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SPATIAL AND TEMPORAL VARIATIONS IN FACTOR PROPORTIONS, OUTPUT, AND WAGES IN THE AGRICULTURAL SECTOR IN MADHYA PRADESH

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The spatial and temporal pattern of wage rates and wage earnings has attracted some interest of agricultural economists.[1] Opinions on reasons for those differences vary from attributing a dominant role to 'new technology'[2] to collective bargaining power.[3] On the other hand, Schultz[4] has found that "differences in land are least important, differences in quality of material capital are of substantial importance, and differences in the capability of farm people are the most important in explaining the differences in the amount and rate of agricultural production" and consequently we infer labour productivity (wages).

These divergent opinionsupholding 'newtechnology,' 'collective bargaining power,' 'capability of farm people' as the prime determinant of wage income in agriculture lead to varying policy implications. For proper direction to developmental and income policies investigations are called for to evaluate the various factors and determining their relative weights. Any attempt in this direction must find answers to the following questions :

1. What explains the differential wage rates and rates of growth of agricultural wages in different regions ?

2. Has the developmental effort of the past exerted any equilibrating effect leading to elimination of regional differences in wages ?

3. What explains the persistence of low wages in certain regions relative to others ?

1. V. M. Rao, " 'Agricultural Wages in India'—A Reliability Analysis," *Indian Journal of Agricultural Economics*, Vol. XXVII, No. 3, July-September, 1972.
2. S. S. Johl: Gains of Green Revolution (How they have been shared in Punjab), Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, 1973.
3. Pranab Bardhan, "Variations in Agricultural Wages : A Note," *Economic and Political Weekly*, Vol. VIII, No. 21, May 26, 1973.
4. T. W. Schultz : Transforming Traditional Agriculture, New Haven, Yale University Press, 1964, p. 16.

In this paper we examine the spatial and temporal pattern of agricultural wages that prevailed in the different districts of Madhya Pradesh between 1960-61 and 1970-71. An attempt is then made to test whether the wage differences are explained by some structural relationships in the agricultural economy. Finally, with the help of some simplifying assumptions the relationship betwween factor proportions and wage rates are analysed in the context of agricultural development. Wage differences are thus examined through differential resource endowments and their growth rather than through differences in production functions and prices of products of a region.

Spatial Pattern of Agricultural Wages

The most dominant characteristic of the vast expanse of land mass within the political boundaries of Madhya Pradesh is the element of contrasts observable in every economic phenomenon. This is true about agricultural productivity as well as agricultural wages. Thus, the per capita (rural) gross value of agricultural output in the different districts of Madhya Pradesh in 1960-61 varied from a low of Rs. 114.16 in Rewa to a high of Rs. 365.24 in Gwalior. Similarly, the average daily wage rate of a male unskilled agricultural worker in 1960-61 ranged from Re. 0.70 in Mandla to Rs. 2.16 in Bhind. The corresponding values in 1970-71 were Rs. 228.08 in Shahdol and Rs. 947.79 in Indore for agricultural output and Rs. 1.36 in Sidhi and Rs. 3.50 in Mandsaur for agricultural wages.[5]

The spatial distribution of wages in 1960-61 and 1970-71 reveals the following :

1. During 1960-61 the wage rates were lowest (rupee one or less) in the entire Narmada valley and adjoining districts forming a belt moving from south-west in a north-easterly direction along the heart of the State.

2. During 1970-71 the low wage belt moved east-ward penetrating deeper into the rice bowel of Madhya Pradesh.

3. The high wage region lies in the north-west of the State. With the exception of one solitary case, all districts in this region retained their high wage status in 1970-71 also.

Cross-Sectional Analysis

A cross-sectional regression analysis with wages, W, as dependent variable and gross value of agricultural output per capita (rural), Y, and mechanization units[6] per thousand agricultural workers, M, gave the equation :

5. The wage rates and gross value of agricultural output are from the publications of the Directorate of Economics and Statistics, Government of Madhya Pradesh.

6. Mechanization units were derived by combining iron ploughs, bullock-driven cane crusher, power-driven cane crusher, oil engines, electric pumps and tractors in the ratio of 5:5:10:20:20:40. The weighted sum per thousand of agricultural workers was taken as $\frac{C}{L}$

$W = 0.61 + 0.0024Y + 0.0034$ M. Another regression with W as dependent variable and and concentration ratio,[7] C, and size-distance index of urban-industrial complex,[8] I, yielded the equation : $W = 2.12 + 0.005C + .002I$. Although the partial regression coefficients were not found statistically significant yet their signs are of interest for the analysis that follows.

Trends in Money and Real Wages

The spatial pattern based on comparison of money wages at two points in time may conceal more than it reveals. Hence a trend analysis for the different districts was undertaken to demarcate the areas of differential growth rates of agricultural wages. In order to estimate the rates of change in real wages, the money wage rates were deflated by the consumer price index (general) of agricultural workers in Madhya Pradesh.

It was found that the growth of money wages during the period 1964-65 to 1970-71 was positive for all districts except Dewas. They ranged from a low of Re. 0.02 to a high of Re. 0.26. The real wages, on the other hand, show that in 14 out of 43 districts the growth was negative. On the other hand, 29 districts bear positive signs. Based on the 'b' values of real wages the district-classification was as under :

	High	Medium	Low	Nominal
	b=±.06 over	b=±0.03 to .06	b=±.01 to .03	b=±.004 or less
	Number of districts			
Increased	2	8	17	3
Decreased	1	5	5	3

Wages of Agricultural versus Industrial Workers

It is frequently argued that due to unionisation the industrial workers are able to bargain for better wage. A time-trend fitted to the data of annual average wage per worker presented by Basu[9] at 1960 prices for the period 1960-69 gave the equation : $Y = 1255.2 + 2.78X$. But a trend fitted to average daily per capita real earnings of factory workers

7. Concentration ratio, C, is the proxy variable for bargaining power.
$$C = \frac{\text{Percentage of area held in holdings above 50 acres}}{\text{Percentage of number of holdings below 5 acres}}$$
8. Size-distance index of urban-industrial complex, I, was derived as :
$$I = \frac{\text{Workers engaged in factories per thousand of population}}{\text{Length of roads per hundred square kilometer.}} \times 100.$$
9. Sreelekha Basu, "Share of Labour in Manufacturing Industries," *Economic and Political Weekly*, Vol. IX, No. 28, July 13, 1974.

drawing less than Rs. 400 per month in Madhya Pradesh for the period 1961-1970 was : $Y = 4.53 - .06X$. As against this, the trend of daily real wages of agricultural workers for the State as a whole for the period 1965-1971 came to : $Y = 0.99 + 0.004X$. However, none of the regression coefficients was significant.

With such weak evidence, it is not possible to draw any firm conclusions. We may at best state that while the factory wage earners in the country as a whole succeeded in resisting loss in their real earnings, the factory workers in Madhya Pradesh did not. The available evidence on agricultural wages was too weak to sustain or reject the contention that the agricultural workers were worse off due to lack of organized bargaining power. A further probe, is, therefore, called for.

Capital Accumulation, Factor Proportions and Wage Rates

If we assume that all regions produce the same crop or crop-mix with the same production function homogeneous of degree one in capital C, and labour L, then returns to capital and labour are the functions of the capital-labour ratio, $\frac{C}{L}$.

Thus, if $Y = f(C, L)$, then under the conditions assumed: $MPP_C = f\left(\frac{C}{L}\right)$, $MPP_L = f\left(\frac{C}{L}\right)$. If $\frac{C}{L}$ is greater in region A than in region B then: $(MPP_L)\ A > (MPP_L)B$ and $(MPP_C)B > (MPP_C)A$. These differential returns will lead to a two-way inter-regional transfer of resources if capital and labour be mobile. The result will be that low wage areas will experience highest rates of increase in wages as well as highest rates of growth of capital and the ratio of capital to labour, thereby exerting an equalising effect on wages and returns to capital.

To the extent these simplifying assumptions do not hold the results will be vitiated. Thus while inter-regional capital flows in agriculture are less likely to occur labour flows are. Capital accumulation may, however, substitute effectively for capital transfer bringing about the same results. Similarly, the differential rates of growth of population may also affect wage increase through differential impact on supply of labour. Under these situations while capital accumulation may still be faster in low wage areas the increases in wages may not, or conversely, the production function and commodity price differences or differential growth of industrial sector may affect capital accumulation in agriculture and hamper equalisation of factor proportions. Despite these limitations we test the hypothesis : (1) Low wage regions experience the highest rates of growth of wages. (2) Low wage regions exhibit the highest rates of growth of capital and capital-labour ratio.

Statistical Evidence

In order to test these hypotheses we computed wages, capital and capital-labour ratio in all the 43 districts of Madhya Pradesh. Both money and real wages are compared. Growth of capital is represented by the mechanization units discussed earlier, while $\frac{C}{L}$ is the ratio of mechanization units per thousand of total rural workers. The results are presented in Table I.

TABLE I—CLASSIFYING DISTRICTS BY $\frac{C}{L}$ RATIO IN 1960-61 AND WAGE INCREASES IN 1970-71

Index	Mechanization group $\frac{C}{L}$ 1960-61	No. of districts	Average value of $\frac{C}{L}$		Average percentage increase of $\frac{C}{L}$ in 1970-71 over 1960-61	Average daily wage 1960-61	Average daily money wage 1970-71	Average daily real wage 1970-71	Average increase in money wage in 1970-71 over 1960-61
			1960-61	1970-71		(Rs.)	(Rs.)	(Rs.)	(per cent)
I	High over 60 ..	6	225	412	83	1.55	2.63	1.33	85.4
II	Medium 20-60	24	42	306	629	1.21	2.31	1.16	94.5
III	Low less than 20 ..	13	12	52	333	1.14	1.73	0.87	85.7

The table brings out vividly the contrasts obtained in the agricultural economy of Madhya Pradesh with respect to capital-labour ratio. A strong trend towards mechanization is reflected in the percentage increases obtained in the medium and low groups which exhibit 629 and 333 per cent increases during the ten-year period in contrast to the 83 per cent increases obtained in the high group. Despite those increases, the gap between different groups stood as under :

Group	1960-61	1970-71
Between I and II	183	106
Between II and III	30	254
Between I and III	213	360

The gap between the first two categories has clearly been narrowed down considerably, yet that between the first and the third and between the second and the third has been considerably widened. This characteristic of the growth process whereby equalisation and differentiation occur simultanesously is undoubtedly an anomalous phenomenon and probably reveals the structural weakness of lagging regions.

Growth of Agricultural Output Per Capita and Wage Rates

So far we have analysed the wage rates in the context of structural characteristics of agricultural economy of the State. It is of interest to study the growth rates of agricultural wages in relation to the growth of agricultural output. A cross-sectional analysis of wages and agricultural output already presented was found to bear a positive relationship. We now relate the two growth rates. For this purpose a trend analysis of gross agricultural output per capita (rural) for the period 1965-66 to 1970-71 was undertaken for all the 43 districts of Madhya Pradesh. A cross-classification of agricultural wages and agricultural output is presented in Table II.

TABLE II—CLASSIFICATION OF DISTRICTS BY GROWTH RATES OF WAGES AND GROSS AGRICULTURAL OUTPUT

Real wage growth groups 'b' values	No. of districts	Growth of gross agricultural output No. of districts showing			Change in		Average value of concentration ratio
		Negative	Low	High	Real wage (1970-71 over 1964-65) (Rs.)	$\frac{C}{L}$ ratio (1970-71 over 1960-61) (Rs.)	1970-71
			Below State average	Above State average			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I Negative	14	—	10	4	—0.18	141	.43
II .001 to .03	20	3	8	9	0.07	168	.47
III over .03	9	4	2	3	0.21	139	.37
Total	43	7	20	16	—	—	—

The table reveals that although positive growth of wages was related to positive growth of output in 22 districts, yet the negative growth in wages was not associated with negative output growth. Out of 36 districts showing positive output growth, as many as 14 districts showed negative growth in wages. These findings based on time-series analysis lend support to the cross-sectional analysis presented earlier that the agricultural output growth and agricultural wages in general bear a positive but weak relationship.

Relating column 6 with column 7 we find that slow rates of growth of wages are related with higher increases in $\frac{C}{L}$ ratio. The districts showing highest wage growth gave the smallest figure of $\frac{C}{L}$ ratio. The hypothesis that highest increases in capital-labour ratio are associated with the low wage areas is thus reinforced.

The hypothesis that a lower bargaining power as reflected by land concentration ratio[10] exerts a dampening effect on wages or growth of real wages is supported by column 8. The low concentration ratio was associated with high increase in real wages and the highest rate of growth of real wages. Higher concentration ratios were found associated with lower growth rates of wages.

Our findings clearly establish the hypothesis that low wage areas have experienced the highest rates of growth of wages and that barring a few exceptions they have also experienced higher rates of growth of capital accumulation relative to labour. The anomalous phenomenon of the growth process with respect to lagging regions has already been pointed out. A possible explanation might be that in those areas the marginal efficiency of investment is influenced by the price of crops produced in the region and by their production functions.

FACTORS DETERMINING AGRICULTURAL WAGES —A CASE STUDY

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A study of regional variation in agricultural wage rates and the factors accountable for it is of particular interest for policy formulation. Agricultural wages are high in some regions and low in others. These differences are associated with a number of factors. The present study is concerned with the analysis of the variation in agricultural wage rates between 16 villages in four districts of Bihar in terms of variation in certain factors affecting wages.

II

The factors influencing wages may be both on the demand side and supply side. The factors which can raise the demand for labour must push up the

10. A caution is warranted in the interpretation of concentration ratio. A high value of C may result from a high value of numerator for a given value of denominator or a low value of denominator for a given value of numerator. Different interpretation is suggested for the latter case.
Space restricts presentation of wage rates for increasing values of numerator holding the denominator constant at different levels. For the same reason districtwise results could not be appended.