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LABOUR SUPPLY AND WAGE DETERMINATION IN RURAL UTTAR PRADESH

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I

PROBLEMS IN RURAL LABOUR MARKET ANALYSIS

It has generally been found difficult to explain wages as simple functions of demand and supply and demand as simple function of wages in the rural labour markets in India. Some studies do find labour market as fairly competitive and wages responsive to variations in demand and supply.[1] A number of others, however, find the structural rigidities of the labour market rendering demand and supply of labour rather inelastic to the wage rates, and wage rates somewhat unresponsive to the variations in the demand and supply of labour.[2] Labour markets, in general, tend to have a slower adjustment mechanism than other markets. The imperfections and rigidities are, however, found to a much greater degree in the rural labour markets so much so that these markets sometimes look qualitatively different from other markets.

The most important factor making for a qualitatively different pattern of functioning of the rural labour markets is the household-based organization of agricultural production. The supply of family labour, which accounts for the major part of labour employed in agriculture, is not subject to changes in the wage rates as such, but is determined by the size of active age group population and social attitudes to work. The latter is particularly significant in the case of supply of female labour, which is the major factor accounting for differences in worker-population ratio among regions and periods. Another social institution introducing rigidity in the functioning of the labour market is the widely prevalent practice of attached labour, under which workers attached to a particular employer are not able to effect inter-employer mobility nor are their wage rates easily flexible. The large extent and peculiar nature of unemployment among agricultural workers makes its own contribution in diffusing the demand, supply and wage inter-relationships in the rural labour markets. The existence of sizable surplus labour which is not actually redundant as most of it is required in certain periods in the

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1. Deepak Lal, "Agricultural Growth, Real Wages and the Rural Poor in India", *Economic and Political Weekly*, Vol. XI, No. 26, June 26, 1976; R. Mabro, "Employment and Wages in Dual Agriculture", *Oxford Economic Papers*, Vol. 23, No. 3, November 1971.

2. V. N. Misra, "Labour Market in Agriculture: A Study of Gujarat Districts", *Indian Journal of Agricultural Economics*, Vol. XXV, No. 3, July-September 1970; P. K. Bardhan, "Determinants of Supply and Demand in Poor Agrarian Economy: An Analysis of Household Data in Rural West Bengal", presented at the ADC/ICRISAT Conference on Adjustment Mechanism of Rural Labour Markets in Developing Areas, *op. cit.*

year,[3] adds to labour stock, which can be converted into labour supply at any wage rate during the lean seasons of the year. This stock and potential supply may vary among areas but such variations may hardly get reflected in differences in the wage rates. Moreover, while all labour markets are found to have regional and local character as they deal in human beings, the rural labour markets tend to assume this characteristic more significantly.[4] The institutions of family and community have stronger force in tying a worker to his home in the rural areas. Consequently, labour supply also becomes more localised and competitive forces leading to equalising tendency in wages through inter-area movements of labour are rather weak.

The specification of demand for labour also poses certain problems in the analysis of rural labour markets. First, the employment of workers in agricultural operations, most of whom work on family farms, gets extended to the extent of supply, rather than being fixed at the point of equality between wage rates and the marginal product. The number of workers engaged in agriculture is, therefore, not a reliable indicator of the demand for labour and most of it may be invariant in relation to the wage rates. In fact, the intensity of their employment in agriculture is found to be less than one-half of the potential labour time at their disposal in the case of Uttar Pradesh.[5] Variations in the number of workers engaged in agriculture thus mainly reflect the differences in the supply of such workers in the rural areas rather than in the demand for their labour in agriculture. To the extent employment opportunities are available in the non-agricultural occupations in the rural areas, employment figures may indicate the demand for labour with a greater degree of reliability and the labour market behaviour would show a greater responsiveness of supply, demand and wages to each other. Non-agricultural employment, however, exists only to a small degree in most of the rural areas. Second, even the demand for hired labour, which is expected to be influenced by the wage rates, may actually be invariant and may not vary inversely with wage rates, particularly in peak seasons when certain agricultural operations have to be completed in a given period of time. High wage rates, or more often, inelasticity of labour supply may, however, lead to substitution of labour by machines for these operations.

II

PRESENT STUDY

The present study attempts an analysis of labour market behaviour in rural Uttar Pradesh, with implicit recognition of the constraints and propositions stated above. The study is conducted on the cross-section inter-district basis using data for 1971. The choice of mode and period of analysis

3. Wolf Ladejinsky, "The Green Revolution in Punjab: A Field Trip", *Economic and Political Weekly*, Vol. IV, No. 26, June 28, 1969.
4. T. S. Papola, "The Indian Labour Market", *Economic and Political Weekly*, Vol. III, No. 30, July 27, 1968.
5. R. C. Sinha, "Agricultural Development and Rural Employment", in Studies on Development of Uttar Pradesh, GIDS Occasional Papers, Vol. I, Giri Institute of Development Studies, Lucknow, 1979.

is dictated by data availability. A complete analysis of labour market behaviour required an explanation of the determinants of demand, supply and wage rates. There are, however, acute problems of specification in the case of demand. Workers engaged in agriculture are not a reliable proxy for the demand for labour, as a sizable part of their labour is not actually required there: it remains unutilized and/or generates a marginal product lower than the going market wage rate. An alternative is to estimate the demand on the basis of actual requirements of labour in agricultural activities. This can be done by deriving norms (either on an average or experimental basis) of labour requirements per unit of cultivated land for each crop and apply them on the given area, intensity of cultivated land and cropping pattern in each of the geographical units under study.[6] Such a measure of demand could be used for deriving a measure of surplus labour for use as an explanatory variable in the analysis of wage rate variations. But attempting an explanation of variations in demand, so estimated on a normative basis, would not be meaningful, for the variables which could be important for explaining demand or factors affecting it are already used for estimating the demand for labour.

Our analysis in this paper has, therefore, been confined to develop and verify certain hypotheses relating to the inter-district variations in the supply of labour and wage rates in agriculture. The supply of labour in a district is obviously dependent on the size and structure of population, which would vary among districts in the first instance due to differences in area and habitation pattern. The absolute size of labour force would, therefore, not serve as an appropriate indicator of variations in labour supply. Ratio of workers to population or to cultivated area as an alternative is a better indicator for our purpose. Worker-land ratio is, however, an amalgam of supply and demand forces, as it reflects both the pressure of population on land and employment in agriculture. We have, therefore, opted for labour force participation rate as an indicator of relative labour supply in various districts.

Worker-population ratio or labour force participation rate, on the other hand, is found to vary among areas more on account of variations in the female participation rates. The phenomenon is so universally recognized that the constancy of male participation rates among geographical areas and periods has been acclaimed as one of the "Great Ratios in Economics".[7] Among districts of Uttar Pradesh, the male labour force participation rates in the rural areas vary, generally, between 49 and 56 per cent, while female participation rates are found to vary between 0.75 and 16.63 per cent.[8] Our analysis of labour supply in this paper, therefore, concentrates on the explanation of inter-district variations in female labour force participation rates. The analysis of wage rate variations among districts has been attempted for both male and female separately with suitable changes in the explanatory variables postulated to affect demand or supply.

6. For details about methodology, see Sinha, *op. cit.*
7. L. R. Klein and R. F. Kosobud, "Some Econometrics of Growth: Great Ratios in Economics", *Quarterly Journal of Economics*, Vol. 75, No. 2, May 1961.
8. Sinha, *op. cit.*

III

LABOUR SUPPLY: DETERMINANTS OF FEMALE PARTICIPATION RATES

(*i*) *Hypotheses*

It is well-known that traditionally women have played only a secondary role so far as working out of homes is concerned: the first opportunity to participate in economic activity gets allotted to men. The situation could be different in areas where activity pattern has a significant element of work which women could perform more easily and efficiently or where the supply of male labour has reached virtual saturation. A lower participation rate among women than among men is the natural result of this phenomenon. In rural Uttar Pradesh the female labour force participation rate stands at 7.27 while the male rate is found to be 52.98 per cent. But variations in female participation rates are very wide. In the above background, it is reasonable to postulate the availability of male labour per unit of land and percentage of area under crops using more female labour (*e.g.*, paddy), as the two important variables determining female participation rate.

The relevance of wages and incomes, however, cannot be ruled out. In fact, importance of income and wage levels implicit to some extent in the 'secondary role' proposition stated above, to the extent need or willingness to work out of homes would be determined by the incomes of family and wages of male earners, and female wage rates respectively. Wage rates would thus influence female labour supply through both income and substitution effects. It has been observed in the developed countries that the female participation in the work force has been a positive function of their own wage rate and negative function of the family incomes.[9] However, in an under-developed region like Uttar Pradesh characterized by widespread poverty, lower wages may encourage greater participation in economic activity because of the necessity to achieve a desired or minimum subsistence level of income.

The negative relationship between female wage rates and participation, in veiw of low family incomes, would imply that with the increase in incomes beyond a level, the female participation would decline, as women's participation would no longer be required to contribute to the subsistence level of income. Thus, the supply curve of female labour would have a backward bending shape, implying a negative relationship between female participation and income levels, the more general form of this relationship has been observed as 'U'-shaped curve. It suggests that the participation rate decreases in the early phase of development and then increases in the later stage of development. According to this hypothesis, in early stages of devement women are pushed out of jobs by competition with men. With rising income the pressure on women to earn supplementary income is also re-

9. Guy Standing: Labour Force Participation and Development, International Labour Office, Geneva, 1978, p. 75.

duced.[10] Starting from very low—below subsistence—levels of incomes it may, however, be argued that the female participation rates curve would tend to assume an inverted 'U'-shaped form. Low wages and incomes would force more of them to enter the labour market, which would increase the household incomes, and after reaching a reasonable level of income to maintain the customary standard of living, they might withdraw from the labour force. Withdrawal might get expedited with faster increase in the wage rates of male workers and in the general productivity levels. It is doubtful if most parts of Uttar Pradesh have yet reached the level of economic development, where the negative slope of the hypothesized curve is relevant, although some observers tend to think that declining part of the U-shaped curve is already in operation.[11]

Income levels, thus, form an important factor explaining the variations in female participation rates. The framework of relationship is broadly what is implied in the 'additional worker' hypothesis: the low household income levels compel women to participate to supplement the income earned by men; and also the lower the wages, more of them have to work to make the necessary contribution. The tendency of a simultaneous increase in the income levels and participation rates may operate over the range where the demand for additional income is absolutely inelastic and in the condition where incomes cannot be raised by an increase in per worker productivity and earnings. Having reached a level of income where the demand for additional income becomes somewhat elastic to the disutility of loss of leisure or loss of social prestige, an increase in the income levels would lead to a fall in female participation rates.

The above arguments also lead us to postulate a positive relationship of the share of landless labourers in rural population and of small holdings in the total cultivated area with female participation rates. It is presumed that the families in these groups will have a greater inelasticity of demand for additional income; and, the loss of social status in the participation of women in economic activity would be low, because of the relatively weak force of inhibitions to work out of homes, at least in the case of landless labourers.

(ii) Analysis and Results

Keeping the above propositions in view we have sought to explain the inter-district variations in female participation rates (FPR) in terms of the following variables, specified in the manner indicated therein:

(1) *Availability of male labour* (Lm): indicated by *number of male workers per 100 hectares* of cultivated land; (2) *Cropping pattern* (Cp) specified in terms of *percentage share of paddy—a woman worker dominated crop—in gross cropped area;* (3) *Wage rates for women workers* (Wf); (4) *Income levels* (Y) approximated in terms of value of output per agricultural worker; (5) *Proportion of small holdings* (Sh)

10. Standing: *op. cit.*, p. 14; S. M. Pandey, "Determinants of Urban-Rural Worker Participation Rates in India: An Exploratory Analysis", *Indian Journal of Industrial Relations*, Vol. 9, No. 2, October 1973.

11. J. N. Sinha, "Female Work Participation: A Comment", *Economic and Political Weekly*, Vol. X, No. 16, April 19, 1975.

specified as a percentage of *area under holdings below three hectares*; (6) *Agricultural labour population* (Al) *as a percentage to total population.*

The multivariate model used to explain inter-district variations in FPR is thus specified as follows (with expected signs of variables indicated):

$$FPR = a - b_1Lm + b_2Cp - b_3Wf - b_4Y + b_5Sh + b_6Al$$

It is likely that some of the variables included in our model are strongly correlated with each other. The analysis, therefore, gets vitiated on account of multicollinearity. In order to avoid this problem, we examined the degree of mutual interrelationship among independent variables on the basis of simple correlation coefficients. Taking the coefficients with a value of 0.8 or above only as indicative of strong collinearity, only two variables, *i.e.*, the percentage of area under holdings of three hectares or less and the number of male workers per 100 hectares of cultivated area are found to be highly correlated. We, therefore, considered only one of the highly correlated variables in estimating the regression equations (2) and (3). The estimated equations are given below:

$$\begin{aligned} FPR = 8.1887 &- \underset{(0.0321)}{0.0118}\,Lm + \underset{(0.0561)}{0.0628}\,Cp - \underset{(0.9033)}{0.2282}\,Wf - \underset{(0.1155)}{0.3779}{***}Y \\ &- \underset{(0.0797)}{0.0570}\,Sh + \underset{(0.2352)}{0.8554}{***}Al;\ R^2 = 0.8220,\ D.F. = 41 \quad ...(1) \end{aligned}$$

$$\begin{aligned} FPR = 5.4578 &- \underset{(0.0166)}{0.0281}{**}\,Lm + \underset{(0.0384)}{0.0462}\,Cp - \underset{(0.7915)}{0.0955}\,Wf - \underset{(0.0969)}{0.3401}{***}Y \\ &+ \underset{(0.1486)}{0.9589}{***}\,Al;\ R^2 = 0.8247,\ D.F. = 42 \quad ...(2) \end{aligned}$$

$$\begin{aligned} FPR = -16.4720 &- \underset{(0.0499)}{0.0402}\,Cp + \underset{(0.8067)}{0.0433}\,Wf + \underset{(0.1006)}{0.0338}\,Y + \underset{(0.0507)}{0.2466}{***}Sh \\ &+ \underset{(0.2081)}{1.2124}{***}\,Al;\ R^2 = 0.6835,\ D.F. = 42 \quad ...(3) \end{aligned}$$

Notes:—Figures in parentheses are the standard errors of the coefficients.

*** Significant at 1 per cent level.

** Significant at 5 per cent level.

The values of R^2 reveal a substantially high explanatory power. Around 68 to 82 per cent of the variations in FPR are explained by the variables included in different equations. All the variables also show expected signs. In the first equation including all variables, productivity and extent of agricultural labourers show a highly significant relationship with the participation rate, other variables yield non-significant coefficients, although with expected signs. Productivity per worker is found to have a negative relationship with FPR, implying that an increase in productivity and income levels leads to withdrawal of women from work.[12] The percentage of agricultural labourers in the population is positively related with FPR, suggesting that more women from among the agricultural labour households participate in economic activity than from among the landed households. The effects of the two variables may be combined to the extent agricultural labour households would also tend to have relatively lower incomes, but the relative lack of

12. Standing: *op. cit.*, p. 61.

social inhibitions among the women of these households does also play an important role in making FPR high among them than among the landed households.

Once we drop the variable of small holdings in equation (2), which has shown a strong correlation with the male worker-land ratio, we find that the latter yields a significant coefficient, and the coefficients of agricultural labour population and productivity levels still retain a high level of significance. It seems that the availability of male labour is an important variable explaining the variations in FPR, but its significance could not show up in equation (1) due to the presence of another strongly correlated variable (Sh) which also was found to be non-significant. This result (equation 2) does not go contrary to that obtained in equation (1), but supports the 'additional worker' hypothesis of female participation rate: so long as male workers are available, and earn a living for the family, women participation in economic activity is only marginal.

The proportion of area under small holdings is found to have a significant relation with FPR, once it is used independently of male worker-land ratio, but along with all other variables in equation (3). It, therefore, holds importance for explaining the variations in FPR. The 'omnipotent' variable agricultural labour-population ratio retains its significance in this equation as well, but productivity, which yielded significant coefficients in the earlier two equations, fails to show a significant relationship and its coefficient also shows a positive sign, contrary to expectation. This result raises some doubt about the generally observed inverse relationship between productivity and income levels and FPR. While the earlier two equations validate this relationship, the last equation yields rather an intriguing result. It is, therefore, worthwhile and interesting to examine this relationship further.

As pointed out earlier, at very low levels of incomes and wages, participation rate may rise simultaneously with the income levels as more persons would need to work to raise income to a desired minimum level. Or, at least, a slight increase in incomes may not lead to any fall in the overall FPR. This proposition is sought to be examined by dividing the sample of 48 districts into three groups of productivity levels; districts with less than Rs.750, those with Rs.750 to Rs. 1,200, and those with higher than Rs. 1,200 as annual value of output per agricultural worker; and estimating the relationship for each of the three groups. Two variables have been dropped: extent of small holdings due to its strong collinearity with the male worker-land ratio (the latter has been retained as it has shown better explanatory power); and the area under paddy due to its revealed non-significant coefficients in all the equations relating to all districts. The results of the exercise are given below:

Districts with value of output per worker more than Rs. 1,200:

$$\underset{}{FPR} = \underset{}{5.0362} - \underset{(0.0305)}{0.0731^{**}}\ Lm + \underset{(1.0699)}{1.0328}\ Wf - \underset{(0.1282)}{0.2238^{*}}\ Y + \underset{(0.2774)}{0.8366^{***}}\ Al$$

$$R^2 = 0.8109,\ D.F. = 12$$

Districts with value of output per worker between Rs. 750 to 1,200:

$$FPR = 20.1743 - 0.0730^{*}\ Lm + 1.3045\ Wf - 1.9498\ Y + 1.5087^{***}\ Al$$
$$(0.0434) \quad (1.9429) \quad (1.5382) \quad (0.3538)$$
$$R^2 = 0.6927,\ D.F. = 10$$

Districts with value of output per worker less than Rs. 750:

$$FPR = 14.9351 + 0.0030\ Lm - 4.1096^{***}\ Wf - 0.5647\ Y + 0.7577^{***}\ Al$$
$$(0.0178) \quad (0.9728) \quad (0.7255) \quad (0.1270)$$
$$R^2 = 0.8964,\ D.F. = 11$$

Notes:— Figures in parentheses are the standard errors of the coefficients.
*** Significant at 1 per cent level.
* Significant at 10 per cent level.

As can be seen from the coefficients in the three equations, while the percentage of agricultural labour to population remains highly significant at all levels of productivity, the significance of availability of male labour gets reduced as an explanatory variable as we move from high to low productivity levels, so much so that it loses significance altogether in the lowest productivity group of districts. The variable indicating income level, namely, value of output per worker retains its significance in the group of districts with the highest productivity levels, but its coefficient loses significance in the medium and low productivity group of districts. It is significant to note that the female wage rate which does not show significant relationship in the overall equation, and also in the high and medium productivity districts, is found to have highly significant negative relationship with FPR in the low productivity districts. The lower the wage rate, the larger is the number of women participating in economic activity, but even this high participation does not seem to produce a level of household income that would lead them to withdraw from the labour force, as seems to be the case at high productivity levels.

IV

DETERMINANTS OF WAGES

(*i*) *Hypotheses*

It has been noted earlier that there are both theoretical and empirical problems in using a simple framework of wage determination making wages a function of some indicators of demand and supply. The reported figures of workers engaged in agriculture reflect both demand and supply and thus raise the basic problem for independence of demand and supply, a necessary condition for such an explanatory framework. The concept of demand for labour in terms of 'standard' requirements, referred to earlier, measures demand only under certain normative conditions. It can, however, be used to provide a broad measure of surplus labour once compared with the measure of potential labour supply. Such a measure of surplus labour could be postulated to have a negative relationship with the wage rate. On the other hand, the universal existence of surplus labour may nullify the effects of any marginal changes in demand conditions: a rise in productivity, for example, need not lead to a rise in wages so long as surplus labour is available to work at the going wage rate.

In effect, the purpose of an analysis of wage determination is not merely to find out whether demand or supply forces are important in making the wage rates change. An analysis confined to this question would be rather truistic, and not much meaningful. Demand and supply are influenced by a variety of factors and what is important is to identify the nature of these factors and determine the extent of their influence individually and directly on the wage rates.

Besides the extent of surplus labour which would directly tend to depress the wage rate, another variable that would influence the wage rate from the supply side is the extent of employment opportunities outside agriculture. A larger scope for work outside agriculture in the rural areas would tend to reduce the supply of labour to agriculture and thereby raise the supply price of labour. On the demand side, it is plausible to argue that the yield levels would influence the wage rates positively. The relationship may, however, not be direct: first because of the existence of surplus labour as pointed out above, and second because an increase in the yield level can be brought about in a manner that may or may not raise the demand for labour. Cropping intensity and irrigation as factors in yield increase may have a positive influence on demand and, therefore, wage rates; while mechanization, at least of certain kind, may negatively affect the demand and hence wages. Certain crops use more labour than others per unit of cultivated area, and therefore, the crop pattern has its direct influence on the demand for labour, and, *ceteris paribus*, on wages. Besides, the pattern of distribution of land holding is a factor which acts on supply, demand and wages in numerous ways. A high concentration of land holdings in the hands of a few cultivators raises the demand for hired labour but at the same time it also implies a large population of agricultural labourers and small holders who would supply their labour on wages. The skewed distribution would also lead to an imbalance in the bargaining structure,[13] where a few large land holders can play the large number of wage labourers against each other to keep the wage levels low.

(ii) Analysis and Results

The scheme of variables that we have adopted for explaining inter-district variations in the wage rates follows the logic explained in the above paragraphs. In the first instance, we have used a rather comprehensive framework for the analysis of male wage rates (Wm) using the following variables: (1) *Surplus labour* (L), measured as a difference between the total available labour computed by multiplying the number of workers in agriculture by 270 days, and standardised requirements of labour in man-days, on the given area, intensity and pattern of cropping, and specified on per hectare basis; (2) *Alternative employment opportunities* (Ns), measured as a percentage of rural workers engaged in non-agricultural activities; (3) *Yield* (Y), measured in terms of per hectare gross output; (4) *Cropping intensity* (I), measured as

13. Kalpana Bardhan, "Factors Affecting Wage Rates for Agricultural Labour", *Economic and Political Weekly*, Vol. VIII, No. 26, June 30, 1973.

a ratio of gross cropped area to net area in percentage terms; (5) *Irrigation* (R), measured as a percentage of irrigated area to gross cropped area; (6) *Mechanization* (T), measured in terms of a composite index computed by linearly pooling all mechanical equipments (tractors, threshers, pumpsets and tubewells) per hectare of net area sown for each district and expressed as an index with Uttar Pradesh as a whole as 100. (*a*) Tractors (Tt) and (*b*) pumpsets per 1,000 hectares (Tp) of gross cropped area have also been used separately as independent variables; (7) *Crop pattern* (Cp), measured as a percentage share of crops requiring 100 man-days or more of labour per hectare in the total cropped area; (8) *Land distribution* (C), measured in terms of land concentration ratio (Gini coefficient).

For the explanation of female wage rate variations, the variables and their specifications have been suitably modified so as to include only the influences specifically relevant for female wage rates. Mechanization and its components have thus been dropped as it would affect demand and wage rates in general and not specifically of women. Similar is the case with crop intensity. Surplus labour has also been dropped for the same reason. Variables relating to yield level and employment opportunities in the non-agricultural sector have been retained as factors influencing demand and supply respectively of female labour. In addition, the supply of female labour has been included directly in terms of the number of female workers per 100 hectares of net area sown (Lw). Concentration ratio has been retained as a measure of inequality determining demand, supply and bargaining position in the labour market, as explained above. These influences may be particularly relevant to women workers' wages, through the need to supply more of their labour if they belonged to the low income and landless families. For the same reason, the percentage of agricultural labour in rural population has also been included. So far as cropping pattern (Cp) is concerned, it has been measured in terms of the percentage of area under paddy cultivation to the gross cropped areas, as it is expected to influence the demand for female labour directly.

Incorporating the variables and specifications as explained above, the following forms of equations (with expected signs) have been used to explain the inter-district variations in male and female wage rates:

Model for male wage determination

$$Wm = a - b_1L + b_2Ns + b_3Y + b_4I + b_5R - b_6T - b_7Tt + b_8Tp - b_9C + b_{10}Cp$$

Model for female wage determination

$$Wf = a - b_1Lw + b_2Ns + b_3Y + b_4Cp - b_5C + b_6L$$

All the models incorporating the various combinations of variables for *male wage determination* given below show adequately high explanatory power in so far as the R^2 in each case exceeds 0.8. It does not, however, vary significantly among the different equations, implying that any of the sets of variables could well serve the purpose. Even the last equation with only three variables, namely surplus labour, per hectare yield and land concentration ratio shows as high explanatory power as other equations using six or seven

variables as shown below. All the variables also show expected signs for their coefficients except irrigation which in any case has turned out to be non-significant.

$$Wm = 5.6397 - \underset{(0.0007)}{0.0063^{***}}\ L + \underset{(0.0109)}{0.0344^{***}}\ Ns + \underset{(0.0071)}{0.0041}\ I - \underset{(0.0048)}{0.0009}\ R$$
$$+ \underset{(0.0167)}{0.0179}\ Tt - \underset{(1.8899)}{5.4101^{***}}\ C + \underset{(0.0055)}{0.0104}\ Cp;\ R^2 = 0.8451,\ D.F. = 40 \quad ...(1)$$

$$Wm = 5.8105 - \underset{(0.0007)}{0.0055^{***}}\ L + \underset{(0.0117)}{0.0277^{***}}\ Ns + \underset{(0.1692)}{0.1445}\ Y - \underset{(0.0061)}{0.0032}\ R$$
$$+ \underset{(0.0197)}{0.0290^{*}}\ Tt + \underset{(0.0092)}{0.0082}\ Tp - \underset{(2.0500)}{4.5015^{***}}\ C;\ R^2 = 0.8326,\ D.F. = 40 \quad ...(2)$$

$$Wm = 5.4680 - \underset{(0.0007)}{0.0056^{***}}\ L + \underset{(0.1086)}{0.2998^{***}}\ Y + \underset{(0.0004)}{0.0010^{***}}\ T - \underset{(1.9248)}{3.7590^{**}}\ C$$
$$R^2 = 0.8369,\ D.F. = 43 \quad ...(3)$$

$$Wm = 6.0793 - \underset{(0.0009)}{0.0061^{***}}\ L + \underset{(0.0114)}{0.0307^{***}}\ Ns + \underset{(0.0203)}{0.0203}\ Tt + \underset{(0.0074)}{0.0041}\ Tp$$
$$- \underset{(2.3095)}{5.3901^{**}}\ C + \underset{(0.0058)}{0.0404^{**}}\ Cp;\qquad R^2 = 0.8163,\ D.F. = 41 \quad ...(4)$$

$$Wm = 5.0697 - \underset{(0.0008)}{0.0059^{***}}\ L + \underset{(0.0923)}{0.4309^{***}}\ Y - \underset{(2.6702)}{3.2350}\ C;$$
$$R^2 = 0.8224,\ D.F. = 44 \quad ...(5)$$

Notes:— Figures in parentheses are the standard errors of the coefficients.
*** Significant at 1 per cent level.
** Significant at 5 per cent level.
* Significant at 10 per cent level.

Surplus Labour turns out to be the one variable with highly significant coefficient in each of the five estimated equations; its coefficients varying marginally between —0.0055 and —0.0063. The next variable which has yielded significant coefficients in four of the equations is land concentration ratio; though in two equations it is significant at one per cent and in another two at 5 per cent level. Non-agricultural workers in rural labour force has highly significant coefficients in all the three equations in which it is used. Per hectare yield was used in three equations: in two its coefficients are highly significant. The coefficients for cropping pattern showed significance at 5 per cent level in the two equations in which it was used. Mechanization index has highly significant coefficient in the only equation it was used. With a positive sign, tractors and pumpsets, however, did not yield significant coefficients in the three equations they were used, in which the index of mechanization was not included separately as a variable. Intensity of cropping and irrigation failed to yield significant relationship with the wage rates.

Thus the three factors which emerge as most significantly related with the male wage rate variations are: surplus labour in agriculture, work opportunities in the non-agricultural sector in the rural areas and pattern of land distribution indicated by concentration ratio. The extent of surplus labour and concentration ratio are found to be inversely related with the wage rates while increase in non-agricultural employment tends to raise the wage rates. In equations (3) and (5), where non-agricultural employment is replaced by the yield level in agriculture, the latter is found to be highly significant and positively influencing the wage levels. But when yield is used along with non-agricultural employment as independent variables, it turned out to be non-significant (equation 3). Since both the variables are found to be significantly correlated ($r=+0.62$), yield can be considered as a factor influencing the wage rates to a certain extent.

The influence of supply variables like surplus labour in agriculture and work opportunities in non-agricultural activities which tend to reduce the surplus and, therefore, the supply of labour to agriculture is, however, found to be more consistently significant. Land concentration ratio which is a supply variable to the extent it implies higher proportion of population depending on wage labour and an institutional variable to the extent it makes the bargaining position rather unfavourable for wage earners, is also found to exert strong negative influence on the wage rates. Among the demand variables, per hectare yield is found significant when considered independently of the alternative employment opportunities; cropping pattern defined in a way that relates it definitionally with the demand for labour, is found significant but at 5 per cent level; cropping intensity and irrigation turn out to be non-significant coefficients; and mechanization index yields a significant positive coefficient, though tractors and pumpsets independently fail to show significant relationship with the wage rates. It thus looks that the wage rate variations among districts are predominantly influenced by supply conditions in the market; the extent of labour surplus punctuated by employment opportunities in the non-agricultural sector and the relative bargaining position determined by the pattern of land distribution explain the major part of wage rate variations. In the given supply situation, demand variables have only marginal influence. Even if the demand for labour increases, the existence of surplus labour, non-availability of adequate employment opportunities outside agriculture and lack of bargaining power among workers do not allow a rise in wages.

The estimated regression equation for *female wage rates* are given below:

$$\begin{aligned} Wf = 1.9147 &- \underset{(0.0112)}{0.0331^{***}}\ Lw + \underset{(0.0142)}{0.0428^{***}}\ Ns + \underset{(0.1368)}{0.0608}\ Y + \underset{(0.0082)}{0.0027}\ Cp \\ &+ \underset{(2.8652)}{1.1584}\ C - \underset{(0.0339)}{0.0447^{*}}\ L; \qquad R^2 = 0.7278,\ D.F. = 41 \end{aligned}$$

Notes:— Figures in parentheses are the standard errors of the coefficients.
*** Significant at 1 per cent level.
* Significant at 10 per cent level.

Variations in female wage rates among districts are also found to be predominantly explained by factors affecting labour supply. The two variables that turn out to be highly significant in a six-variable model with 0.73 per cent explanatory power are: number of female workers per 100 hectares and alternative employment opportunities, specified in the same manner as in the equations for male wages. Another variable which yields significant coefficient though at 10 per cent level, is the percentage of agricultural labour in rural population, a factor which also indicates the supply particularly of female labour for the reasons explained earlier. Per hectare yield is not found to be significantly related with female wage rates, and even cropping pattern defined in a way to bring about the demand for female labour directly (percentage of area under paddy) does not show up significant coefficient. In this case, land concentration ratio has also failed to yield significant relationship with the wage rates. Thus it looks that the supply conditions in the labour market have come up more sharply as determinants of wage rates in the case of women workers with demand variables showing no influence whatsoever.

V

CONCLUSION

The present paper sought to analyse the labour market behaviour in the rural areas by identifying the determinants of labour supply and wage rates. Labour supply was identified in terms of female labour force participation rates for the reason that the supply of male labour is not found to vary significantly over space and time. An analysis of wage rates was, however, attempted both for male and female workers separately.

The supply of female labour is primarily determined by certain structural and institutional factors. Areas with larger proportions of agricultural labourers and small holdings tend to reveal a higher proportion of female population in the labour force. While the need to earn a minimum family income, and relative lack of inhibitions in taking up wage labour among the women of landless and small cultivator families account for this tendency, women still continue to be 'secondary' workers in so far as we find that availability of male labour tends to reduce labour force participation of women. So far as the purely economic variable like income is concerned, it is found to have generally a negative influence on the proportion of female workers to female population: at lower income levels the participation rate among women is high, while it declines with an increase in the income levels. The relationship, however, does not appear to be a continuous one across all income levels: it is not found to hold at low levels of productivity and incomes, where besides the structural factors mentioned above, the female wage rate has a negative influence on worker-population ratio among women. It looks that the lower the wage rate for women, more of them are obliged to work to make their contribution to achieve the targeted household income.

The absence of a significant negative relationship between income levels and female participation rate in the low income ranges adds some new insights into the operation of the generally observed 'U'-shaped curve depicting income-female participation rate relationship, without, of course, invalidating it. While the female participation rates can be expected to behave in a pattern to yield a 'U'-shaped curve with a rise in incomes, it would not be logical to expect such shape of the curve right from the origin of the X-axis, that is from zero or very low levels of incomes. There has to be a positive cut-off point depicting a minimum level of income from which the female participation rate (FPR) will start declining over a range of income and later show an increase again at a high level of development and incomes. But what happens in the range below this cut-off point of income ? Our analysis points out that participation rates of women are not influenced by the variations in the income levels below this point. It may remain constant or even rise with the increase in incomes, particularly when a rise in incomes has to be brought about on the basis of larger employment at very low and declining levels of wages. The 'U'-shaped curve, therefore, does not tell the whole truth; it needs to be supplemented by an analysis of FPR behaviour in the conditions where the demand for additional incomes is absolutely inelastic and it cannot be brought about by a marginal rise in per worker productivity and earnings.

On the question of wage determination our analysis clearly brings out the dominant influence of supply factors for both male and female wages. The extent of surplus labour and availability of non-agricultural employment opportunities are found to account for a major part of inter-district variations in the wage rates. In low wage areas, depression in the wage rates that is produced by high labour surplus and lack of employment opportunities outside agriculture is further accentuated by unfavourable bargaining position of wage earners resulting from high land concentration ratio and a large proportion of agricultural labour in the population. In a way, these unfavourable factors exist in the entire rural sector, although to some extent, it may vary from one area to another. That is why significant variations in yield and productivity levels are not accompanied by corresponding variations in the wage rates. In the districts of Uttar Pradesh included in our analysis, the value of output per worker in agriculture varies from Rs. 540 to Rs. 2,752, while the male wage rates vary between Rs. 1.57 and Rs. 4.74 only. A higher productivity thus does not ensure a commensurate increase in the wage rates,[14] due to the given supply conditions and institutional situation.

Our analysis suggests that in order to ensure an increase in the wage rates with rise in productivity, the demand for labour will have to rise high enough to reduce the labour surplus to the minimum. Increase in cropping intensity or use of labour intensive techniques of production may

14. In a time-series analysis also, it has been observed that the changes in productivity have not influenced the real wages. See V. N. Misra and S. B. L. Gupta, "Productivity, Wages and Its Determination in Gujarat Agriculture: An Inter-district Analysis", *Indian Journal of Agricultural Economics*, Vol. XXIX, No. 3, July-September 1974; J. N. Sinha, "Employment and Agriculture in Draft Plan 1978-83", *Economic and Political Weekly*, Vol. XIV, No. 35, September 1979.

bring about such increases in the demand for labour in agriculture, but they would have no impact on the wage rates, even in the face of increase in yield per hectare and per worker, till they are able to raise the demand for labour almost equal to the labour supply in agriculture. This may, however, be a long drawn process; therefore, another factor which is found to have significant positive influence on the wage rates in our analysis, namely, employment opportunities in the non-agricultural sector may prove a potent factor in reducing labour surplus and thus ensuring that wage earners have a share in the productivity gains in agriculture in the none-too-distant future. Further, our analysis also suggests that land reforms ensuring a more equitable distribution of land holdings could also lead to better correspondence between demand factors such as the yield levels, and wage rates,[15] by bringing about a better balance of bargaining powe between the employers and the wage earners.

15. *Cf.* M. R. Rosenzweig, "Rural Wages, Labour Supply, and Land Reform: A Theoretical and Empirical Analysis", *The American Economic Review*, Vol. 68, No. 5, December 1978.