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SHORT-DISTANCE RURAL-RURAL MIGRATION OF WORKERS IN WEST BENGAL : A CASE STUDY OF BARDHAMAN DISTRICT

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This paper investigates the correlates of migration of the workers in the rural area of Bardhaman District of West Bengal from the rural areas of other districts of the state using a dynamic panel data model during the post "economic reform" era when rapid changes in Government's policies pertaining to trade, foreign investment, exchange rate, industry, fiscal affairs etc.have taken place. A neo-classical gross migration function is estimated using migration as dependent variable and distances from the source districts, differentials of wage rates, percentage share of agricultural workers in rural workers and Gini coefficients of inequality in operational land-holding as independent variables. Our dynamic panel model explains a significant proportion of the rural-rural migration and it is found that distances from the source districts, differentials of percentage share of agricultural workers in rural workers and differentials of wage rates are the most significant explanatory factors.

Keywords : Rural-Rural Migration; Dynamic Panel Model; Neo-Classical Migration Function.

I. INTRODUCTION

Ravenstein assumed migration as a result of individual utility maximization subject to the budget constraint. This is basically the Neoclassical Theory of Migration where an individual seeks to maximize his income moving to places where wages are higher due to several reasons. An important extension of this theory was presented by Todaro (1969) and Harris and Todaro (1970) in terms of their two-sector model where they relaxed the assumption of full-employment in the labour market and introduced the probability function of getting employment in the destination area, within the utility function. In their model, migration was assumed to be the function of expected rather than actual wage-differential. Most of the studies in 70's, following this neo-classical model, came to the conclusion that people migrate primarily for economic reasons, i.e. to enjoy greater economic opportunities in the destination regions. In addition to this primary economic motive, people migrate for better education, to enjoy social and cultural freedom in destination areas, to escape from violence and political instability of the source regions and to join already migrated friends and family members. Internal migration was viewed as a socially beneficent process in 1960's. According to Elkan (1960, 1967) seasonal migrants were able to supplement their incomes by short-term circular migration in accordance with seasonal variations in labour requirements. In this way short-term imbalances of real wages between two locations were adjusted and balance was restored by raising rural average incomes and lowering urban incomes. On the other hand in 1970's internal migration had been viewed quite negatively. Sabot (1975b) described rural-urban migration as the cause of rising level of urban unemployment. Lipton(1976), Connell et al (1975) and Schultz (1976) had concluded that although individual migrant behave according to private rationality, on the aggregative level, internal migration adversely affects the welfare of the source (primarily rural) areas. Harris and Sabot (1976) and Todaro (1976a) concluded that internal migration contributes very little to the expansion of social welfare of the destination (primarily urban) area.

Following the assumptions of the Neo-classical model of migration a number of Econometric studies have been done between 1960's and 1970's to examine the determinants and effects of internal migration in different countries. Among these studies, most important are Beals, Levy and Moses (1967, Ghana),

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Huntington (1974, Kenya), Barnum and Sabot (1975, Tanzania), Schultz (1971, Colombia), Sahota (1968, Brazil), Levy and Wadycki (1972a, 1973, and 1974a, Venezuela), Knowles and Anker (1975, Kenya), Hay (1974, Tunisia), Falaris (1976, Peru) etc. in Latin America and Greenwood (1969, Egypt) in Middle East and Greenwood (1971a, India) in Asia. All of them were cross-sectional studies although Barnum and Sabot used both cross-section and time-series data. Most of these studies were done on the basis of macro migration function.

Under this backdrop, this paper tries to find out the proximate explanatory factors behind such process of migration by considering the agriculturally prosperous district, 'Bardhaman', in West Bengal as destination district. We have applied a neo-classical migration function theory and tried to estimate the migration function for the period since the inception of the policies of economic reform in terms of a dynamic panel data approach. This paper is structured as follows. Section II explains the methodology and data; section III presents a brief review of literature; section IV presents the econometric model; section V presents the analytical results of the study and finally section VI gives the concluding observations

RURAL-RURAL MIGRATION IN BARDHAMAN DISTRICT

The Bardhaman district of West Bengal is predominantly an agro-based district such that a vast majority of workers of the district depends on agriculture as source of their livelihood. However the proportion of total rural population engaged in agriculture in this district has fallen from 72.45% in 1991 to 62.38% in 2001 **(see Table-1)**. Rice is the dominant crop in the agricultural operation and among the various varieties of rice cultivation of Boro rice constitutes a majority proportion of the gross cropped area. Interestingly with the introduction of modern seed fertilizer technology since mid sixties, the relative share of Boro rice in the net cultivated area has increased tremendously **(see Table-2).** With the use of quick maturing HYV seeds as a part of the package of new modern seed fertilizer technology the district has also experienced a tremendous increase in the cropping intensity **(see Table-3).**

Table-1: Percentage of Workers Engaged in Agricultural Activities to Total Workers in Bardhaman

		1991			2001	
Residence	Persons	Male	Female	Persons	Male	Female
Total	53.03	50.49	68.73	44.48	43.12	49.53
Rural	72.45	71.22	78.65	62.38	63.3	59.56
Urban	9.46	8.35	22.32	5.25	4.61	9.42

Source: Census of India 1991 & 2001, Government of India.

Table-2: Area Under Principal Crops as a Percentage of Net Cultivated Area in the District of Bardhaman

Crop	1960-61	1965-66	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-2001
Boro Paddy	0.48	0.59	6.82	16.6	19.93	21.07	25.83	37.99	46.03
Wheat	0.5	0.77	5.68	7.98	2.21	2.1	0.59	0.88	1.32
Jute	1.37	1.99	2.81	1.89	3.67	4.32	2.98	2.19	2.2
Potato	2.27	3.29	3.2	4.58	5.2	5.9	8.26	50.46	8.82
Total Pulses	9.84	6.47	6.3	6.98	3.61	2.85	0.61	0.34	1.13
Rape and Mustard	0.44	0.51	0.75	0.62	4.31	7.61	11.39	7.06	10.32

Source: Statistical Abstract, Bureau of Applied Economics & Statistics, Government of West Bengal, various years.

Table-3: Cropping Intensity of Bardhaman Compared to that of West Bengal

Year	Bardhaman	West Bengal
1980-81	145	139
1985-86	153	147
1990-91	162	159
1995-96	166	164
1996-97	171	165
1997-98	178	169
1998-99	189	171
1999-00	191	174
2000-01	165	168

Source: Statistical Abstract, Bureau of Applied Economics & Statistics, Government of West Bengal, various years.

This has also led to increase in total productivity per unit of land thereby placing the district in a most prominent and conspicuous position. As a fallout the district has experienced a tremendous increase in the demand for labour which could not be met out of its own supply of agricultural labourers. Consequent on this the district has got to depend on migrant labour-force from other districts. Parallely it has been found that workforce participation rate of the agricultural workers in the rural area of Bardhaman district has remained more or less stagnant **(see Table-4)**.

Table-4: Workforce Participation Rate of Agricultural Workers in the Rural Area of the District of Bardhaman

Year	Work Participation Rate
1991	23.67
1992	23.68
1993	23.71
1994	23.74
1995	23.78
1996	23.83
1997	23.89
1998	23.95
1999	24.03
2000	24.11
2001	24.19

Source: Census of India 1991 & 2001

Consequently the agricultural operation in the district has got to be increasingly dependent on the migrant workers. On the other hand, as an outcome of the rigorous land-grab movement of the pro-poor

Left Front Government and also of the patrilineal property relations, not only the district of Bardhaman but also all the districts of the state have experienced increased marginalization which has led to the overwhelming dominance of marginal farms (about 88%) in the agricultural sector. Actually it is found that since 1970s agricultural workers in the district were no more interested to do the manual works in the cultivation process. They preferred to spend more time out of the agricultural works and started searching urban white-collared jobs for themselves and their children. They would rather prefer to hire migrant workers for cultivation as this was now affordable for them **(Rogaly et al, 2001)**. So in short, the agricultural sector fostered the demand for labour, which in turn, induced the migration of agricultural workers in the rural areas of Bardhaman. Workers mainly come from those districts where inequality in the distribution of land is higher. In these districts those who are relatively poorer feel more deprived than those districts where almost all are poor. The feeling of relative deprivation induces poorer people to migrate for agricultural work in Bardhaman. Kishak Sabha, the CPI (M) led organization made up of smallholder cultivators and agricultural workers has almost closed the gap between male and female agricultural wages in Bardhaman and ensured steady increases in monetary wage rate over the time. **(Rogaly et al, 2001).** These changes created favourable situation for the migrant agricultural workers in Bardhaman. Non-availability of agricultural work throughout the year due to overcrowding in the agricultural sector in the source districts is another reason of migration. The higher the percentage of rural people engaged in agriculture in a district the higher will be the chance of finding no job, at least, for some months in a year and therefore higher will be the probability of these surplus workers to migrate for agricultural work in Bardhaman for supplementing their subsistence. Distance is an important factor in the migration process. Most of the migrants in Bardhaman come from nearby districts like Hooghly, Bankura, Nadia, Birbhum, Murshidabad etc. as the cost of travel is low and the migrants are familiar with the employers, the culture and the eating habits of Bardhaman district.

METHODOLOGY AND DATA

We consider the neo-classical macro migration function as:

$$\frac{M_{ij}}{P_i} = f\,(Y_i, Y_j; U_i, U_j, Z_i, Z_j, d_{ij}, C_{ij}), \qquad (1)$$

$i = 1, \ldots\ldots\ldots\ldots, n$

$j = 1, \ldots\ldots\ldots\ldots, n$

where,

$\frac{M_{ij}}{P_i}$ = rate of migration from i to j expressed in terms of the population (P) in i,

Y = wage or income levels,

U = unemployment rates,

Z = Degree of urbanization,

d_{ij} = Distance between i and j, and

C_{ij} = Friends and relatives of residents of i in the destination j.

Following this form of macro migration function we write the macro migration function of our analysis as

$$RRM_{ij} = f\,(D_{ij}, W_j, W_i, AW_i, AW_j, INQ_i, INQ_j) \qquad (2)$$

i = source district

j= destination district

where,

RRM_{ij} = rate of rural-rural migration of workers from the source district (i) to the destination district (j)

= Migrant workers from rural areas of the source district to rural areas of the destination district (M_{ij}) / Number of rural population of the source district (P_i)

D_{ij} = railway distance in Km. from the headquarters of the destination district to the headquarters of the source district.

W_i, W_j = combined average daily wage rate of agricultural field labourers of the ith and jth district.

AW_i, AW_j = percentage share of agricultural workers (cultivators + agricultural labourers) in total rural workers of the ith and jth district.

INQ_i, INQ_j = Gini Coefficient of inequality in operational land-holding for the ith and jth district.

The linear relationship between RRM_{ij} and the independent variables may be inappropriate and nonlinearities may well be expected in this relationship given the complexities of the real world. Therefore we consider the above general form of the migration function in Cobb-Douglas form.

$$\boldsymbol{RRM_{ij} = b_0\, D_{ij}^{\,b_1}\, W_{ji}^{\,b_2}\, AW_{ij}^{\,b_3}\, INQ_{ij}^{\,b_4}\, e^{\varepsilon_i}} \qquad \textbf{(3)}$$

where,

$$RRM_{ij} = \frac{M_{ij}}{P_i}, \quad W_{ji} = \frac{W_j}{W_i}, \quad AW_{ij} = \frac{AW_i}{AW_j}, \quad INQ_{ij} = \frac{INQ_i}{INQ_j}$$

ε_i is the stochastic error term and b_1 , b_2 , b_3 , b_4 are the constant elasticities of the rate of rural-rural migration with respect to the explanatory variables.

This study is exclusively based on the district-level secondary data which are available from various issues of Census Report of Government of India, the District Statistical Handbooks and the Statistical Abstracts of Government of West Bengal. The data of railway distance between district headquarters are calculated from the given information of railway distance in kilometers from the timetable of Eastern Railway of India.

Migration data for West Bengal of 1991 and 2001, employed in this study have been extracted from Census of India, 1991 and 2001. Census of India 1991 and 2001 collected district level migration details for each individual by place of birth and place of enumeration. In this analysis, firstly, we find out all migrants enumerated in the rural areas of Bardhaman district who were born in rural areas of other districts of West Bengal. But these are the number of all migrants, among whom, some may not be workers and may have migrated for any other purpose. Now since we are interested only in migrant workers, the data for which are not directly available from census reports we find out the number of migrant workers by using the following method.

Let P_{i0} = number of rural population of ith district in 1991

P_{in} = number of rural population of ith district in 2001

Both of these numbers can be found out the Census reports of 1991 and 2001.

Secondly, we find out the exponential growth rate (x) of rural population during this period by using the formula, $P_{in} = P_{i0}x^n$ therefore, $x = \left(\frac{P_{in}}{P_{i0}}\right)^{\frac{1}{n}}$, where, n= 10.

Now, we assume that the growth rate of population is equal to the growth rate of workers. Using this rate of growth we find out the estimated number of rural workers of ith district (W_{in}) in 2001, where W_{i0}= number of rural workers of ith district in 1991, which is available in the census report of 1991.

Finally we find out the estimated number of migrant rural workers of ith district as the difference between the actual number of rural workers of ith district in 2001 and the estimated number of rural workers of ith district in 2001. We then compare this figure with the number of total-rural migrants given in the census report of 2001. Say, r % of the census figure of total-rural migrants is our estimated number of total-rural migrant workers. We then use this percentage to find out the estimated rural-rural migrant workers of each district as r% of the rural-rural migrants given in the Census report. Now assuming that growth rate of migrant workers is equal to the growth rate of rural workers we compute the estimated number of total-rural migrant workers of each district in 1991. We then compare this figure with the number of total-rural migrants given in the census report of 1991. Say, s % of the census figure of total-rural migrants is our estimated number of total-rural migrant workers. We then use this formula to find out the estimated rural-rural migrant workers of each district as s % of the rural-rural migrants given in the Census report.

We also calculate the estimated number of rural-rural migrant workers for the years in between 1991 and 2001, using the exponential growth rate formula, namely, $M_{in} = M_{i0}\,\rho^n$ and therefore, $\rho = \left(\frac{M_{in}}{M_{i0}}\right)^{\frac{1}{n}}$, where, M_{in}= Estimated number of rural-rural migrant workers of ith district in 2001, M_{i0}= Estimated number of rural-rural migrant workers of ith district in 1991, n = 10 and ρ = exponential growth rate of rural-rural migrant workers. Number of rural-rural migrant workers for each source district in a particular year is then divided by total number of rural population of that source district for the respective year to obtain the proportion of the migrant workers who migrated from the rural areas of that source district to the rural areas of Bardhaman in that particular year.

Data for Average daily wage rates of male and female agricultural field labourers of different districts of West Bengal from 1991 to 2001 have been extracted from the publications of the Department of Agriculture, Government of West Bengal. Since the data for three cases of wage rate of male agricultural field labourers are missing we have used either interpolated and or extrapolated data for those cases.[1] The data for three cases of wage rate of female agricultural field labourers are also not available and we have calculated these figures by using the ratio of male and female wage rates of the previous or next year.[2] Wage rates have been deflated by the Consumer Price Index Number for Agricultural Labourers on Base Year 1960-61=100 (Agricultural Year Average Indices :Labour Bureau, Ministry of Labour, Govt. of India). We have calculated the combined average daily wage rate of agricultural workers for each district in the following method:

[1] Wage rates of male agricultural field labourers of Darjeeling and Jalpaiguri in the year 1991 have been calculated using the method of linear extrapolation and the wage rates of all districts in 1993 and of Hooghly in 1996 have been calculated using the method of linear interpolation.

[2] Wage rates of female agricultural field labourers in the year 1991(for Darjeeling and Jalpaiguri), 1992 (for Darjeeling and Murshidabad) ,1993 (for Darjeeling, Jalpaiguri and Murshidabad) have been calculated according to the ratio of male and female wage rates of 1994 and similarly, wage rate of female agricultural field labourers in the year 1996 (for Jalpaiguri and Hooghly) and 1999 (for Bankura) have been calculated according to the ratio of male and female wage rates of 1995 and 1998, respectively. Wage rates of female agricultural field labourers in the year 2000 (for all districts) and 2001 (for all districts) have been calculated according to the ratio of male and female wage rates of 1999.

$$W = \left(\frac{AL_M}{AL}\right)W_M + \left(\frac{AL_F}{AL}\right)W_F$$

where,

$AL - AL_M + AL_F$

W = Combined average daily wage rate of agricultural field labourers

W_M = Average daily wage rate of male agricultural field labourers

W_F = Average daily wage rate of female agricultural field labourers

AL = Agricultural labourers

AL_M = Male Agricultural labourers

AL_F = Female Agricultural labourers

Data for agricultural workers and rural workers of each district in 1991 and 2001 have been taken from the census reports of 1991 and 2001.Agricultural workers and rural workers of each district for the years in between 1991 and 2001 have been calculated by exponential growth method, using the formulae,

$AW_{in} = AW_{i0}\,\alpha^n$, therefore, $\alpha = \left(\frac{AW_{in}}{AW_{i0}}\right)^{\frac{1}{n}}$ where, AW_{in}= number of agricultural workers of ith district in 2001, AW_{i0}= number of agricultural workers of ith district in 1991, n = 10 and α = exponential growth rate of agricultural workers and $RW_{in} = RW_{i0}\,\beta^n$ therefore, $\beta = \left(\frac{RW_{in}}{RW_{i0}}\right)^{\frac{1}{n}}$ where, RW_{in}= number of rural workers of ith district in 2001, RW_{i0}= number of rural workers of ith district in 1991, n = 10 and β = exponential growth rate of rural workers.

Then we have calculated percentage share of agricultural workers in rural workers from 1991 to 2001.

In order to calculate Gini Coefficient of operational landholding for the districts, data for operational handholding of 1991, 1996 and 2001 have been collected from District statistical handbooks of West Bengal for different years. The data for the intermediate years which are not available, have been calculated using the method of linear interpolation.

Distances between district headquarters are calculated from the given information of railway distance in Kilometers from timetable of Eastern Railway.

The rate of migration of rural workers from each source district to Bardhaman from 1991 to 2001 is assumed to be the dependent variable. We also assume that most proximate explanatory factors behind the cross-district migration of agricultural workers are: distance from the source district to Bardhaman district, agricultural wage-differential between the rural areas of Bardhaman and the respective source district, difference between the percentage share of agricultural workers in rural workers of the source district and that of Bardhaman and difference between Gini Coefficient of inequality of operational land-holding of the source district and that of Bardhaman district. The economic logic behind the inclusion of the abovementioned factors as explanatory ones is as follows:

Firstly, distance has been introduced as an explanatory factor in macro migration function in almost all empirical studies related to migration. Distance can be used as a proxy variable for pecuniary costs of migration and non-pecuniary costs of new area far from home and family (Banerjee and Kanbur, 1981).

Therefore we include distance from the source district to Bardhaman district as an explanatory variable.

Secondly, agricultural wage-differential is taken as a pull factor. We assume that the workers migrate to the rural areas of Bardhaman mainly for economic purpose, i.e. the greater the difference in agricultural wage rates between the rural areas of Bardhaman and the respective source districts, the greater will be the flow of migrants from the source districts to the rural areas of Bardhaman.

Thirdly, percentage share of agricultural workers in rural workers in a district shows how much crowded the agricultural sector of that district is. If it is high then the agricultural sector is overcrowded there and there are chances that the surplus workers will not find job at least for some months in a year and will have to migrate to other districts in search of work in those months of every year. Therefore, the difference between the percentage share of agricultural workers in rural workers in the source district and that in Bardhaman has been taken as a push factor.

Fourthly, relative deprivation is assumed to be an important push factor of migration in theoretical literature. If inequality is higher in source districts compared to that in Bardhaman, poorer people in source districts will feel relatively more deprived and will try to improve their situations by earning some more money from the agricultural works in Bardhaman. So we have introduced the difference between Gini Coefficients of inequality of operational land-holding between the source district and Bardhaman district as an explanatory factor.

ECONOMETRIC MODEL

To estimate the macro migration function of equation (3) quantitatively we have applied the Fixed Effect Vector Decomposition econometric model (Plümper and Troeger (2007)). The logic behind the use of this model can be given as follows. Actually in our study, the rural-rural migrant workers mean the flow of workers from rural areas of different districts of West Bengal to the rural area of Bardhaman district during the period under consideration. So one may find various dimensions of such migrants. Firstly, movement from the district of birth to the district of enumeration implies spatial dimension which obviously involves some motivations vis-à-vis some explanatory factors. Secondly, continuous flow of migration to certain district from certain districts over a period of time can affect the spatial distribution of people and economic, social and environmental structure of all the districts. This is the temporal dimension of migration. (Ivan Etzo, 2008). Therefore, in this study, the most suitable technique of analysis would be one which would take care of both the spatial and the temporal dimension of migration. Panel data regression model takes care of both of these dimensions, i.e., both the cross-time and cross-section effects. The model also takes care of the omitted variables and individual heterogeneity (Baltagi, 2001; Wooldridge, 2002). Actually in Panel data analysis there are two main techniques: the Fixed Effect Model and the Random Effect Model. The choice between the Fixed Effect Model and the Random Effect Model depends on the particular structure of the dataset. Here in our study we use the Fixed Effect Vector Decomposition econometric model as the Fixed Effect model fails to estimate the time-invariant and the slowly changing variables whereas in the Random Effect model although it is possible to capture the region-specific effect but the model treats the unit effect as random and thus includes it in the composite error term, $v_{it} = u_i + \varepsilon_i$ (Plümper, Thomas; Troeger, 2007). In migration analysis a time-invariant variable like distance plays an important part and most of the other independent variables change slowly or rarely over time. However, variables that have different variability structures affect the decision of migration differently. Variables with high cross-sectional variability are more likely to affect the decision of where to migrate. On the other hand, variables with high longitudinal variability are more likely to affect the decision of whether to migrate or not. In this way, variability structure of independent variables determines the intensity and direction of migration. Therefore, it is important to use the most appropriate technique that takes into account both type of variability structure. .Fixed Effect Vector Decomposition (FEVD) model allows the time-invariant and rarely-changing variables using a Fixed Effect Method. (Ivan Etzo, 2008). The details of the structure of the model used in our study are given in Appendix-I.

ANALYTICAL RESULTS OF THE RURAL-RURAL MIGRATION

In 1991 Hooghly, Birbhum, Bankura, Nadia and Murshidabad were the top five source districts from where the maximum number of migrant workers came to the rural areas of Bardhaman for agricultural work. In 2001 also these districts retained their positions. In terms of compound growth rate of migration of workers Hooghly, Birbhum, Bankura, Nadia and Murshidabad were in fourth, sixth, fifth, tenth and seventh positions respectively. Therefore, it can be concluded that the number of migrant workers from these five districts were maximum throughout the time period and the number increased moderately over the years. On the other hand, Maldah, South 24 Parganas and Purulia were in thirteenth, eleventh and sixth position respectively in terms of absolute number of migrant workers coming to Bardhaman in 1991. Maldah and South 24 Parganas climbed up to eleventh and ninth position respectively while Purulia retained its sixth position in 2001. In terms of compound growth rate of migration of workers in Bardhaman throughout the period, Maldah, South 24 Parganas and Purulia were in top three positions **(see Table-6).**

Table-6: Compound Growth Rate of Rural-Rural Migration to Bardhaman During 1991 to 2001

Source District	Rural-rural migration of workers to Bardhaman in 1991*	Rural-rural migration of workers to Bardhaman 2001*	Compound growth rate of migration of workers (% per annum) to Bardhaman
Darjeeling	129(15)	114(15)	0.98771(11)
Jalpaiguri	247(14)	243(14)	0.99837(9)
Coochbihar	893(12)	417(13)	0.92668(14)
Dinajpur	2116(10)	928(12)	0.92088(15)
Maldah	752(13)	1251(11)	1.05221(1)
Murshidabad	23153(5)	24724(5)	1.00659(7)
Birbhum	44485(2)	48979(2)	1.00967(6)
Nadia	29641(4)	28053(4)	0.99451(10)
North 24 Parganas	5019(7)	4285(7)	0.98431(12)
Hooghly	49844(1)	60740(1)	1.01997(4)
Bankura	32003(3)	37281(3)	1.01538(5)
Purulia	11600(6)	17439(6)	1.04161(3)
Medinipur	3209(8)	3274(8)	1.00201(8)
Howrah	2680(9)	2020(10)	0.97212(13)
South 24 Parganas	2010(11)	3162(9)	1.04635(2)

Figures in brackets are Ranks of the respective districts.

*The estimated number of migrant workers has been calculated using the exponential growth rate formula shown in the section II.

Figure-1

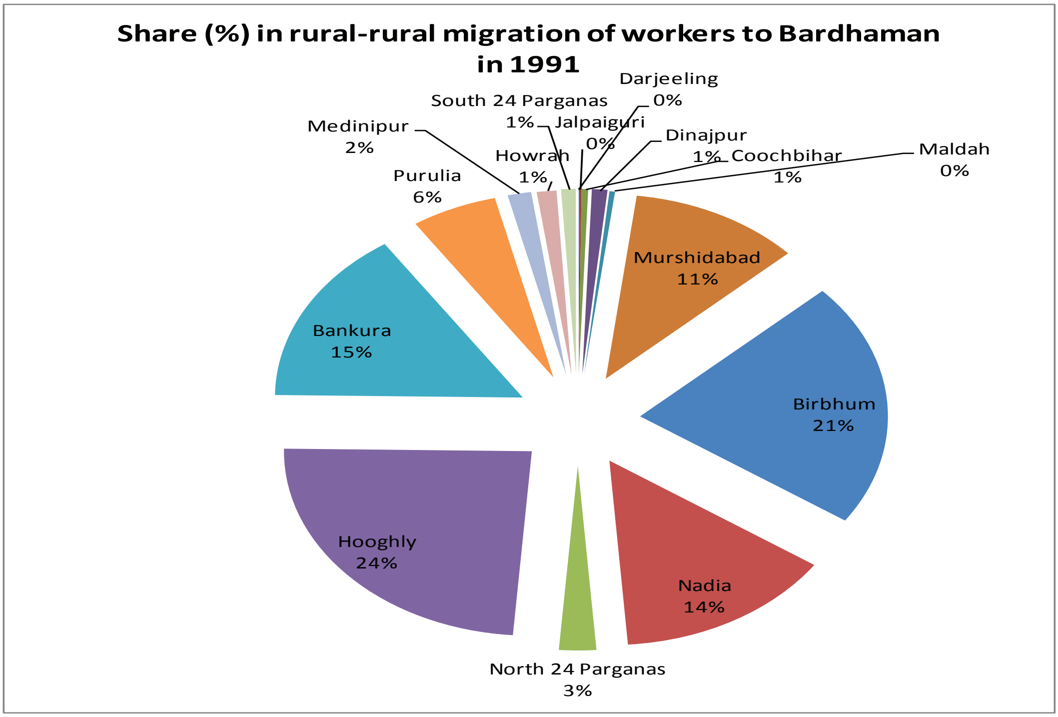
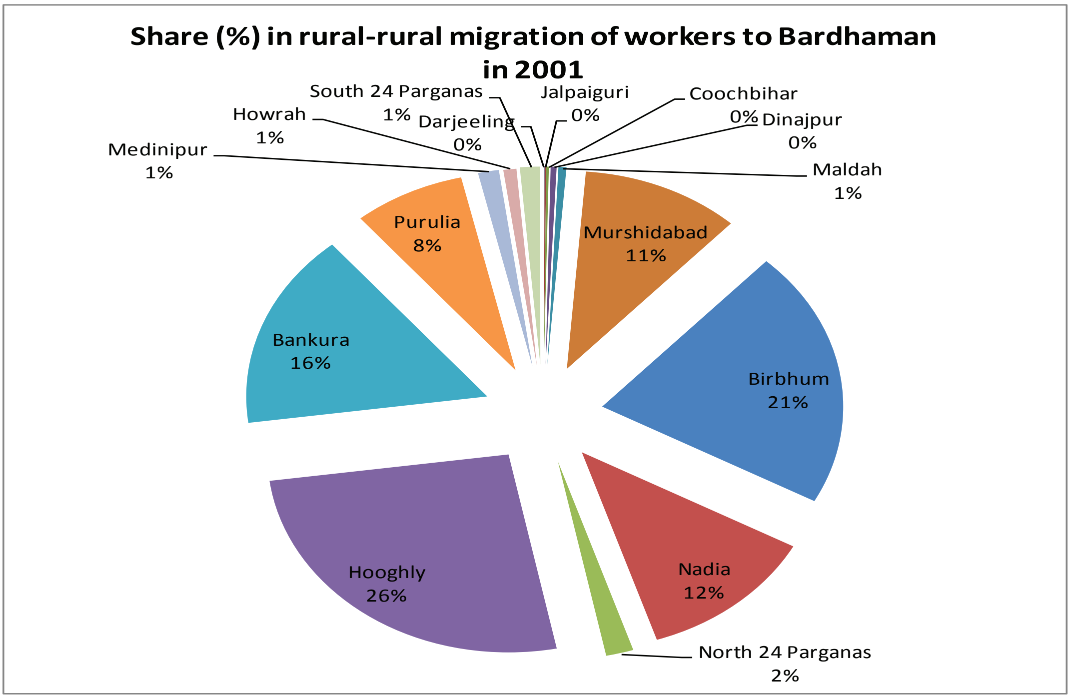


Figure-2



Therefore, it can be concluded that although the number of migrant workers from these three districts were not very high in 1991 but over time number of migrant workers increased considerably. Shares of the districts in total cross-district rural-rural migration of workers to Bardhaman district in 1991 and 2001 are shown in **Figure-1** and **Figure-2**.

The results of our analysis are presented in Appendix-II.[3]

From the results of the analysis we see that the coefficient of the distance variable 1n (D_{ij}) is highly significant and has negative sign. This result is same as that of almost all the other migration studies[4]. Distance here is a significant intervening obstacle.

Wage-differential variable 1n(W_{jit}) has highly significant positive coefficient. Wage-differential is a pull factor. The workers migrate in rural areas of Bardhaman mainly for economic purpose, i.e. the greater the difference in agricultural wage rates between the rural areas of the destination districts and that of

Bardhaman, the greater will be the flow of migrants from the rural areas of the source districts to that of Bardhaman.

1n(AW_{ijt}) has positive and highly significant coefficient. This positive sign indicates that if the percentage share of agricultural workers in rural workers is higher in the source district compared to that of Bardhaman then agricultural workers will migrate to Bardhaman in search of work. This implies that non- availability of agricultural work due to overcrowding in the agricultural sector in the source districts is a significant reason of migration. The higher the percentage of rural people engaged in agriculture in a district the higher will be the chance of finding no job, at least, for some months in a year and therefore higher will be the probability of these surplus workers to migrate to Bardhaman for agricultural work for supplementing their livelihood in those months of each year.

The coefficient of 1n(INQ_{ijt}) is significantly different from zero and it has positive sign, which confirms that relative deprivation induces migration. Here inequality is playing the role of a push factor. It seems that high inequality of operational land-holding in the rural areas of the source district makes the poor workers relatively more deprived than those of Bardhaman and therefore the rural workers of the source district migrate to the rural areas of Bardhaman district in search of agricultural work.

CONCLUDING OBSERVATIONS

This paper examines the main explanatory factors of rural-rural migration of workers from 15 source districts of West Bengal to Bardhaman district over the period 1991-2001 on the basis of the secondary data available from various Census reports and the estimated values of the relevant variables by using a panel data approach. A neo-classical gross migration function is estimated using migration as dependent variable and distances from the source districts, differentials of wage rates, percentage share of agricultural workers in rural workers and Gini coefficients of inequality in operational land-holding as independent variables. Because of the limitations of the applicability of the Fixed Effect and the Random Effect model, we have applied the Fixed Effect Vector Decomposition model for our empirical estimation. The estimation of the model shows that all of the four explanatory factors play significant role in explaining the cross-time and cross-district rural-rural migration process. It is found that the distance variable, the differentials of the percentage shares of agricultural workers in rural workers in source district and destination district are the most significant explanatory factors. Most of the migrant workers come to Bardhaman from nearby districts and it seems that one of the most important causes of their migration is the inadequacy of the employment opportunities in agricultural operation throughout the whole year in the home districts. Relative deprivation

[3] Regression analysis has been done in LIMDEP (version 7.0) software programme.

[4] Inter-state rural-urban migration studies done on the basis of macro migration functions.

due to unequal distribution of land and higher agricultural wage in Bardhaman are found to be the other two most significant explanatory factors behind such migration.

The policy implication, which emerges from our study, can be outlined as follows. First it seems that, the differences in agricultural wages across the districts should be reduced which would automatically reduce the rate of rural-rural migration. However, it is worthmentioning that under the ruling of the left-front government in West Bengal the bargaining power of the rural workers has increased. So the cross-district wage-differential has also reduced to some extent. Secondly, inequality in the distribution of land-holding should be reduced. This will reduce the relative deprivation and thereby reduce rural-rural migration. However, it is worthmentioning that the state government has achieved phenomenal success in redistributing land and in recording and protecting sharecroppers' or *Bargadars'* rights since 1979. The same redistributive policy should be continued more intensely. Finally, the lack of employment opportunity in the source districts seems to be most important explanatory factor in inducing rural-rural migration. Therefore, more emphasis should be given towards the creation of non-farm employment opportunity in source districts so that people can supplement their income from non-farm jobs during lean season of agricultural operation.

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APPENDIX-I

Fixed Effect Vector Decomposition (FEVD) model is a three-step procedure to estimate the coefficients of the time-invariant variables and rarely changing variables efficiently in a panel data model with unit effects. The FEVD procedure combines a quasi-OLS estimate of time-invariant and slowly changing variables and a quasi-Fixed Effect estimate of the time-varying variables. In this model one has to run a Fixed Effect Model in the stage-1, regress the vector of unit effects on a set of time-invariant variables and rarely changing variables in the stage-2 and finally rerun the first stage model as pooled OLS including the time-invariant variables, rarely changing variables and the unexplained variance of the stage-2 in stage -3. Before starting the analysis we have to choose the time-invariant variables, the quasi-time invariant (or rarely changing) variables and the time-varying variables in our model. According to Plümper and Troeger, the efficient choice of an estimator to be a Fixed Effect or a FEVD one depends crucially on the ratio of between-variance (variance across the units) and the within-variance (variance over time) and on the level of within-variation. They have proved that FEVD estimator is better than the Fixed Effect estimator in situations where the within variation of the explanatory variable is very small and the ratio of between-variation to within-variation exceeds approximately 2.

Firstly, we transform equation (3) into a log-linear form of regression equation at period t.

$$\mathbf{1n}\ (RRM_{ijt}) = \mathbf{1n}\ b_0 + b_1\ \mathbf{1n}\ (D_{ij}) + b_2\ \mathbf{1n}\ (W_{jit}) + b_3\ \mathbf{1n}\ (AW_{ijt}) + b_4\ \mathbf{1n}\ (INQ_{ijt}) + u_i + \varepsilon_t \quad \mathbf{(4)}$$

where, ε_{it} stands for normally distributed error component, i.e.

$\varepsilon_{it} \sim N(0, \sigma^2 I)$.

Here, i = 1, 2, 3, ………., 15 refers to the individual source districts, j refers to the destination district, t = 1, 2, 3, ………., 11 refers to the time period, u_i is the unobserved unit effect which captures all the unobserved characteristics that vary between individual source districts but are constant over time. In this cross-district migration context, the term u_i may capture different district-level propensities to migrate which are related to the culture of the district or other characteristics like those related to environmental aspects.

In this model, 1n (D_{ij}) or the log of distance is the time-invariant variable, as we see that it's within variation is zero. We consider 1n (AW_{ijt}) and 1n (INQ_{ijt}) as quasi-time invariant variables as the values of the ratios of between-standard deviation (standard deviation across the units) and the within-standard deviation (standard deviation over time) for these variables are large. 1n (W_{jit}) is considered as the only time-varying variable in this model as the value of the ratio of between-standard deviation (standard deviation across the units) and the within-standard deviation (variance over time) for it is small **(see Table- 5).**

Table-5: Between and Within Descriptive Statistics of the Variables:

Variable		Mean	Std.Dev.	Minimum	Maximum	Cases	B/W
	Overall	4.93331333	.615423945	4.2195	6.045	N =165	∞
1n (D_{ij})	Between		.635090993	4.2195	6.045	n = 15	
	Within		0				
	Overall	.131558545	.177298028	-.18931	.78733	N =165	1.21
1n (W_{jit})	Between		.139378507	-.14872	.41352	n = 15	
	Within		.114859477	-.19544	.71511		
1n	Overall	-.100564303	.218122317	-.74799	.19172	N =165	5.38
(AW_{ijt})	Between		.221061903	-.56722	.17839	n = 15	
	Within		.041094444	-.18077	.18257		
	Overall	-0.070564	.245112723	-.63599	.67833	N =165	3.28
1n (INQ_{ijt})	Between		.241262929	-.50099	.51852	n = 15	
	Within		.0736346605	-.26644	.18141		

In the first stage, according to the FEVD procedure, we estimate a standard Fixed Effect model. The Fixed Effect transformation is obtained by averaging equation (4)[5] over time.

[5] There are 15 source districts. We have taken the data for 11 years from 1991 to 2001 for each source district in our analysis. This gives us 165 observations.

$$\mathbf{1n\ (RRM_{ij}) = 1n\ b_0 + b_1\ 1n\ (D_{ij}) + b_2\ 1n\ (W_{ji}) + b_3\ 1n\ (AW_{ij}) + b_4\ 1n\ (INQ_{ij}) + u_i + \varepsilon_i} \quad (5)$$

Now equation (5) is subtracted from equation (4). This transformation removes the individual effect u_i and the time-invariant variable $\ln(D_{ij})$. The demeaned equation is

$$1n\ (RRM_{ijt}) - 1n\ (RRM_{ij}) = b_2\left(1n\ (W_{jit}) - 1n\ (W_{ji})\right) + b_3\left(1n\ (AW_{ijt}) - 1n\ (AW_{ij})\right) + b_4\left(1n\ (INQ_{ijt}) - 1n\ (INQ_{ij})\right) + \left(\varepsilon_{it} - \varepsilon_i\right)$$

$$\mathbf{Or,\ 1n\ (rrm_{ijt}) = b_2\ 1n\ (w_{jit}) + b_3\ 1n\ (aw_{ijt}) + b_4\ 1n\ (inq_{ijt}) + e_{it}} \quad (6)$$

Where, $1n\ (rrm_{ijt}) = 1n\ (RRM_{ijt}) - 1n\ (RRM_{ij})$, $1n\ (w_{jit}) = \left(1n\ (W_{jit}) - 1n\ (W_{ji})\right)$, $1n\ (aw_{ijt}) = \left(1n\ (AW_{ijt}) - 1n\ (aw_{ij})\right)$, $1n\ (inq_{ijt}) = \left(1n\ (INQ_{ijt}) - 1n\ (INQ_{ij})\right)$ and $e_{it} = \left(\varepsilon_{it} - \varepsilon_i\right)$.

We run the Fixed Effect regression on equation (6) with the intention to obtain the estimated unit effect $\check{u}_i$.

Estimated unit effect is derived from the following equation:

$$\mathbf{\check{u}_i = 1n\ (RRM_{ij}) - b_2^{FE}\ 1n\ (W_{ji}) - b_3^{FE}\ 1n\ (AW_{ij}) - b_4^{FE}\ 1n\ (INQ_{ij})} \quad (7)$$

In the second stage, we regress $\check{u}_i$ on the time invariant variable and the averages of the quasi-time invariant variables over time.

$$\mathbf{\check{u}_i = \omega + \gamma_1\ 1n\ (D_{ij}) + \gamma_2\ 1n\ (AW_{ij}) + \gamma_3\ 1n\ (INQ_{ij}) + h_i} \quad (8)$$

where ω is the intercept of the equation (8) and h_i is the error. We can say that, h_i is the part of u_i that is not explained by the time-invariant variable and the quasi-time invariant variables in our study.

In the third stage we rerun the full model without the unit effects but including the decomposed unit Fixed Effect Vectors h_i obtained in stage-2. Stage-3 is estimated by pooled OLS method. Equation of the stage-3 is

$$\mathbf{1n\ (RRM_{ijt}) = 1n\ b_0 + 1n\ (D_{ij}) + b_2\ 1n\ (W_{jit}) + b_3\ 1n\ (AW_{ijt}) + b_4\ 1n\ (INQ_{ijt}) + \delta h_i + \varepsilon_{it}} \quad (9)$$

Here h_i is no longer correlated with any of the time-invariant or quasi-time invariant variables, but by including h_i , the error term of stage-2, we are able to account for district-specific effect that cannot be observed.

In stage-3, we do three corrections in the model. Firstly, the heteroscedasticity is eliminated by using White's Robust VC matrix. Secondly, since there is positive serial correlation in the pooled model, we do a Prais-Winston transformation of the original data to correct it. Thirdly, in calculating the standard errors of the coefficients, we use corrected degrees of freedom. Even though the third stage is estimated as a pooled OLS model, the procedure is based on a Fixed Effect set up that has to be mirrored by the computation of the standard errors. (Plümper, Thomas; Troeger, 2007). Here total number of parameters should be the number of coefficients to be estimated plus the number of unit-specific effects. Therefore, we reduce OLS degrees of freedom by the number of units to account for the number of unit effects in stage-1.

APPENDIX-II

The study is restricted to rural-rural migration of workers in Bardhaman district from other districts of West Bengal. There are 15 source districts, namely, Darjeeling, Jalpaiguri, Coochbihar, Dinajpur, Maldah, Murshidabad, Birbhum, Nadia, North 24 Parganas, Hooghly, Bankura, Purulia, Medinipur, Howrah and South 24 Parganas. We have excluded Kolkata from both the lists of source districts. We have combined Uttar Dinajpur and Dakshin Dinajpur as Dinajpur (combined) and Paschim Medinipur and Purba Medinipur as Medinipur (combined). For each source district we have eleven time periods, namely, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000 and 2001. This gives us 165 observations.

Dependent variable of our analysis is

$\ln(RRM_{ijt})$	Log-normal value of rate of migration of rural workers from district i to district j at time period t.

Explanatory variables of our analysis are

$\ln(D_{ij})$	Log-normal value of distance of the headquarters of district i from that of district j.
$\ln(W_{jit})$	Log-normal value of difference between the combined average daily wage rate of agricultural field labourers of district j and that of district i at time period t.
$\ln(AW_{ijt})$	Log-normal value of difference between the percentage share of agricultural orkers in rural workers of district i and that of district j at time period t.
$\ln(INQ_{ijt})$	Log-normal value of difference between the Gini coefficient of inequality of operational land-holding of district i and that of district j at time period t.

REGRESSION RESULTS

Fixed Effect Vector Decomposition Method:

STAGE-1

Fixed Effect Model: (With district-specific effects only)

Dep. var. = $\ln(rrm_{ijt})$

variable	Coefficient	P[|Z|>z]
$\ln(w_{jit})$	b_2^{FE} = .4274348213	.0000
$\ln(aw_{ijt})$	b_3^{FE} = .2478359063	.3685
$\ln(inq_{ijt})$	b_4^{FE} = -.4117664465	.0042

STAGE-2

Ordinary Least Squares Regression

Dep. var. = $\check{u}_i$

variable	Coefficient	P[|Z|>z]
Constant	7.473521797	.0366
$\ln(D_{ij})$	-2.764592635	.0009
$\ln(AW_{ijt}$	2.532302384	.0835
$\ln(INQ_{ij})$	2.888228641	.1065

STAGE-3

Pooled Ordinary Least Squares Regression

(The heteroscedasticity is eliminated by using White's Robust VC matrix.)

Dep. var. = $\ln(RRM_{ijt})$

variable	Coefficient	P[|Z|>z]
Constant	6.773871741	.0000
$\ln(D_{ij})$	-2.635342530	.0000
$\ln(W_{jit})$	.4501777805	.0063
$\ln(AW_{ijt})$	2.565020876	.0000
$\ln(INQ_{ijt})$	1.946524127	.0000
h_i	.9987564418	.0000

```
F[5,159] = 1403.50( p value=.00000)
Diagnostic: Log-L =-14.2264,
Adjusted R-squared =.97715.
Autocorrel: Durbin-Watson Statistic =.57146, Rho =.71427
```

Since there is positive serial correlation in the Pooled model, we do a Prais Winston transformation of the original data to correct it. The final results are as follows:

Dep. var. = $\ln(RRM_{ijt})$

```
+----------------------------------------------+
| AR(1) Model:     e(t) = rho * e(t-1) + u(t) |
| Initial value of rho       =         .71427 |
| Iter=  4, SS=      3.320, Log-L=  87.029713 |
| Final value of Rho    =              .94097 |
| Durbin-Watson:   e(t) =              .11805 |
| Std. Deviation:  e(t) =              .42694 |
| Std. Deviation:  u(t) =              .14451 |
| Durbin-Watson:   u(t) =             1.92474 |
| Autocorrelation: u(t) =              .03763 |
| N[0,1] used for significance levels         |
| Adjusted R-squared =.97715                  |
|                                              |
+----------------------------------------------+
```

variable	Coefficient	P[|Z|>z]
Constant	5.073041584	.0000
1n (D_{ij})	-2.295003100	.0000
1n (W_{jit})	.2873508080	.0166
1n (AW_{ijt})	2.672321331	.0000
1n (INQ_{ijt})	.3071895484	.0288
h_i	.9371409934	.0000
RHO	.9409743599	.0000

In the uncorrected model, we get number of observations = 165, number of parameters = 7, degree of freedom (df 1) = 158. But here we do not take into account the number of unit effects, which we have included in the form of $h_{i.}$ Here number of unit effect is 10. So although it is a pooled OLS model, we consider it as a Fixed Effect model and the correct number of parameters is 17. Therefore, correct value of degree of freedom (df 2) is 148. Corrected Standard Error = Standard Error 1 X Square root of (df 1/df 2).