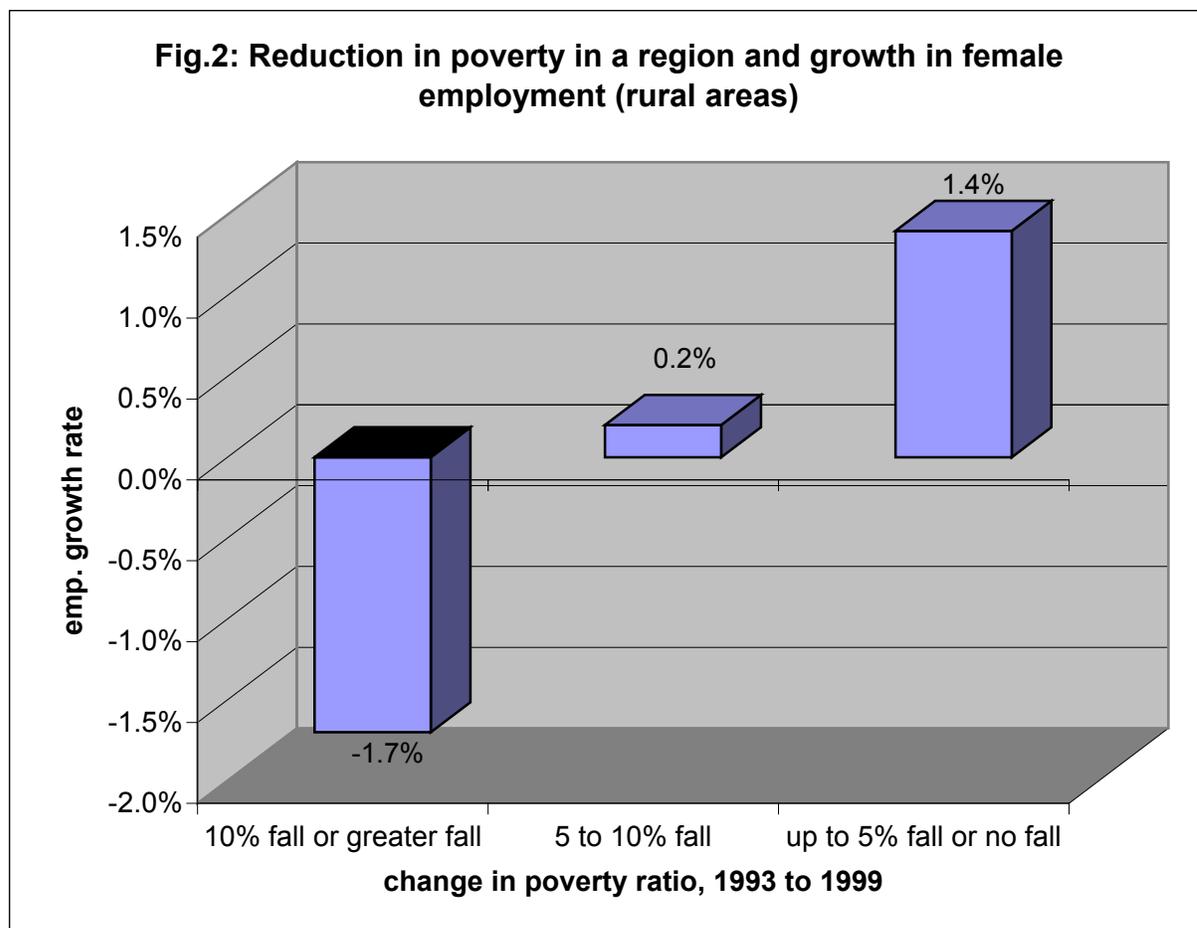
⁵ This analysis is based on regions-wise employment and poverty estimates made by Goldar and Sakthivel (2004).

Fig.1: Annual growth rate in female employment in rural areas, 1993-94 to 1999-00



Analysis of changes in poverty incidence in rural areas (headcount ratio) and growth of female employment in rural areas brings out that the two are correlated. The correlation coefficient is 0.24 (statically significant at the 10 per cent level).

In Fig 2, a comparison of the growth rate in rural female employment is made across three groups of NSS regions, classified according to the extent of poverty reduction achieved between 1993-94 and 1999-00. The first group includes 17 regions in which the poverty headcount ratio declined by 10 percentage points or more between 1993-94 and 1999-00. The second group includes 19 regions in which the reduction in poverty headcount ratio between 1993-94 and 1999-00 was more than 5 percentage points but less than 10 percentage points. The third groups includes all other regions (25 in number) in which poverty headcount ratio fell by less than 5 percentage points between 1993-94 and 1999-00 or did not fall. It would be noticed that female employment in rural areas fell by 1.7% per annum during 1993-00 in the first group, it increased by 0.2 percent per annum in the second group and by 1.4 percent per annum in the third group during the same period.



Having discussed trends in employment growth, it would be useful to turn to trends in real wages. Table 3 shows the growth rate in real wages of male and female workers in rural areas in the periods 1983 to 1993-94 and 1993-94 to 1999-00, taken from a study undertaken by Himanshu (2005). These are based on NSS data.

Table 3: Growth rates in real wages in rural areas, All-India, 1983 to 1999-00
(% per annum)

Period	Agricultural occupations		Non-agricultural occupations	
	Male	Female	Male	Female
1983 to 1993-94	2.77	3.08	2.22	4.06
1993-94 to 1999-00	2.80	2.95	3.67	5.13

Source: Himanshu (2005), Tables 3a and 3b.

It is seen from Table 3 that the growth rate in real wages in rural areas in agricultural operations in the period 1993-94 to 1999-00 was about the same as in the period 1983 to 1993-94. This is true for both male and female workers. The growth rate in real wages in non-agricultural operations, on the other hand, was faster in the period 1993-94 to 1999-00 than that in the period 1983 to 1993-94. Thus, overall, there has been a slight acceleration in the growth of real wages in rural areas in the post-reform period.

3. Model, Data and Variables

In this paper, we use data on rural households in India, collected by the National Sample Survey in its 55th round (July 1999 – June 2000). The data relates to the household schedule 10 on employment and unemployment.

Our dataset consists of 1,43,281 females who are aged above 15 years. We wish to study their labour supply behavior for wage employment. Of these 36,243 (approximately 25%) belong to below poverty line (BPL) households while the remaining 1,07,038 are from the above poverty line (APL) households. In defining the poverty line, we use a cut-off for monthly consumer expenditure at Rs. 327, which is the official estimate of the Planning Commission (2001) for all India rural poverty in 1999-2000.⁶

From current weekly activity particulars, the data on time disposition during the week shows that only 10.4% (14,862) of females report having earnings from wage employment.⁷ Of these, 40% belong to BPL households and 60% to APL households. Considering only BPL households, 74% of females are engaged in manual work in cultivation which includes ploughing, sowing, transplanting, weeding, harvesting and other cultivation activities. Among females from APL households in wage employment this percentage falls to 58%. This variation in the type of operations the females are engaged in gains importance later in the paper in the light of our findings from the econometric estimation of labour supply. As is obvious, 26% of female workers from BPL households and 42% from APL households are engaged in other types of operations which include forestry, plantation, animal husbandry, fisheries, others and manual work in non-agricultural activities.

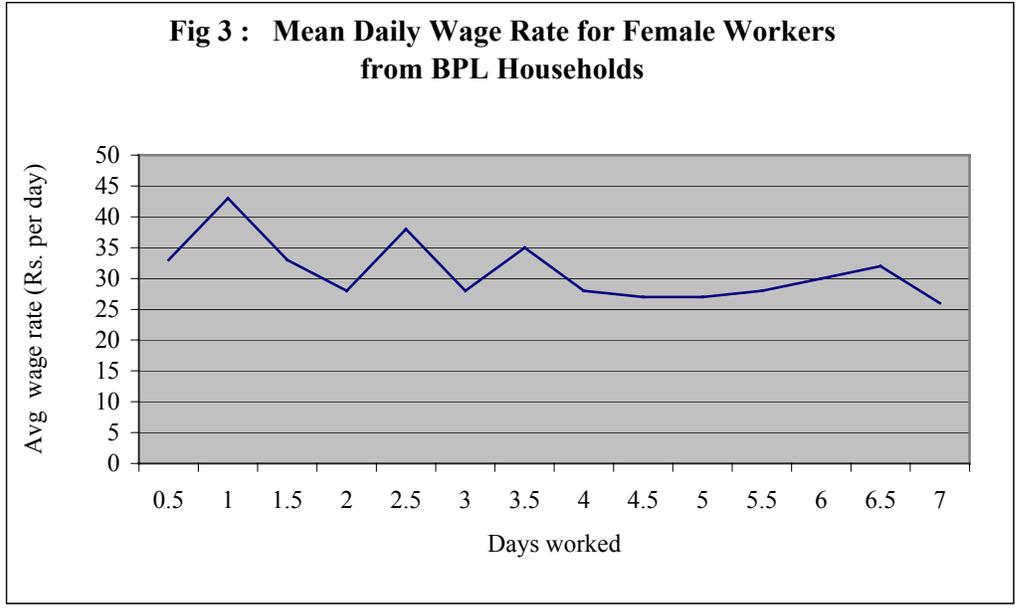
Using data on total number of days worked in the week and earnings (wage and salary) during the week, we start by computing the simple average wage rates per person employed.⁸ The purpose is to see if average wage rates differ according to the number of days worked in the week. We find that out of 14,862 females in wage employment, there is wide variation in the average wage rate, if these are classified as per the total number of days worked. There is an overall inverse trend in the average wage rate when plotted against the total number of days worked during the week. This trend is far more pronounced if one considers those females who belong to BPL households (Fig 3).⁹

⁶ This cut-off can be adjusted for state specific poverty lines.

⁷ As per NSS definitions, a person is considered as working (employed) for the entire day if he/she had worked for 4 hours or more during the day. If the person had worked for 1 hour or more but less than 4 hours, he/she is considered as working (employed) for half-day (NSS 55th round).

⁸ Deriving the wage rate in this manner, where the number of days worked is used as a dependent variable as well, is problematic in the sense that it could lead to a negative bias in the relationship between wage rates and days of employment. We are aware of this problem and are in the process of exploring alternative ways of computing the wage rate. For instance, one option is to compute a village-level wage rate on the basis of available information on individual wages and days of employment.

⁹ A similar negative trend is noted for males from BPL households.



On fitting a trend to the data separately for 64 NSS regions (typically states are divided into NSS regions and each NSS region in turn comprises of certain districts within the state) in the dataset, we find that at this preliminary level of investigation the negative relationship is obtained between average wage rates and number of days worked in a week in the majority of cases. The negative relationship holds for 60% of the regions (37 out of 64) of which, in 15 regions (41%) this is statistically significant at 5% level. A positive relationship is seen in 26 regions (40%), of which only in the case of 5 regions is this statistically significant.

Social and demographic conditions, along with economic status are expected to influence labour supply behaviour. Therefore, it is important to control for the effects of these variables in the analysis. Although, theoretically, several variables can be considered, we use a set of variables which are most likely to influence supply of female labour in our specific context. Data used on household characteristics includes number of earning members in the household, number of children below five years of age, land owned by the household and the monthly per capita expenditure of the household. At the individual level, we use data on the type of operation (type of work performed by a person during the reference period as already mentioned above), the age and educational level of the individual member of the household. An exogenous variable on the mode of payment (cash or kind) is also included in the analysis.¹⁰

¹⁰ As Bardhan (1984) points out in analyzing the labour supply of individual households, it is also important to recognize that data from such employment surveys do not allow us to look at certain factors which also influence supply such as terms and conditions of contract in local labour markets, availability of credit, and the distribution of power among the local actors at the village economy level. However, due to data constraints we are unable to incorporate these into the analysis while acknowledging the importance of these factors.

We estimate the labour supply function using the Heckman selection technique, fitting a regression model with selection by using a full information maximum likelihood estimation. This technique helps us overcome the problem of not being able to observe the wage for those who are not employed in the reference period.

The model is based on the logic that women would choose not to work when their personal reservation wage is greater than the wage offered by an employer. For instance, they may consider that the returns to being at home are higher than the returns at the going wage rate. Then, the decision to participate in the labour market is not a random one, and it would be incorrect to use the Ordinary Least Squares method. Wages are observable only for those who are actually seen as employed. For the others, wages are not observed, although there are underlying decision-making processes based on the offer wage. Meaningful solutions to such models can be found if there are some variables that affect the chances for observation (the reservation wage) but not the final outcome (the offer wage).¹¹ Alternatively put, we observe the extent of labour being supplied only for those for whom the market wage exceeds the reservation wage. In econometric terms, this would mean that the variable, days of labour supplied, is truncated.

The model is therefore formulated in terms of two equations: a selection equation – usually a probit estimation (takes a value of 1 if a woman is working, 0 otherwise) to explain the decision of whether to participate in the labour market and, a regression equation to explain days of actual labour market participation, observable only for those for whom the selection equation takes a value of 1.

For the selection equation: $z_i^* = w_i \gamma + u_i$; $z_i = 1$ if $z_i^* > 0$ and 0 otherwise

Regression model: $y_i = x_i \beta + \varepsilon_i$; observed only if $z_i = 1$

$(u_i, \varepsilon_i) \sim$ bivariate normal $[0, 0, 1, \sigma_\varepsilon, \rho]$ where ρ is the correlation between ε_i and u_i . It follows that standard regression techniques would yield biased estimates when $\rho \neq 0$. Heckman provides consistent, asymptotically efficient estimates for all the parameters in such a model. In actual estimation, a likelihood ratio test of the independence of these equations (testing for $\rho = 0$) with the corresponding chi-squared statistic is done.

Since household level variables would influence the labour supply decisions of females in rural households, we distinguish between APL and BPL families and estimate their labour supply functions separately. This also has the advantage that it helps us focus our attention on the specific characteristics of the supply function for the poor, so that meaningful inferences can be drawn for employment policies targeted at the poor.

The dependent variable in the labour supply estimation is the number of days of labour supplied during the reference week. In the model, this variable becomes observable for a small part of the total sample, namely the “uncensored observations” for which both

¹¹ See Greene, *Econometric Analysis* (2003), Stata software manual (2003) for theoretical details of the model and estimation method.

employment and wage data are available. As such, it may be observed that this does not therefore take into account those who are self-employed (for instance own farm workers). However, our primary focus of analysis is on labour supply decisions of females from BPL households. As such, the idea is to understand what are the factors that influence such decisions, and how best can one make interventions in the labour market to increase such wage employment.

For the selection (or wage) equation the independent variables used are: amount of land owned by the household, the educational level of the female, the number of children below five years of age, the age of the female, and the monthly per capita expenditure of the household. For the regression (estimating labour supply) the independent variables used are: wage rate, type of occupation, age and educational level of the worker, the mode of payment of wages, the land owned by the household, and the number of earning members in the household.¹²

4. Empirical Results

Table 4 presents some summary statistics on the variables used in the estimation. We keep the same set of variables for BPL and APL households for ease of comparison of results.

Table 4: Summary Statistics for Variables used in Model Estimation

<i>Variable Name</i>	<i>Mean Value for BPL</i>	<i>Mean Value for APL</i>
<i>Dependent Variable:</i> Days of Labour Supplied	5.1 (for 5941 females)	5.1 (for 8921 females)
<i>Independent Variables:</i>		
Wage rate (Rs. per day)	28.5	69.9
Type of occupation (=1 if involved in manual activities other than main cultivation)	0.75	0.83
Age of female (in years)	34.9	36
Educational level (=1 if primary and above)	0.15	0.37
Mode of payment (=1 if payment for work is made in kind, partially or completely)	0.02	0.005
Earning members in the household (number)	1.2	0.77
Children below 5 in the household (number)	1.3	0.75
Land owned (in 10 ⁻² hectares)	79.9	160.1
Monthly per capita expenditure (Rs.)	261.06	594.13
Total Observations*	36,243	107,038

* For the age variable we had valid observations only for 36,199 and 1,06,939 females from BPL and APL households respectively.

¹² Certain other variables found to be important in other studies could not be used meaningfully in the regression due to econometric problems; social category of the household (whether SC/ST) for instance was significantly correlated with land owned and the number of earning members in the family; similarly household size was significantly correlated with number of earning members, number of children below 5, social status and education level of the female.

We next present the results obtained from the estimation of the Heckman selection model separately for females from BPL households and females from APL households (Table 5).

Table 5: Results from Heckman Selection Model for Estimation of Female Labour Supply

<i>Regression Model with Sample Selection</i>	<i>BPL estimation</i>	<i>APL estimation</i>
<i>Number of observations</i>	36,199	1,06,939
<i>Censored observations</i>	30,258	98,018
<i>Uncensored observations</i>	5941	8921
<i>Prob > chi2</i>	0.000	0.000
<i>Regression model dependent variable:</i> Days of Labour Supplied	<i>Coefficient Value for BPL</i>	<i>Coefficient Value for APL</i>
<i>Independent Variables:</i>		
Wage rate (Rs. per day)	-0.005* (-5.38)	-0.0002 (-1.08)
Type of occupation (=1 if involved in manual activities other than main cultivation)	0.28* (4.96)	0.28*(6.3)
Age of female (in years)	-0.004 (-1.42)	-0.006*(-3.6)
Educational level (=1 if primary and above)	-0.1 (-0.35)	-0.02(-0.31)
Mode of payment (=1 if payment for work is made in kind, partially or completely)	0.33*(4.47)	0.23* (2.8)
Earning members in the household (number)	-0.06* (-3.30)	-0.22*(-14.10)
Land owned (in 10 ⁻² hectares)	-0.001* *(-1.96)	-0.0003(-1.0)
<i>Selection Equation:</i>		
Land owned (in 10 ⁻² hectares)	-0.002* (-22.4)	-0.002*(-39.13)
Educational level (=1 if primary and above)	-0.41*(-15.75)	-0.25*(-19.06)
Children below 5 in the household (number)	-0.11*(-14.4)	-0.13*(-20.10)
Monthly per capita expenditure (Rs.)	-0.001*(-8.1)	-0.00002(1.24)
Age of female (in years)	-0.007*(-12.47)	-0.005*(-13.26)

Note: Figures in parentheses denote t-statistics. * and ** indicate that the coefficient is significant at 99% and 95% level of confidence respectively.

These results indicate that there is similarity in the selection mechanism with explanatory variables having the same sign and significances for both APL and BPL females. Land owned, educational level, the number of children below five, and age are all inversely related to the decision to participate. The only exception is monthly per capita expenditure, which is negatively associated with the decision to participate for both the APL and BPL females, but, is of far greater significance for those below the poverty line. Therefore, the basic factors driving the decision to participate in the labour market are similar. However, there are differences in supply behaviour with regard to the extent of

participation across BPL and APL female workers. Of course, the preliminary investigations on the data had also pointed at some of the differences, as discussed earlier.

The wage rate is found to be negatively related to the supply of labour, although it is insignificant in the case of APL. This indicates the importance of recognizing the existence of a forward falling supply curve for female labour for those below the poverty line. The results are similar to findings elsewhere in the developing economies as noted earlier. This also implies that as real wages fall, most people from low income households would participate more in the labour market (Licona 2000). The results on occupation are interesting to the extent that they reveal that there is a clear preference among both BPL and APL households for non manual, non cultivation based activities. Age is a significant explanatory variable for APL workers, the older one is the lower is the supply of labour.

The amount of land owned is expected to be inversely related to the supply of wage labour, both because of an income effect and also due to a status effect of making one more reluctant to work for others. This result holds for both the decision to participate and the decision on the extent of participation. However, this variable is significant in explaining the labour supply only for BPL workers. The educational level is insignificant for both BPL and APL workers. The results also indicate that payment in kind, encourages supply of labour. Also, higher the number of earning members in the household the lower would be the participation of females in the labour market. Our results indicate that female labour supply needs to be looked at in a differentiated manner, distinguishing between the poor and not poor. It seems that the explanatory variables differ in their influence on labour supply according to the poverty level. The decision to supply labour is based not only on individual but also on household characteristics and on the nature of employment being offered. The factors that govern labour supply decisions may differ according to the level of economic well-being of the household where the worker lives. Fatima (2003) obtains similar results in her study of female employment in Egypt. These findings are of particular relevance for policy designed to intervene in the labour market to encourage participation.

In designing interventions, it is to be noted that payment in kind seems to act as an incentive to supply labour, perhaps because it represents availability for immediate consumption. The higher the number of earning members in the household, the less is the supply of labour from females from poor households, underlining the notion of forced employment being prevalent among these workers, who are probably operating at the lowest wages. The larger the number of earning members in the household, the lower is the necessity for working. A higher monthly per capita expenditure discourages participation as well. While our findings on the individual explanatory variables influencing labour supply are in keeping with findings from other studies, the overall implications for a forward falling supply curve is of importance.¹³

¹³ Bardhan (1979) found evidence for a locally forward falling supply curve for the set of all adult women, including housewives. However, his results were based on the use of a simple OLS estimation. For women

We now use these estimates to derive implications for labour supply due to changes in the number of earning members and wages (Table 6)

Table 6: Changes in Labour Force Participation (%)

<i>Item</i>	<i>Percentage change in days of labour supplied</i>
Number of earning members increases by one (other variables held constant)	Reduction by 1.5%
Wage rate increases to APL wage rate	Reduction by 4.7%
Wage rate increases to APL wage rate and number of earning members increases by one	Reduction by 6.25%

We also calculate the change in the probability of participation in the work force arising from an increase in the number of earning members in the household. A simple OLS regression relating total household expenditure to the number of earning members yields a significantly positive coefficient indicating that as the number of earning members increases in the household, it leads to a rise in total expenditures, other things held constant. Given the household size, this implies that the monthly per capita expenditure rises correspondingly. This raised monthly per capita expenditure can be combined with our parameter estimates from the selection equation to obtain the impact on the labour force participation by females. By this method, we find that if the number of earning members in the household increases by one, the probability of joining the work force decreases by 0.009, i.e. about one percentage point.

5. Implications of the Empirical Findings

The paper has presented econometric evidence of what may be called “forced employment” or “need-based participation in workforce” for females from BPL families in rural areas. From the empirical results obtained it seems that if the female wage rate earned by BPL households in rural areas goes up substantially or if male members of such households get more employment opportunities, more and more women of BPL families may withdraw from the labour force.

What is the welfare implication of such a change in female labour supply? It seems reasonable to argue that women withdraw from the labour force because they find the returns from home based work higher. It follows therefore that if wage hikes or increase in the number of earning members in the family causes women to withdraw from the labour force, there is a welfare gain for the family.

in the usual labour force he found the wage response of labour supply to be significantly positive. Our results are broader, and particularly relevant for policy making for BPL households.

These gains in welfare of the household need to be set off against income losses of the female household member which may be an important issue if the family income is near or below the threshold poverty level, and the gains from employment of female outside the house, such as awareness, empowerment, etc.

If women turn to home based activities (either household work or a combination of household work with home-based income generation activities) as their household's economic position improves, this could imply two things: (a) the need for designing interventions/ programs that can help women combine home-based income generation activities with household chores; (b) possibility of implied status change for women, from a casual wage earner to being self-employed in some capacity.

Given that the supply of female labour in rural areas is downward sloping, interventions that increase the supply of female labour are important for creating more employment for them, thus contributing to better economic conditions of the households, and to greater awareness among and empowerment of rural women. Some of the possible directions in which interventions may be made include better care facilities for children during work hours, more training to get wages beyond the threshold (moving from the forward falling part to the upward sloping part of the supply curve), modes of payment, and type of work/activities that attract women.

National Employment Guarantee Scheme

There is a great deal of expectation from the National Rural Employment Guarantee Scheme (NREGS). In the initial stage, the scheme is being implemented in 150 most backward districts. This will later be scaled up to 600 districts. The scheme offers a guarantee of 100 days of paid employment at the level of minimum wages of the states. The promise is to provide at least 100 days of work to poor rural households whose adult members volunteer to do unskilled manual work. According to the scheme, one member of a below poverty line (BPL) family would be offered a job and till he or she gets it, a third of the minimum wage will be given. There is 33% reservation for women,¹⁴ and there are expectations that 40% of the employment benefits would go to women.

The scheme would benefit the BPL families in that the income of at least one member and per capita expenditure will go up. This will also raise the bargaining power of rural workers through higher reservation wage and getting more organized (working together in such schemes). There are reasons to believe that the implementation of the scheme will push up the rural wages. Indeed, analyzing the experience of previous employment

¹⁴ Two conditions under the scheme may be mentioned in this context: (a) At least one-third of the beneficiaries shall be women who have registered and requested for work under this Act; (b) In case the number of children below the age of six years accompanying the women working at any site is five or more, provisions shall be made to depute one of such women workers to look after such children.

guarantee schemes in India, Gaiah and Imai (2005) conclude that the schemes had a significant positive effect on rural wages.

The empirical results presented above raise some concerns regarding the impact that the NREGS may have on rural female employment. The scheme may raise the rural wages and this in turn may have an adverse effect on female labour supply. The wage for female labour from BPL families may go up, but the number of persons working may not increase. What is of greater concern is that as the number of earning members of the family goes up, the women may withdraw from labour force. There may therefore be difficulties in attaining the target of 33% job opportunities going to women. One may argue that whether or not women work, the scheme would help in the betterment of the economic conditions of the rural BPL households. But, there are clear adverse effects of women withdrawing from work in terms of awareness and empowerment.

The answer to the problem highlighted above lies to some extent in the proper designing of the schemes implemented at the ground level, particularly the type of activities in which employment opportunities are offered. Careful thinking is needed in this regard to ensure that the adverse effect of the scheme on female employment as indicated above is fully taken care of.

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Annex: Effects of labour demand expansion on employment when the labour supply curve is forward falling

If the supply curve of labour is forward falling, then an expansion in labour demand due to output growth need not lead to an increase in employment. This is depicted in Diagram-1. DD' denotes the demand curve for labour. SS' is the supply curve. Below wage rate of \hat{w} , the supply curve is forward falling. Above \hat{w} , the curve has a normal upward sloping shape. As wage rate keeps increasing, beyond a level, the curve may bend backward, giving thereby the inverted-S shape. It is assumed that the level of demand for labour is low so that the market is currently operating at the bottom (forward falling) portion of the supply curve. The equilibrium wage rate and employment are w^* and L^* , respectively.

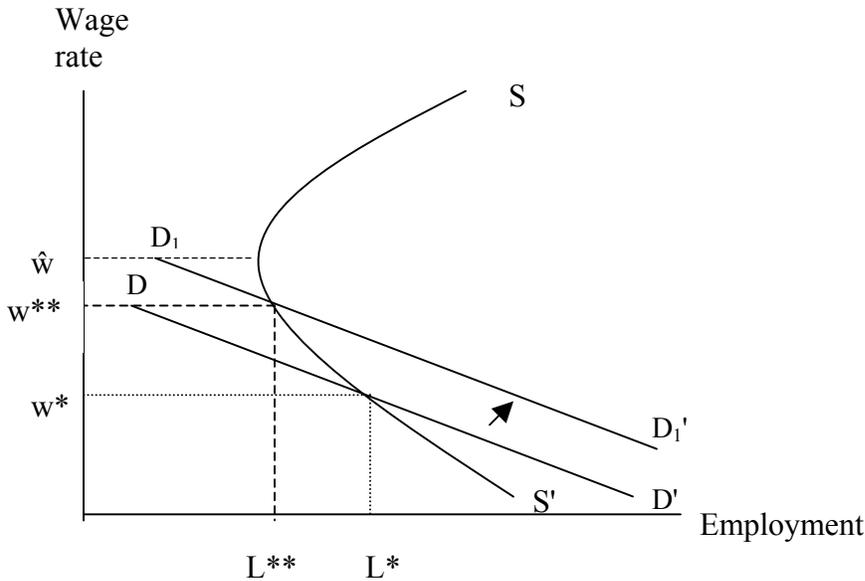


Diagram-1: Equilibrium in labour market with forward falling supply curve

Consider next an expansion in demand due to output growth. This causes the demand curve to shift to the right to D_1D_1' . In the changed situation, the equilibrium wage rate and employment level are w^{**} and L^{**} respectively. It is seen that the new equilibrium is at a higher wage rate but lower employment.

One may argue that the adverse effect on employment in the above diagram would not occur if the demand curve is steeper than the supply curve. This does not seem likely to happen because a steeper demand curve than the supply curve when both are falling will make the equilibrium unstable (see Diagram-2). Further, if a minimum wage is imposed, higher than the equilibrium wage, then the demand for labour at minimum wage will exceed supply leading to shortages of labour (gap between a and b in the diagram), tending to raise wage further and thereby creating more shortage of labour. This is obviously not consistent with what is observed in real life.

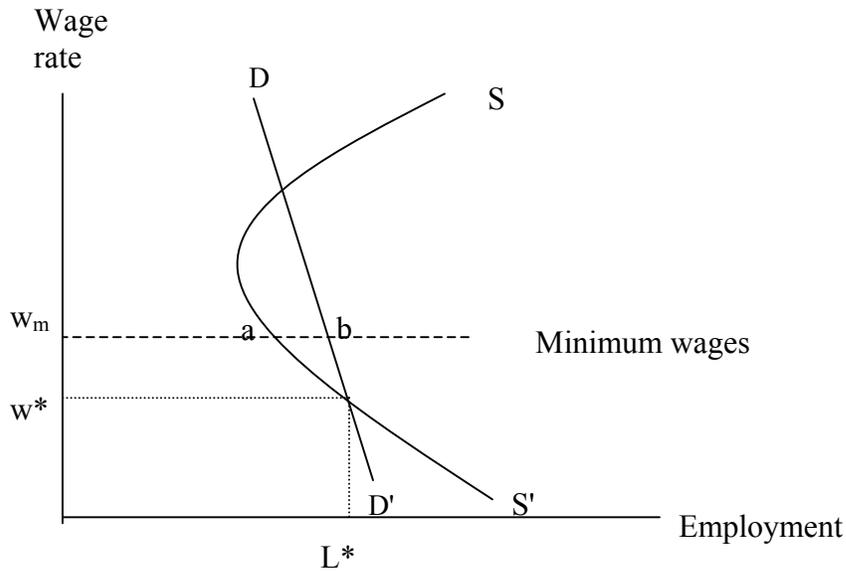


Diagram-2: Equilibrium in labour market with forward falling supply curve and steeper demand curve

Let us now consider again the situation depicted in Diagram-1, and bring in a minimum wage fixed by the government. This is shown in Diagram-3. Since the equilibrium point is below the minimum wage line, the employment level will be L_m and wage rate will be w_m .

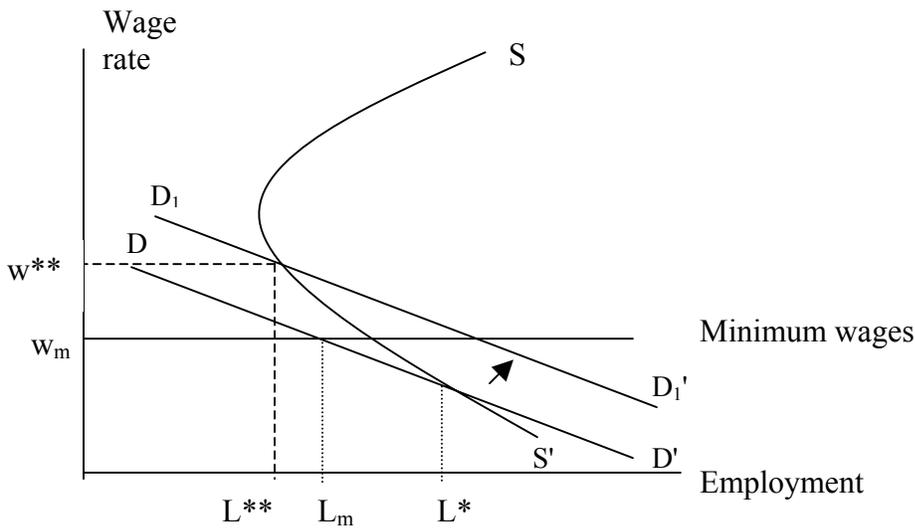


Diagram-3: Wage and employment determination in labour market with forward falling supply curve and minimum wage fixed by the government

It is evident from the diagram above that a small shift in the demand curve to the right, would lead to an increase in the employment level keeping the wage rate fixed at w_m . But, if there is a large shift in the demand curve of labour to the right because of a rapid output growth, then the new equilibrium could be at a point at which employment is lower and wage rate is higher (as shown in the diagram).