

M. R. Narayana\*

## Continuity of Inter-regional Migration of Workers in India: A Spatio-temporal Analysis<sup>†</sup>

### Introduction

THIS paper considers that the true inter-regional (or, inter-state) migration of workers in

India is a continuous process in time and space. However, inter-regional migration is often characterised in India by a discrete process in time and space due to lack of continuous (e.g. annual time series) data on migration. An obvious drawback of discrete migration data is that it conceals all information and implications relating to the actual spatio-temporal process of inter-regional migration.

Previous econometric studies on India's Inter-regional migration are few and are directed at explaining the nature of economic determinants, of lifetime inter-regional migration (Greenwood 1971; Narayana 1990a, 1991).<sup>1</sup> Notable exception is Greenwood who had used data from the 1961 census on total number of male inter-regional migration in all durations of residence and in duration of residence of less than one year for the purpose of comparing the economic determinants of migration between these durations of residence. Greenwood's study had mainly shown that parametric estimates of lifetime migration have a simultaneity bias due to aggregation of migration over time.<sup>2</sup>

To my knowledge, there exists no methodological framework to obtain a continuous process of economic migration in time and space, based on the observed discrete migration process. Thus, the main purpose of this paper is to fill in this research gap.

This paper contributes in developing a simple dynamic migration model for the purpose of estimating the spatio-temporal continuity of migration process.<sup>3</sup> Also, this paper estimates the dynamic model by standard econometric techniques and obtains the continuous path of migration for selected years by the technique of econometric simulation analysis.

\* Associate Professor, Population Research Centre, Institute of Social and Economic Change, Nagarabhavi, P.O. Bangalore 560 072.

<sup>†</sup> An early version of this paper was presented at the Ninth Annual Conference on Economic Theory and Policy at the Indian Statistical Institute (New Delhi) and at a seminar in the Institute of Social and Economic Change (Bangalore). Grateful thanks are due to the participants of these seminars for helpful comments. In the same way, the suggestions of an anonymous referee of this Journal and the financial assistance of the Union Ministry of Health and Family Welfare are gratefully acknowledged. Any errors in the paper are my sole responsibility.

1. For a survey of econometric studies on migration in developing countries, see Todaro (1976).

2. For an empirical discussion on simultaneity bias in migration models, see Greenwood (1975).

3. For a good general introduction to the economic and econometric analysis of migration, see Willis (1974).

The rest of the paper is organised as follows. In Section 2, a dynamic model of migration is developed and its estimation strategy is outlined. Section 3 describes the data and variables used in the actual estimations of the model. In Section 4, estimates of results of the economic determinants of inter-regional migration of workers in India are given. Section 5 gives the estimates of the path of spatio-temporal migration for the period 1971-74. Section 6 concludes the paper with policy implications.

### The Model

Consider a nation comprising a set of  $R$ -regions. Let the gross migration of workers in a particular pattern from region  $i$  to region  $j$  in time  $t$  be denoted by  $M_{ij}^p(t)$ . Assume that gross flow of inter-regional migration in time is influenced by migration of previous period  $\{M_{ij}^p(t_0)\}$  as well as by the current values (or, levels) of a set of explanatory variables in region  $i$  and  $j$ ,  $\{Z_i(t) = \{Z_i^1(t), \dots, Z_i^m(t)\}; Z_j(t) = \{Z_j^1(t), \dots, Z_j^m(t)\}\}$ , where  $m$  need not equal to  $m^*$ . This can be expressed as follows:

$$M_{ij}^p(t_1) = g_1\{M_{ij}^p(t_0), Z_i(t_1), Z_j(t_1)\}, \quad (1)$$

$$M_{ij}^p(t_2) = g_2\{M_{ij}^p(t_1), Z_i(t_2), Z_j(t_2)\}, \quad (2)$$

$$\dots \dots \dots$$

$$M_{ij}^p(t_r) = g_r\{M_{ij}^p(t_{r-1}), Z_i(t_r), Z_j(t_r)\} \quad (3)$$

where  $i, j = \{1, \dots, R\}$ , and  $M_{ij}$  is zero for all  $i$ .

From the viewpoint of data, the system of equations in (1)-(3) constitutes a time series of cross-section data on gross flow of inter-regional migration. In India, a time series data and a time series of cross-section data on inter-regional migration are not available. Rather, what is available is a cross-section data in which information on migration process is given by different durations of residence where each duration is a temporal aggregation of the process of migration occurring over a period of time. For instance, in 1981 census, data on gross inter-regional migration is available, among others, in duration of residence of five to nine years. If data on observed migration is available only by durations of residence, then every information relating to the gross migration process occurring in time is concealed/unobserved. Consequently, there exists a divergence between the actual (continuous) migration process and the observed (discrete) migration process by durations of residence. This situation suggests a form of asymmetric migration information and calls for alternative strategies for estimation of macro migration equations in (1) through (3).

### Derivation of Estimable Equation

Consider that the functional relationships in (1)-(3) are linear. Then, a deterministic linear migration system can be written as follows.

$$M_{ij}^p(t_1) = M_{ij}^p(t_0) + \theta_i \cdot Z_i(t_1) + \theta_j \cdot Z_j(t_1) \quad (4)$$

$$M_{ij}^p(t_2) = M_{ij}^p(t_1) + \theta_i \cdot Z_i(t_2) + \theta_j \cdot Z_j(t_2) \quad (5)$$

where  $\theta_i = \{\theta_{i1}, \dots, \theta_{im}\}$  and  $\theta_j = \{\theta_{j1}, \dots, \theta_{jm}\}$  are the column vector of coefficients associated with  $(Z_i(t), Z_j(t))$ . This system shows that migration process in time forms a recursive system since each of the endogenous variables can be determined sequentially. Hence, migration in  $K$ th time can be solved to yield:

$$M_{ij}^p(t_k) = M_{ij}^p(t_0) + \theta_i \cdot \sum_{h=1}^k Z_i(t_h) + \theta_j \cdot \sum_{h=1}^k Z_j(t_h), \tag{7}$$

Throughout,  $M_{ij}^p(t_0)$  will be treated as exogenously given stock of migration.

Migration in  $K$ th time in (7) is a culmination of migration over a period from 1 to  $K$ . Thus,  $M_{ij}^p(t_k)$  captures the process of migration over time as much as migration by duration of residence of 1 to  $K$  years. Consequently, equation (7) can be a framework for estimation of determinants of migration by duration of residence of 1 to  $K$  years as well when the underlying process of migration is continuous in time and space.<sup>4</sup>

In addition, the formulation in (7) captures the following features. First, in the recent macroeconomic literature, an economic system in which the final configuration of a variable depends on the path taken towards it is called hysteretic (Setterfield 1993). From this viewpoint, the linear migration system in (7) may be considered for a case of hysteresis in migration since the final configuration of migration in this system depends on path taken toward it. Second, Migration in different times is influenced by the same set of explanatory variables,  $\{Z_i, Z_j\}$  whose influence do not vary in time. However, the model clearly allows for differential impact of  $\theta_i$  and  $\theta_j$  on migration. Third, migration depends on the entire time-path of  $Z$  through the cumulative total, viz.,  $\sum_{h=1}^k Z_i(t_h)$  and  $\sum_{h=1}^k Z_j(t_h)$ . This underlines that the migration system has a long memory such that it will not forget the determining features of its previous time-path. Fourth, the past values of migration will have no explicit influence on current exogenous variables and its coefficients that, in part, characterise the system but determines the migration over a period of time. In econometric terms, this formulation assumes away the classic problem of simultaneity.

Given the estimated coefficients  $(\theta_i^*, \theta_j^*)$  from (7), and the basic data on  $M_{ij}^p(t_0)$  and  $\{Z_i(t_h), Z_j(t_h)\}$ ,  $h = 1, \dots, K$ , an estimate of the continuous time-path of migration  $\{M_{ij}^p(t_1)^*, \dots, M_{ij}^p(t_k)^*\}$  can be obtained by the following non-stochastic simulation analysis.

$$M_{ij}^p(t_1)^* = M_{ij}^p(t_0) + \theta_i^* \cdot Z_i(t_1) + \theta_j^* \cdot Z_j(t_1); \tag{8}$$

$$M_{ij}^p(t_2)^* = M_{ij}^p(t_1)^* + \theta_i^* \cdot Z_i(t_2) + \theta_j^* \cdot Z_j(t_2); \tag{9}$$

.. .. ..

4. Very often in the migration literature, determinants of migration by duration of residence is estimated in one of the following forms.

$$M_{ij}^p(t_k) = \alpha_{ij} + \theta_i \cdot Z_i(t_1) + \theta_j \cdot Z_j(t_1); \text{ or,}$$

$$M_{ij}^p(t_k) = \alpha_{ij} + \theta_i \cdot Z_i(t_k) + \theta_j \cdot Z_j(t_k); \text{ or,}$$

$$M_{ij}^p(t_k) = \alpha_{ij} + \theta_i \cdot [(Z_i(t_1) + Z_i(t_k))/2] + \theta_j \cdot [(Z_j(t_1) + Z_j(t_k))/2].$$

The first equation assumes, *a priori*, that all migration over a period of  $K$  years has occurred only during the first period, whereas second equation assumes that the same has occurred during the  $K$ th period. On the other hand, the third equation assumes that all migration has occurred in the middle of the period. As compared to these equations, equation (7) above seems to be new in the literature.

$$M_{ij}^p(t_k)^* = M_{ij}^p(t_{k-1})^* + \theta_i^* \cdot Z_i(t_k) + \theta_j^* \cdot Z_j(t_k); \quad (10)$$

Thus, the regression and simulation analyses allow for the intercept to vary over time and to vary over cross-section units, but not the slopes. Otherwise, separate cross-section regression for each time would be required which is possible if only one has a time series of cross-section migration data.

#### Estimation Strategy

In order to estimate equation (7), the first step is to identify the  $Z_i(t_k)$  and  $Z_j(t_k)$ . In this regard, I adopt the explanatory variables as suggested by the quantitative economic theory of local (regional) public goods in Narayana (1991) for explaining the economic behaviour of inter-regional migration of workers in a federal economy like India. Those variables are (i) wage rates ( $w_i, w_j$ ); (ii) per capita regional taxes or expenditures ( $g_i, g_j$ ); (iii) per capita federal taxes or subsidies ( $s_i, s_j$ ); (iv) population size ( $p_i, p_j$ ); and migration cost ( $c_{ij}$ ). I presume that all these variables are time-dependent except the moving cost.

In reality, inter-regional migration of workers may be influenced by many other factors, in addition to pure economic variables above. To account for these left out variables, it is essential to treat the estimation of migration in a stochastic form. Incorporating the theoretically suggested explanatory variables above, the stochastic form of equation (7) can be written as follows.

$$\begin{aligned} M_{ij}^p(t_k) = & M_{ij}^p(t_0) + \theta_{1i} \cdot \{\Sigma_{h=1}^k w_i(t_h)\} + \theta_{2j} \cdot \{\Sigma_{h=1}^k w_j(t_h)\} + \\ & \theta_{3i} \cdot \{\Sigma_{h=1}^k g_i(t_h)\} + \theta_{4j} \cdot \{\Sigma_{h=1}^k g_j(t_h)\} + \theta_{5i} \cdot \{\Sigma_{h=1}^k s_i(t_h)\} + \\ & \theta_{6j} \cdot \{\Sigma_{h=1}^k s_j(t_h)\} + \theta_{7i} \cdot \{\Sigma_{h=1}^k p_i(t_h)\} + \theta_{8j} \cdot \{\Sigma_{h=1}^k p_j(t_h)\} + \\ & \theta_9 \cdot (K \cdot c_{ij}) + \epsilon. \end{aligned} \quad (11)$$

where  $\epsilon$  is the random error term and all other notations are the same as defined above.

In total, the model contains ten parameters including the intercept term.

Alternatively, if the relationships in (1)-(3) are presumed to be non-linear in variables but linear in parameters, then a log. linear form of estimable equation is :

$$\begin{aligned} \log M_{ij}^p(t_k) = & \log M_{ij}^p(t_0) + \theta_{1i} \cdot \log \{\pi_{h=1}^k w_i(t_h)\} + \\ & \theta_{2j} \cdot \log \{\pi_{h=1}^k w_j(t_h)\} + \theta_{3i} \cdot \log \{\pi_{h=1}^k g_i(t_h)\} + \\ & \theta_{4j} \cdot \log \{\pi_{h=1}^k g_j(t_h)\} + \theta_{5i} \cdot \log \{\pi_{h=1}^k s_i(t_h)\} + \\ & \theta_{6j} \cdot \log \{\pi_{h=1}^k s_j(t_h)\} + \theta_{7i} \cdot \log \{\pi_{h=1}^k p_i(t_h)\} + \\ & \theta_{8j} \cdot \log \{\pi_{h=1}^k p_j(t_h)\} + \theta_9 \cdot \log (K \cdot c_{ij}) + \epsilon. \end{aligned} \quad (12)$$

where  $\epsilon$  is presumed as an additive term and  $\{\pi_{h=1}^k w_i(t_h)\} = \{w_i(t_1) \cdot w_i(t_2) \cdot w_i(t_3) \cdot \dots \cdot w_i(t_k)\}$  and so on.

The two formulations in (11) and (12) are entirely different in treating the determinants of unobserved migration process in time. In (11) [or 12], the determinants of unobserved migration process is presumed to be linearly [or nonlinearly] additive [or interactive]. But

the specification of variables in both (11) and (12) allows for differential impact between a unit change in origin level variable and a unit change in destination variable.

The expected signs on the coefficient are as follows :

$$\theta_{1i} \leq 0; \theta_{2j} \geq 0; \theta_{3i} \geq 0; \theta_{4j} \leq 0; \theta_{5i} \leq 0; \theta_{6j} \geq 0; \theta_{7i} \geq 0,$$

or  $\theta_{7i} \leq 0; \theta_{8j} \geq 0$ , or  $\theta_{8j} \leq 0$ ; and  $\theta_9 \leq 0$ .

#### Data and Variable Descriptions

The migration data for this empirical study is drawn from the 1981 census. This is the latest information on inter-regional migration since migration tables of 1991 census are yet to be published. In particular, the data on gross inter-regional migrants who reported employment as a reason for migration, by duration of residence of five to nine years, as a proxy for migration of workers is employed.<sup>5</sup> On the other hand, migrants who reported employment as a reason for migration by duration of residence of more than ten years is employed for stock of migrants [i.e.  $M_{ij}^*(t_0)$ ]. In economic terms, the existence of a large migrant stock can be a source of information and communication to new migrants, and, thereby, influence migration between regions. The sample employed consists of 20 states, excluding all the Union Territories and states of Assam and Sikkim.<sup>6</sup>

The statistical information on all the following independent variables are obtained from the available sources. Appendix I gives sources and additional discussion for these variables.

(i)  $w_i$  ( $w_j$ ). This variable refers to per capita income in different states. It is used as a proxy for average market wage rate in different regions. This is done for lack of information on occupational settlement of migrants in different sectors, such as, agriculture, industry, services etc. in the migration data which poses the practical problem of choosing a representative wage rate. In this connection, the author is aware that if inter-state migration flows are stratified by rural or urban residence in an origin state and by rural or urban residence in a destination state, then one can use sectoral (rural or urban) wage rates which may be a better variable than per capita income. However, such a stratification contradicts the inclusion of other variables, such as, federal transfers etc. which are neither determined nor defined on the basis of rural and urban distinctions in different states.

(ii)  $t_i$  ( $t_j$ ). This variable refers to the per capita own tax revenue in region  $i$  ( $j$ ). It is assumed to represent the per capita cost of providing a common level of regional public services as well as to indicate a dimension of cost of living in different states. Since the major sources of tax revenue for state governments in India are indirect taxes (e.g. sales tax on

5. According to the 1981 Census, employment as a reason for migration include persons (i) in search of a job, or hoping to get a job; (ii) got a job and moved to take up a job; (iii) having already got a job and moved because of transfer, promotion etc. For lack of information on these job/employment status of migrants, it is presumed that all migrants shift from one job to another as they move between regions.

6. The exclusion of Union Territories is due to non-availability of federal transfer figures since they do not come under the purview of fiscal federalism. The state of Assam is excluded since the census could not be conducted there in 1981. Sikkim was excluded since federal transfer data is not available for it as a state before 1975.

commodities), their incidence can be presumed uniform on all residents and in all occupations within the state. Hence, per capita taxes rather than tax rates are used here.

The specification of  $t_i$  ( $t_i$ ) in the estimable equations implicitly assume that per capita regional taxes are equivalent to per capita benefits of regional expenditure. Hence, no measures of benefits or regional public services are included in the same equations. Also, the benefits of regional expenditures are assumed to be capitalised in no other forms.

(iii)  $p_i$  ( $P_i$ ). This variable refers to total population size of a state and is used as a proxy for labour market conditions in different regions. In fact, states which are larger in population size have attracted large number of migrants. This is possibly due to larger labour markets and greater employment opportunities the large states can provide because of their high level of urbanisation, industrialisation etc. These unmeasured effects (e.g. urbanisation) are assumed to be captured in using destination population size as an explanatory variable.

(iv)  $C_{ij}$ . It refers to the rail distance between state capitals/major cities in the state and is used as a proxy for various migration costs [e.g. the monetary and psychic costs of moving] that a worker has to incur in moving from one region to another. I treat moving costs as a constant in my estimations due to lack of information on the changes in non-monetary costs of migration in time.

(v)  $si$  ( $sj$ ). This variable refers to the per capita total transfers to a state where the total transfers to a state are from the Finance Commission, the Planning Commission and the federal discretionary grants. Although the nature and instruments of transfers of these commissions are different (e.g. revenue-sharing and grants-in-aid are the major instruments of Finance Commission transfers and plan grant is a major instrument of Planning Commission transfers), the sum of these transfers is plausible since the ultimate objective of all transfers is redistributive in nature. Further, in arriving at per capita federal transfers, the total federal transfers to a state are deflated by that state's total population since the entire population in a state are assumed to benefit from those transfers. Throughout, these transfers would be considered as a welfare payment and constitute a specific form of income to the residents in different regions

### Results of Estimation and their Economic Interpretation

Table 1 summarises the Ordinary Least Squares (OLS) estimates of the parameters of the linear model and Table 2 gives the parameter estimates of log linear model. In each table, estimation results of three different sub-models are given. For instance, in Table 1, sub-model 1.1 includes estimates of all parameters in equation (11), whereas sub-model 1.2 is estimated without the variable  $pi$  and sub-model 1.3 is estimated without  $pi$  and  $py$ . Note that dropping of the variable  $pi$  alters the sign of coefficients and their level of statistical significance much. This indicates that multicollinearity between  $pi$  and other explanatory variables is severe in estimating sub-model 1.1 in Table 1, or 2.1 in Table 2.

Of the three sub-models in Table 1, model 1.2 performs better in terms of predicted signs on and statistical significance of coefficients, although the explanatory power of the model (in terms of  $R^2$ -square) is comparable between sub-models. In the same way, sub-model 2.2 performs better in the class of log linear models in Table 2. On the bases of these qualitative

TABLE 1 : ECONOMIC DETERMINANTS OF INTER-REGIONAL MIGRATION WORKERS IN INDIA  
PARAMETER ESTIMATES OF THE LINEAR MODEL

Dependent variable: Number of inter-state migrants who reported employment as a reason for migration by duration of residence of five to nine years

Variable	Estimated coefficients, and t-ratios in paranthesis		
	Sub-model 1.1	Sub-model 1.2	Sub-model 1.3
Intercept:	0.6* (3.99)	0.68* (4.35)	0.86* (5.74)
Wage rate in i:	-1.32 (1.35)	-2.81* (2.87)	-1.63 (1.77)
Wage rate in j:	-0.25 (0.25)	2.19** (2.38)	1.65 (1.79)
Per capita regional taxes in i:	2.58 (0.26)	16.34 (1.61)	7.83 (0.79)
Per capita regional taxes iny:	23.71** (2.34)	7.9 (0.78)	14.52 (1.44)
Per capita federal transfers in i:	0.12 (0.23)	-1.99** (2.12)	-1.84 (1.94)
Per capita federal transfers iny:	1.15 (0.85)	2.4 (1.72)	0.83 (0.63)
Labour market conditions in i:	0.29* (5.76)	—	—
Labour market conditions iny:	0.01** (2.21)	0.02* (3.24)	—
Moving cost between i and j:	-0.19 (1.65)	-0.2 (1.65)	-0.14 (1.20)
Adjusted R <sup>2</sup> -square:	0.25	0.18	0.15
Standard error of forecast:	1973.11	2056.79	2082.83
F-statistic:	13.36	10.02	9.7
Number of observations:	380	380	380

Notes: 1. \* Indicates that the coefficient is significant at 1% level.

2. \*\* Indicate that the coefficient is significant at 5% level.

3. The critical value of  $F(9,370)$ ,  $F(8,371)$ , and  $F(7,372)$  at 1% level of significance is 1.88, 1.94, and 2.01 respectively.

differences between sub-models, the linear model of 1.2 and the log linear model of 2.2 is acceptable on empirical grounds. This suggests that both linear and log linear functional forms are appropriate specification of inter-regional migration of workers in India. However, for the rest of my analysis below, I use the results of log linear model of 2.2. as it contains more number of statistically significant coefficients than the linear model in 1.2.

7. For a systematic analysis of the criteria for model choice in the context of India's inter-regional migration, see Narayana (1990b).

TABLE 2: ECONOMIC DETERMINANTS OF INTER-REGIONAL MIGRATION WORKERS IN INDIA  
PARAMETER ESTIMATES OF THE LOG LINEAR MODEL

Dependent variable: Log [Number of inter-state migrants who reported employment as a reason for migration  
by duration of residence of five to nine years]

Variable	Estimated coefficients, and t-ratios in paranthesis		
	Sub-model 2.1	Sub-model 22	Sub-model 23
Intercept:	0.49* (12.08)	0.52* (12.64)	0.65* (16.13)
Wage rate in i:	-0.39* (3.59)	-0.56* (5.24)	-0.15 (1053)
wage rate in j:	0.02 (0.22)	0.38* (4.30)	0.38* (3.40)
Per capita regional taxes in i:	0.07 (1.32)	0.13* (2.88)	0.01 (0.25)
Per capita regional taxes in j:	0.11** (2.53)	0.02 (0.56)	0.08 (1.72)
Per capita federal transfers in i:	0.02 (0.33)	-0.21* (7.26)	-0.2 (6.27)
Per capita federal transfers in j:	0.23* (3.85)	0.35* (6.36)	0.06 (1.14)
Labour market conditions in i:	0.15* (5.16)	—	—
Labour market conditions in j:	0.13* (4.83)	0.18* (7.47)	—
Moving cost between i and j:	-0.12* (5.54)	-0.11* (4.72)	-0.08* (3.34)
Adjusted R-square:	0.72	0.71	0.65
Standard error of forecast:	1.25	1.3	1.38
F-statistic:	106.87	109.36	101.99
Number of observations:	380	380	380

Notes: 1. \* Indicates that the coefficient is significant at 1% level.

2. \*\* Indicate that the coefficient is significant at 5% level.

3. The critical value of F(9,370), F (7,372) at 1% level of significance is 1.88,1.94, and 2.01 respectively.

In economic terms, the estimation results can be interpreted in the following ways. First, the negative and positive migration elasticity with respect to  $w$ , and  $w_j$  respectively may be interpreted that workers move from regions of low wage rate to regions of high wage rate. Hence, accentuation of inter-regional wage differentials, *ceteris paribus*, encourages migration. Second, for a given level of regional public services, the positive elasticity with

TABLE 3: ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN 1971 AS A PERCENTAGE OF TOTAL ESTLMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA DURING 1 97 1 -74

	<i>Migration from region i:</i>																			
	<i>A.P.</i>	<i>Bihar</i>	<i>Guj- arat</i>	<i>Har- yana</i>	<i>HP.</i>	<i>J &amp; K</i>	<i>Kar- nataka</i>	<i>Kerala</i>	<i>Mf. Maha- rashtra</i>	<i>Mani- pur</i>	<i>Megh- alaya</i>	<i>Naga- land</i>	<i>Orissa</i>	<i>Punjab</i>	<i>Rajas- tan</i>	<i>Tamil- Nadu</i>	<i>Tri- pura</i>	<i>U.P.</i>	<i>W.B.</i>	
A.P	—	19.53	20.00	20.10	20.43	20.08	21.03	20.56	20.72	21.60	14.37	18.87	19.81	20.94	19.45	20.04	21.02	17.96	18.54	18.97
Bihar	20.52	—	21.44	21.85	22.44	21.80	20.59	19.52	21.56	21.66	22.32	22.36	23.78	21.88	22.70	21.28	18.64	23.47	21.40	22.17
Gujarat	19.48	18.51	—	20.05	19.41	14.42	18.77	19.89	20.56	21.80	15.51	16.65	16.48	19.36	18.48	21.08	19.30	12.99	19.36	17.00
Haryana	19.25	20.10	19.58	—	21.89	21.31	18.14	19.98	20.11	20.61	18.14	19.32	21.58	20.48	22.34	21.18	17.82	19.96	20.50	19.99
HP.	20.67	19.58	20.11	21.75	—	21.57	19.94	21.31	20.13	20.85	19.26	18.72	20.19	18.81	20.87	20.35	18.64	18.25	20.23	18.63
J & K	20.87	18.85	19.03	21.65	22.89	18.89	20.20	19.18	20.33	21.50	17.32	18.99	21.36	20.44	22.29	20.91	19.06	23.41	20.89	19.88
Karnataka	20.0%	19.54	20.43	20.48	20.96				21.62	19.81	22.29	13.98	16.52	18.65	19.35	17.02	20.02	21.12	16.60	18.51
Kerala	20.80	20.23	19.80	21.02	20.77	20.90	20.29	—	21.05	21.84	21.02	19.72	22.51	20.39	20.34	20.06	20.50	19.80	19.97	19.29
M.P.	20.23	20.82	21.51	21.01	22.17	22.30	19.84	18.56	—	22.05	15.00	18.71	22.42	21.78	20.84	21.99	19.23	19.87	20.59	20.66
Maharashtra	20.81	18.87	20.16	19.80	20.59	19.51	19.57	20.47	21.12	—	20.66	16.62	17.54	19.84	20.02	19.65	19.29	15.81	19.54	18.08
Manipur	20.81	17.67	19.23	20.34	22.01	18.52	20.60	19.09	20.09	19.03	—	24.32	26.12	21.43	22.09	20.30	17.71	23.25	20.62	19.31
Meghalaya	19.49	19.38	18.66	21.68	22.38	21.83	20.61	21.60	20.17	21.18	23.21	—	23.27	21.20	22.72	21.02	20.70	23.13	18.70	21.34
Nagaland	18.79	17.58	18.97	19.71	22.29	20.22	20.57	21.25	17.80	21.42	20.60	22.66	19.37	20.09	21.46	20.84	18.51	20.52	17.90	17.02
Orissa	20.15	20.69	20.96	20.46	21.95	22.07	21.52	19.86	20.99	21.44	17.55	16.63	—	21.06	21.20	18.91	21.92	19.96	21.76	
Punjab	18.79	19.38	19.83	20.90	21.86	21.56	18.22	18.41	20.64	20.80	18.73	19.19	19.64	19.43	—	20.99	17.26	15.68	20.60	18.63
Rajasthan	19.90	19.94	21.69	22.05	21.05	20.65	20.53	19.08	21.21	21.87	21.09	19.65	20.74	20.57	22.40	—	19.50	20.40	20.37	20.61
Tamil Nadu	20.92	19.99	20.93	20.32	19.38	19.06	21.82	22.00	20.31	21.36	20.20	18.33	20.70	20.43	19.59	19.96	—	16.57	19.46	18.71
Tripura	19.95	16.32	20.75	21.24	17.92	20.54	18.0%	18.45	18.07	18.85	23.34	24.43	23.64	21.98	21.15	21.33	18.55	—	19.45	21.06
U.P.	20.78	19.82	21.49	21.96	22.22	20.47	21.12	19.85	21.53	21.54	20.13	20.21	21.20	19.57	22.38	21.54	19.15	21.20	—	20.53
W.B.	19.68	21.17	20.63	20.72	19.88	20.23	20.07	20.04	19.84	21.17	19.33	20.79	20.29	21.44	20.66	20.24	19.29	21.29	20.65	—

Source: Computed by the author.

TABLE 4: ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN 1972 AS A PERCENTAGE OF TOTAL ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA DURING 1971 -74

Migration to region j:	Migration from region i:																			
	A.P.	Bihar	Gujarat	Haryana	HP.	J & K	Karnataka	Kerala	MP.	Maharashtra	Manipur	Meghalaya	Nagaland	Orissa	Punjab	Rajasthan	Tamil Nadu	Tripura	UP.	W.B.
A.P.	—	22.91	23.84	22.86	23.04	22.93	23.97	23.19	23.33	23.74	23.36	22.42	22.36	23.41	23.50	23.02	23.40	23.65	23.26	23.34
Bihar	23.37	22.36	23.87	23.89	24.00	23.83	23.37	23.25	23.80	23.76	24.44	24.22	24.35	23.86	24.08	23.80	23.36	24.53	24.09	24.10
Gujarat	22.81			22.83	22.57	20.93	23.44	22.82	23.26	23.69	23.46	21.71	20.63	22.70	23.33	23.142	22.66	22.47	23.48	22.93
Haryana	22.88	23.26	24.06	—	23.79	23.69	22.42	23.13	23.38	23.42	23.20	22.72	23.27	23.38	23.92	23.59	23.13	23.52	23.86	23.14
HP.	22.68	22.23	22.48	23.04	—	23.08	23.26	22.81	22.42	22.81	23.47	20.43	18.94	21.48	23.51	22.57	21.37	22.68	23.32	22.62
J & K	22.65	21.77	23.06	23.05	23.56	—	22.03	21.32	22.48	22.92	20.27	19.47	18.78	22.34	23.23	22.69	22.61	23.75	23.35	21.86
Karnataka	23.56	23.09	23.50	23.09	23.33	22.91	—	23.70	23.06	24.01	25.25	22.15	21.66	22.91	23.93	23.18	23.47	23.98	24.00	23.41
Kerala	23.48	23.12	24.50	23.21	23.31	23.21	24.41	—	23.56	23.78	23.63	24.03	23.36	23.25	22.79	23.76	23.66	23.19	23.58	23.61
MP.	23.32	23.55	23.84	24.03	23.84	24.08	23.06	23.51	—	24.00	25.47	22.54	23.62	23.82	24.63	23.87	22.85	24.56	24.41	23.98
Maharashtra	23.37	22.65	24.15	22.77	23.11	22.74	23.98	23.15	23.47	—	23.59	22.85	21.23	22.92	22.87	23.46	23.26	21.39	23.33	23.07
Manipur	21.48	19.92	20.32	22.50	18.09	16.60	21.54	22.26	21.65	19.90	—	22.50	23.04	21.72	21.80	21.49	20.12	23.67	21.92	22.13
Meghalaya	20.67	21.52	20.80	22.09	21.25	21.41	21.89	22.87	21.64	21.51	21.84	—	21.73	21.84	22.36	21.90	22.94	22.65	22.08	22.08
Nagaland	19.06	19.06	19.14	18.74	19.82	18.72	20.46	20.85	19.24	0.02	19.58	21.34	—	20.09	20.80	21.15	18.89	21.51	19.13	20.02
Orissa	23.70	23.33	23.60	22.90	24.28	23.70	23.66	22.77	23.90	23.63	22.64	21.44	23.50	—	23.15	23.42	23.26	23.98	23.54	23.66
Punjab	22.61	22.98	23.15	23.31	23.68	23.75	22.25	22.37	23.33	23.45	23.08	22.48	22.19	22.99	—	23.43	21.92	23.23	23.40	23.19
Rajasthan	23.59	23.00	23.90	23.71	23.96	23.22	23.35	22.41	23.92	23.70	23.86	22.82	23.87	23.14	23.94	—	23.37	23.57	23.64	23.16
Tamil Nadu	23.60	23.41	23.68	23.12	22.78	23.20	23.82	23.91	23.46	23.85	23.69	22.50	23.08	23.59	22.89	23.19	—	23.95	23.17	23.50
Tripura	22.91	19.58	22.32	21.46	21.48	19.02	21.61	20.32	22.18	20.63	22.56	22.73	23.41	22.68	22.19	22.21	22.23	—	22.40	21.92
UP.	23.54	23.77	23.88	23.82	23.96	24.18	23.57	23.15	23.80	24.31	23.73	23.27	23.45	23.88	23.99	23.76	23.49	24.67	—	23.89
W.B.	23.65	23.62	23.60	23.29	23.84	23.20	23.27	23.09	23.62	23.59	23.40	23.55	23.92	23.68	23.37	23.26	23.44	24.39	23.44	—

Source: Computed by the author.

TABLE 5: ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN 1973 AS A PERCENTAGE OF TOTAL ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA DURING 1971-74

<i>Migration to region j:</i>	<i>Migration from region i:</i>																			
	<i>A.P.</i>	<i>Bihar</i>	<i>Gujarat</i>	<i>Haryana</i>	<i>H.P.</i>	<i>J &amp; K</i>	<i>Karnataka</i>	<i>Kerala</i>	<i>M.P.</i>	<i>Maharashtra</i>	<i>Manipur</i>	<i>Meghalaya</i>	<i>Nagaland</i>	<i>Orissa</i>	<i>Punjab</i>	<i>Rajasthan</i>	<i>Tamil Nadu</i>	<i>Tripura</i>	<i>U.P.</i>	<i>W.B.</i>
A.P.	—	26.49	26.09	25.85	25.92	26.21	25.84	25.98	26.03	25.65	27.65	26.64	26.03	25.97	26.16	26.44	25.89	26.93	26.73	26.57
Bihar	26.01	—	25.59	25.54	25.46	25.75	25.78	26.21	25.82	25.57	25.49	25.63	25.08	25.70	25.24	26.07	26.50	25.32	25.93	25.66
Gujarat	26.57	27.02	—	26.14	26.53	0.02	26.53	26.34	26.27	25.73	27.90	27.80	27.48	26.60	26.56	26.30	26.48	29.00	26.72	27.11
Haryana	26.50	26.47	26.29	—	25.80	26.05	26.37	26.22	26.34	25.96	26.72	26.77	25.74	26.16	25.45	26.23	26.84	26.53	26.30	26.32
H.P.	25.86	26.36	25.65	25.45	—	25.81	25.87	25.61	26.05	25.55	26.20	26.31	24.98	26.16	25.80	26.28	26.10	26.55	26.21	26.46
J & K	25.73	26.46	25.99	25.49	25.28	—	25.40	25.79	25.92	25.32	25.70	25.86	24.21	25.74	25.20	26.05	26.12	25.18	25.96	25.89
Karnataka	26.18	26.73	26.07	26.00	26.11	26.95	—	25.90	26.50	25.63	28.50	27.99	26.90	26.61	27.18	26.70	26.01	27.91	27.32	26.94
Kerala	26.01	26.27	26.20	25.58	25.77	25.95	26.07	—	25.95	25.57	25.72	26.45	25.23	26.06	25.48	26.47	26.10	26.19	26.31	26.45
M.P.	26.21	26.19	25.71	25.87	25.61	25.69	26.02	26.67	—	25.55	27.72	26.70	25.35	25.77	25.88	25.90	26.36	26.44	26.25	26.13
Maharashtra	26.24	26.94	26.34	26.27	26.27	26.73	26.46	26.26	26.13	—	26.32	27.84	27.26	26.50	26.16	26.79	26.61	28.11	26.69	27.09
Manipur	25.41	26.56	24.79	25.37	23.71	25.11	25.15	25.96	25.82	25.07	—	24.63	23.85	25.26	24.46	26.11	25.94	24.95	25.76	25.98
Meghalaya	25.29	26.08	24.82	24.79	24.28	24.88	24.86	24.97	25.51	24.46	23.66	—	24.43	25.15	24.36	25.71	25.51	24.87	26.12	25.28
Nagaland	26.00	26.79	25.33	25.19	24.91	25.71	25.21	25.40	26.38	25.02	25.53	25.43	—	25.77	24.95	26.07	25.87	26.02	26.50	26.74
Orissa	26.23	26.18	25.66	25.66	25.67	25.69	25.55	26.01	26.01	25.54	26.79	27.31	26.37	—	25.45	26.10	26.37	25.84	26.32	25.76
Punjab	26.78	26.77	26.24	26.05	25.90	26.07	26.57	26.80	26.25	26.00	26.87	26.98	26.58	26.60	—	26.34	27.07	28.13	26.32	26.92
Rajasthan	26.13	26.23	25.54	25.43	25.77	26.02	25.61	25.95	25.87	25.39	25.60	26.09	25.64	25.80	25.21	—	26.09	25.84	26.11	25.85
Tamil Nadu	26.10	26.48	25.85	25.90	26.30	26.73	25.64	25.73	26.29	25.80	26.23	27.04	26.01	26.21	26.04	26.60	—	27.60	26.58	26.75
Tripura	25.90	26.90	25.05	24.81	25.58	24.89	25.72	25.85	26.40	25.17	24.29	24.65	24.43	25.35	24.45	25.82	26.07	—	26.12	25.48
U.P.	26.08	26.54	25.73	25.63	25.66	26.28	25.73	26.19	25.88	25.76	26.28	26.40	25.95	26.45	25.44	26.05	26.44	26.11	—	26.21
W.B.	26.37	26.07	25.83	25.78	26.22	26.23	25.94	26.09	26.37	25.73	26.31	26.15	26.12	25.85	25.76	26.41	26.37	26.03	26.12	—

Source: Computed by the author.

TABLE 6: ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN 1974 AS A PERCENTAGE OF TOTAL ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA DURING 1971-74

Migration to region j:	Migration from region i:																			
	A.P.	Bihar	Gujarat	Haryana	H.P.	J & K	Karnataka	Kerala	M.P.	Maharashtra	Manipur	Meghalaya	Nagaland	Orissa	Punjab	Rajasthan	Tamil Nadu	Tripura	U.P.	W.B.
A.P.	—	31.07	30.07	31.19	30.60	30.79	29.17	30.27	29.92	29.01	34.62	32.08	31.80	29.68	30.89	30.50	29.69	31.46	31.46	31.13
Bihar	30.10	—	29.10	28.72	28.10	28.63	30.26	31.03	28.82	29.00	27.74	27.79	26.79	28.56	27.99	28.85	31.50	26.68	28.58	28.06
Gujarat	31.14	32.12	—	30.99	31.49	36.28	31.26	30.95	29.91	28.78	33.14	33.83	35.40	31.34	31.63	29.20	31.56	35.54	30.43	32.06
Haryana	31.37	30.17	30.07	—	28.52	28.95	33.07	30.67	30.17	30.01	31.95	31.19	29.42	29.98	28.30	29.00	32.21	29.99	29.34	30.55
H.P.	30.79	31.83	31.76	29.76	—	29.54	30.95	30.27	31.40	30.79	31.07	34.55	35.89	33.55	29.82	30.80	33.88	32.52	30.24	32.29
J & K	30.75	32.92	31.92	29.82	28.27	—	32.37	33.72	31.27	30.25	36.71	35.68	35.64	31.48	29.28	30.35	32.22	27.66	29.81	32.37
Karnataka	29.29	30.63	30.00	30.44	29.61	31.25	—	28.78	30.64	28.07	32.27	33.34	32.79	31.12	31.88	30.10	29.40	31.50	31.08	31.14
Kerala	29.71	30.38	29.50	30.19	30.15	29.94	29.23	—	29.44	28.81	29.63	29.80	28.89	30.30	31.39	29.71	29.73	30.82	30.14	30.65
M.P.	30.25	29.44	28.95	29.09	28.39	27.94	31.08	31.26	—	28.39	31.81	32.04	28.61	28.63	28.64	28.24	31.56	29.12	28.76	29.23
Maharashtra	29.58	31.54	29.34	31.15	30.03	31.02	29.99	30.11	29.28	—	29.42	32.68	33.97	30.73	30.94	30.09	30.84	34.69	30.45	31.76
Manipur	32.31	35.85	35.66	31.79	36.20	39.77	32.71	32.69	32.44	36.01	—	28.54	26.99	31.59	31.65	32.10	36.20	28.13	31.69	32.57
Meghalaya	34.55	33.01	35.72	31.44	32.10	31.88	32.64	29.56	32.68	32.85	31.29	—	30.56	31.81	30.56	31.38	30.85	29.36	33.10	31.29
Nagaland	36.16	36.57	36.55	36.35	32.98	35.35	33.76	32.49	36.57	32.84	34.29	30.57	—	34.06	32.79	31.94	36.72	31.96	36.47	36.23
Orissa	29.92	29.81	29.79	30.97	28.10	28.54	29.26	31.36	29.10	29.39	33.02	34.62	30.76	—	30.35	29.28	31.46	28.27	30.18	28.82
Punjab	31.82	30.87	30.78	29.74	28.56	28.62	32.96	32.43	29.78	29.75	31.32	31.35	31.60	30.98	—	29.24	33.74	32.95	29.67	31.26
Rajasthan	30.38	30.83	28.87	28.81	29.22	30.11	30.51	32.56	29.01	29.04	29.46	31.45	29.76	30.50	28.45	—	31.03	30.19	29.87	30.37
Tamil Nadu	29.38	30.12	29.54	30.65	31.54	31.02	28.72	28.36	29.95	28.99	29.87	32.13	30.21	29.78	31.48	30.25	—	31.89	30.79	31.03
Tripura	31.24	37.19	31.88	32.49	35.02	35.55	33.71	35.39	33.36	35.35	29.81	28.19	28.53	29.99	31.22	30.64	33.16	—	32.04	31.54
U.P.	29.60	29.87	28.90	28.59	28.16	29.07	29.58	30.81	28.78	28.40	29.86	30.11	29.39	30.09	28.19	28.66	30.92	28.02	—	29.37
W.B.	30.30	29.13	29.94	30.21	30.07	30.35	30.73	30.77	30.18	29.50	30.96	29.50	29.66	29.02	30.20	30.09	30.90	28.29	29.79	—

Source: Computed by the author.

TABLE 7: PERCENTAGE CHANGES IN THE ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA BETWEEN 1971 AND 1972

Migration to region j:	Migration from region i:																			
	A.P.	Bihar	Gujarat	Haryana	H.P.	J & K	Karnataka	Kerala	M.P.	Maharashtra	Manipur	Meghalaya	Nagaland	Orissa	Punjab	Rajasthan	Tamil Nadu	Tripura	U.P.	W.B.
A.P.	—	17.34	19.19	13.74	12.77	14.20	14.00	12.76	12.60	9.93	62.55	18.82	12.88	11.79	20.86	14.86	11.35	31.66	25.45	23.04
Bihar	13.91	—	11.36	9.35	6.93	9.32	13.49	19.11	10.39	9.30	9.52	8.30	2.40	9.06	6.08	11.85	25.33	4.51	12.59	8.71
Gujarat	17.07	20.80	—	13.87	16.32	45.11	24.84	14.68	13.14	8.67	51.25	30.38	25.17	17.27	26.28	11.11	17.40	72.93	21.27	28.10
Haryana	18.86	15.73	22.87	—	8.69	11.19	23.63	15.78	16.30	13.63	27.91	17.57	7.84	14.19	7.07	11.41	29.84	17.86	16.36	15.75
H.P.	9.68	13.53	11.79	5.91	—	7.01	16.64	7.05	11.38	9.42	21.91	9.10	-6.17	14.18	12.67	10.92	14.66	24.24	15.28	21.40
J & K	8.53	15.49	21.18	6.46	2.92	—	9.07	11.16	10.58	6.60	17.04	2.50	-12.08	9.27	4.21	8.48	18.61	1.43	11.77	9.99
Karnataka	12.40	18.17	15.00	12.74	11.30	21.26	—	9.60	16.41	7.70	80.54	34.12	16.10	18.39	40.60	15.79	11.12	44.43	36.35	26.48
Kerala	12.90	14.29	23.75	10.40	12.26	11.03	20.28	—	11.89	8.91	12.41	21.84	3.77	14.04	12.06	18.41	15.41	17.14	18.08	22.38
M.P.	15.27	13.14	10.81	14.39	7.55	7.99	16.19	26.69	—	8.84	69.78	20.48	5.39	9.40	18.18	8.52	18.88	23.60	18.57	16.07
Maharashtra	12.28	20.01	19.77	14.98	12.24	16.55	22.51	13.08	11.09	—	14.18	37.48	21.03	15.52	14.23	19.36	20.61	35.34	19.38	27.56
Manipur	3.18	12.75	5.68	10.60	-17.8	-10.40	4.58	16.56	7.79	4.56	—	-7.48	-11.80	1.35	-1.30	5.88	13.42	1.82	6.31	14.59
Meghalaya	6.05	11.03	11.44	1.89	-5.08	-1.91	6.21	1.19	7.25	1.54	-5.89	—	-6.61	3.02	-1.58	4.19	10.79	-2.05	18.07	3.46
Nagaland	1.44	8.44	0.90	-4.92	-11.09	-7.45	-0.52	-1.87	8.11	-3.27	-4.94	-5.82	—	-0.00	-3.06	1.50	2.07	4.83	6.88	17.63
Orissa	17.63	12.76	12.59	11.92	10.61	7.38	9.94	14.65	13.88	10.21	28.98	28.94	21.36	—	9.96	10.46	22.99	9.42	17.93	8.72
Punjab	20.32	18.55	16.75	11.55	8.29	10.16	22.17	21.53	13.03	12.74	23.24	17.14	13.00	18.27	—	11.60	26.97	48.10	13.63	24.46
Rajasthan	18.58	15.34	10.17	7.53	13.80	12.44	13.75	17.45	12.76	8.36	13.14	16.16	15.10	12.48	6.87	—	19.83	15.53	16.07	12.38
Tamil Nadu	12.82	17.12	13.14	13.75	17.56	21.77	9.16	8.69	15.51	11.67	17.26	22.71	11.47	15.47	16.83	16.17	—	44.56	19.05	25.60
Tripura	14.82	19.97	7.55	1.03	19.84	7.38	13.94	10.13	22.77	9.43	-3.38	-6.96	-0.98	3.19	0.16	4.13	19.84	—	15.16	4.08
U.P.	13.30	19.92	11.14	8.51	7.80	18.12	11.57	16.61	10.52	12.86	17.91	15.11	10.61	22.04	7.20	10.31	22.70	16.39	—	16.39
W.B.	20.21	11.55	14.37	12.42	19.93	14.67	15.93	15.21	19.05	11.43	21.05	13.27	17.91	10.44	13.11	14.91	21.51	14.59	13.48	—

Source: Computed by the author.

TABLE 8: PERCENTAGE CHANGES IN THE ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA BETWEEN 1972 AND 1973

Migration to region j:	Migration from region i:																			
	A.P.	Bihar	Gujarat	Haryana	H.P.	J & K	Karnataka	Kerala	M.P.	Maharashtra	Manipur	Meghalaya	Nagaland	Orissa	Punjab	Rajasthan	Tamil Nadu	Tripura	U.P.	W.B.
A.P.	—	15.64	9.41	13.06	12.50	14.30	7.81	12.06	11.54	8.01	18.35	18.81	16.37	10.91	11.32	14.88	10.62	13.38	14.94	13.85
Bihar	11.27	—	7.20	6.92	6.12	8.06	10.34	12.72	8.48	7.60	4.28	5.84	3.02	7.68	4.82	9.55	13.43	3.21	7.62	6.47
Gujarat	16.49	20.83	—	14.49	17.54	35.58	13.19	15.46	12.93	8.64	18.92	28.06	33.21	17.18	13.85	12.32	16.86	29.03	13.78	18.24
Haryana	15.84	13.77	9.26	—	8.44	9.98	17.59	13.37	12.66	10.85	15.18	17.86	10.60	11.88	6.40	11.17	16.01	12.77	10.23	13.72
H.P.	14.04	18.56	14.12	10.48	—	11.82	11.25	12.27	16.17	12.03	11.61	28.81	31.83	21.82	9.75	16.43	22.11	17.08	12.36	16.96
J & K	13.64	21.54	12.69	10.59	7.29	—	15.33	20.98	15.29	10.45	26.83	32.85	28.90	15.26	8.51	14.82	15.52	6.01	11.17	18.40
Karnataka	11.13	15.76	10.94	12.61	11.93	17.64	—	9.31	14.95	6.73	12.87	26.34	24.20	16.17	13.60	15.17	10.81	16.40	13.83	15.08
Kerala	10.77	13.62	6.94	10.20	10.52	11.78	6.80	—	10.16	7.51	8.85	10.10	8.01	12.10	11.82	11.41	10.30	12.94	11.61	12.03
M.P.	12.39	11.22	7.86	7.67	7.41	6.68	12.86	13.43	—	6.46	8.87	18.44	7.29	8.17	5.07	8.53	15.33	7.64	7.54	8.98
Maharashtra	12.27	18.94	9.08	15.39	13.68	17.54	10.38	13.44	11.35	—	11.58	21.83	28.44	15.62	14.41	14.20	14.38	31.40	14.41	17.43
Manipur	18.30	33.33	21.98	12.73	31.06	51.28	16.77	16.64	19.22	25.99	—	9.47	3.54	16.33	12.18	21.48	28.91	5.41	17.50	17.41
Meghalaya	22.34	21.18	19.33	12.23	14.26	16.19	13.59	9.15	17.91	13.74	8.36	—	12.41	15.19	8.93	17.41	11.23	9.78	18.29	14.49
Nagaland	36.44	40.57	32.29	34.41	25.72	37.34	23.19	21.81	37.11	20.75	30.37	19.18	—	28.28	19.92	23.22	36.92	20.98	38.49	33.55
Orissa	10.64	12.23	8.75	12.07	5.70	8.40	7.99	14.26	8.81	8.09	18.35	27.37	12.19	—	9.91	11.45	13.41	7.74	11.84	8.88
Punjab	18.44	16.50	13.34	11.77	9.39	9.75	19.40	19.80	12.51	10.87	16.42	20.01	19.77	15.74	—	12.45	23.49	21.12	12.47	16.07
Rajasthan	10.76	14.08	6.90	7.25	7.55	12.03	9.67	15.80	8.15	7.12	7.31	14.31	7.41	11.50	5.32	—	11.66	9.67	10.44	11.59
Tamil Nadu	10.60	13.13	9.15	12.04	15.48	15.18	7.61	7.60	12.06	8.18	10.73	20.20	12.72	11.12	13.76	14.71	—	15.24	14.73	13.81
Tripura	13.09	37.34	12.26	15.63	19.12	30.83	19.02	27.21	19.01	21.99	7.69	8.45	4.36	11.74	10.21	16.27	17.29	—	16.62	16.21
U.P.	10.77	11.65	7.76	7.58	7.08	8.69	9.15	13.12	8.76	6.00	10.75	13.48	10.64	10.74	6.02	9.64	12.52	5.83	—	9.70
W.B.	11.49	10.37	9.45	10.69	9.98	13.07	11.47	13.01	11.63	9.06	12.41	11.03	9.19	9.15	10.20	13.57	12.49	6.70	11.45	—

Source: Computed by the author.

TABLE 9: PERCENTAGE CHANGES IN THE ESTIMATED INTER-REGIONAL MIGRATION OF WORKERS IN INDIA BETWEEN 1973 AND 1974

Migration to region j:	Migration from region i:																			
	A.P.	Bihar	Guj- arat	Har- yana	H.P.	J & K	Kar- nataka	Ker- ala	M.P.	Maha- rashtra	Mani- pur	Megh- alaya	Naga- land	Ori- ssa	Pun- jab	Rajas- than	Tamil- nadu	Tri- pura	U.P.	W.B.
A.P.	—	17.27	15.27	20.64	18.03	17.50	12.87	16.49	14.96	13.12	25.20	20.43	22.17	14.29	18.09	15.36	14.68	16.84	17.69	17.15
Bihar	15.76	—	13.72	12.43	10.33	11.17	17.36	18.40	11.64	13.42	8.84	8.43	6.81	11.15	10.93	10.65	18.90	5.39	10.20	9.35
Gujarat	17.20	18.89	—	18.57	18.66	27.88	17.84	17.48	13.88	11.83	18.79	21.68	28.80	17.79	19.07	11.00	19.21	22.56	13.90	18.27
Haryana	18.34	13.99	14.41	—	10.54	11.10	25.40	16.96	14.51	15.57	19.57	16.50	14.30	14.62	11.22	10.56	20.03	13.04	11.56	16.07
H.P.	19.05	20.78	23.80	16.96	—	14.47	19.56	18.21	20.54	20.49	18.60	31.31	43.70	28.26	15.57	17.18	29.81	22.49	15.38	22.02
J & K	19.50	24.44	22.85	16.97	11.83	—	27.43	30.74	20.67	19.48	42.82	37.95	47.23	22.28	16.19	16.50	23.35	9.87	14.83	25.05
Karnataka	11.85	14.58	15.08	17.10	13.41	15.98	—	11.09	15.60	9.55	13.24	19.10	21.92	16.94	17.29	12.73	13.02	12.87	13.78	15.59
Kerala	14.23	15.65	12.57	18.02	17.01	15.39	12.13	—	13.45	12.68	15.22	12.64	14.49	16.26	23.19	12.25	13.90	17.66	14.56	15.89
M.P.	15.43	12.39	12.59	12.46	10.85	8.78	19.42	17.24	—	11.10	14.74	19.99	12.88	11.08	10.64	9.01	19.73	10.16	9.56	11.85
Maharashtra	12.73	17.06	11.38	18.56	14.31	16.04	13.33	14.67	12.08	—	11.77	17.39	24.60	15.95	18.26	12.32	15.88	23.40	14.09	17.24
Manipur	27.17	34.97	43.87	25.33	52.70	58.41	30.07	25.93	25.66	43.63	—	15.85	13.14	25.03	29.40	22.96	39.55	12.73	23.04	25.35
Meghalaya	36.63	26.58	43.90	26.82	32.22	28.17	31.27	18.39	28.11	34.30	32.21	—	25.07	26.47	25.47	22.07	20.94	18.05	26.72	23.76
Nagaland	39.08	36.49	44.34	44.30	32.36	37.53	33.90	27.90	38.62	31.24	34.30	20.21	—	32.16	31.44	22.52	41.95	22.81	37.64	35.50
Orissa	14.08	13.85	16.08	20.69	9.50	11.09	14.51	20.57	11.91	15.06	23.25	26.75	16.67	—	19.25	12.20	19.30	9.41	14.64	11.90
Punjab	18.81	15.31	17.30	14.14	10.27	9.78	24.03	21.02	13.46	14.41	16.53	16.19	18.91	16.44	—	10.99	24.64	17.12	12.73	16.13
Rajasthan	16.28	17.54	13.02	13.29	13.38	15.75	19.14	25.45	12.15	14.40	15.08	20.56	16.08	18.24	12.83	—	18.93	16.84	14.40	17.50
Tamil Nadu	12.54	13.73	14.30	18.33	19.90	16.05	12.02	10.21	13.94	12.37	13.88	18.80	16.12	13.62	20.90	13.74	—	15.55	15.83	16.02
Tripura	20.59	38.27	27.24	30.97	36.88	42.83	31.10	36.91	26.38	40.45	22.74	14.38	16.77	18.30	27.67	18.65	27.20	—	22.65	23.80
U.P.	13.49	12.58	12.31	11.56	9.77	10.61	15.00	17.65	11.21	10.22	13.64	14.05	13.28	13.78	10.82	10.03	16.98	7.33	—	12.04
W.B.	14.90	11.75	15.89	17.17	14.68	15.70	18.48	17.93	14.46	14.67	17.66	12.80	13.56	12.28	17.25	13.94	17.21	8.69	14.04	—

Source: Computed by the author.

regard to per capita regional taxes shows that an increase in per capita regional taxes would encourage migration from high tax regions. Surprisingly, the coefficient for the destination level tax variable is statistically insignificant, and, hence its impact on migration is tested to be zero. Third, the negative and positive migration elasticity with respect to  $S_i$  and  $S_j$  respectively may be interpreted that, other things being equal, workers move from regions of low per capita federal transfers to regions of high per capita federal transfers. This finding underlines that federal transfers in India have resource (labour) allocative effects rather than pure income redistribution effects. Qualitatively, this result is similar to results in Narayana's (1990a) studies on the determinants of inter-state life-time total migration of workers of 1971 census. Fourth, the distance elasticity is -0.11. This estimate is smaller than in other studies on India's inter-state migration. For instance, Greenwood's (1971) study on the determinants of inter-state male life-time migrants of 1961 census had reported the distance elasticity of -2.416, and Narayana's (1990a) study had reported the elasticity of -2.002. These comparisons may suggest that distance elasticity of short time migration is lower than the long time migration of workers in India. Finally, the estimated coefficient of the destination population size is positive. Thus, changes in destination labour market conditions (e.g. an increase in better job opportunities) have a large positive effect on migration of workers in India.

### **Estimation of Spatio-temporal Continuity of Migration**

The log linear parameter estimates of the sub-model 2.2 in Table 2 is used below to obtaining the continuous time-path of inter-regional migration of workers during 1971-74 by econometric simulation analysis. The framework for this simulation analysis is the equation (8)-(10) in Section 2. Throughout this simulation exercise, the non-existence of return migration between regions (since, return migration are not accounted for in actual migration data of the census reports) and zero natural growth of population in all regions is assumed.

The spatio-temporal distribution of the annual gross flows of estimated inter-regional migration of workers in India during 1971-74 is summarised in Table 3 through Table 6. First of all, most of the gross flows are positive, increasing, and distributed in the range of 15% to 20% in 1971, 20% to 25% in 1972, 25% to 30% in 1973, and 30% to 35% in 1974. However, these flows are characterised by considerable variations in space and time, due to differing migration propensities. These results clearly indicate the spatio-temporal continuity and variability of the migration process.

On the other hand, the annual growth of inter-regional migration in India, in terms of the percentage changes in estimated inter-regional migration between years, is summarised in Table 7 through 9. This information helps in identifying the relative growth rates of gross flows between region and in time and over time. The most important results from these tables are as follows. First, the growth rates are neither uniform across states between given years nor uniform for the same state over the years. Thus, considerable variations exist in the inter-regional and inter-temporal growth of migration in India. Second, of the states, the BIMARU (i.e. Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) states show positive

annual growth of migration to all other states during 1971 -74. This trend may go a long way in reducing the pressure of bigger population size of these regions due to population redistribution in time and space.

TABLE 10: NATIONAL DISTRIBUTION OF INTER-REGIONAL MIGRATION OF WORKERS IN INDIA: A COMPARISON OF ESTIMATED VALUES AND OBSERVED VALUES

Region	Estimated inter-regional in-migration of workers as a percentage of total estimated inter-regional in-migration of workers in the nation				Observed inter-regional in-migration of workers by duration of residence of five-nine years as a percentage of total observed inter-regional in-migration of workers by the duration of residence of five-nine years in the nation as a whole as per 1981 census
	1971	1972	1973	1974	
1. Andhra Pradesh	5.33	5.37	5.43	5.37	5.42
2. Bihar	5.35	5.47	5.68	5.64	6.96
3. Gujarat	5.81	5.90	5.79	5.73	4.64
4. Haryana	5.89	5.72	5.67	6.39	4.79
5. Himachal Pradesh	4.71	4.54	4.46	4.33	4.62
6. Jammu & Kashmir	4.49	4.45	4.51	4.42	4.20
7. Kamataka	5.68	5.76	5.73	5.75	4.98
8. Kcrala	4.87	4.86	4.93	4.94	6.06
9. Madhya Pradesh	6.47	6.46	6.48	6.35	5.98
10. Maharashtra	6.45	6.24	6.09	5.95	5.54
11. Manipur	2.76	2.97	2.98	2.96	3.23
12. Meghalaya	2.77	2.79	2.90	2.89	2.60
13. Nagaland	2.79	2.66	2.66	2.64	2.81
»4. Orissa	5.11	5.07	4.83	5.04	5.35
15. Punjab	5.69	5.59	5.46	5.40	5.68
16. Rajaslhan	6.36	6.29	6.36	6.11	6.02
17. Tamil Nadu	5.51	5.73	5.83	5.87	5.83
18. Tripura	2.77	2.86	2.85	2.74	2.34
19. Uttar Pradesh	6.14	6.36	6.40	6.24	7.14
20. West Bengal	5.05	4.92	4.98	5.23	5.80
Total	100	100	100	100	100

Source: Computed by the author.

Table 10 provides the inter-regional comparison between the estimated and observed distribution of the total inter-regional in-migration of workers. It is apparent that the distribution of observed migration is marked by considerable inter-regional variations. In the same way, the national distribution of estimated migration shows marked variations in different states. Most importantly, the annual estimated distribution of migration is not comparable with the observed distribution. This divergence may indicate the magnitude of asymmetric information with regard to the actual (true) and observed process of migration.

### Conclusion and Policy Implications

This paper has developed a simple dynamic model for the purpose of estimating the determinants and spatio-temporal continuity of inter-regional migration of workers in India. The empirical implementation of the model for 1981 census data shows the importance of wage rates, regional taxes/expenditures, federal taxes/subsidies, labour market conditions, and moving costs as the major determinants of inter-regional migration of workers in India. These estimated determinants were in turn employed to obtain a continuous spatio-temporal path of migration during 1971-74 by the econometric simulation analysis. The simulation results mainly demonstrated that the inter-regional migration of workers in India is a continuous process in time and space. However, this process is characterised by considerable variations in its magnitude, growth, and distribution between regions.

The results above have several policy implications. First, since policy determinants, among others, can be directly and appropriately manipulated by the government, the government can as well control the direction and the extent of population redistribution in space and time through inter-regional migration. Second, the estimates of spatio-temporal continuity of migration may be useful for projecting the regional population changes and its implications in relation to inter-regional migration?

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S. This implication is in contrast with demographic projections where the role of inter-regional migration is negligible. See, for instance, the Report of the Expert Committee on Population Projections in Government of India [(1988), p. 6].

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## APPENDIX

The purpose of this appendix is to provide data sources and additional description of all the variables employed in the estimation.

$M_{ij}^o$  ( $tk$ ) [or,  $M_{ij}^o$ ( $to$ )]. This refers to the aggregate (male and female in rural and urban areas) number of migrants from region  $i$  to  $j$  who reported employment as a reason for migration in duration of residence of 5-9 [or more than ten] years. In spite of these aggregations of rural-urban and gender flows, 6 observations in durations of residence of 5-9 years were found to be zero. Since zero value observations are not permissible for migration estimation under logarithmic functional form, the zero values were replaced by the non-zero and non-unitary values in the duration of residence of one-four years or total inter-regional migrations of all durations and for all reasons. *Source*: Census of India (1988).

$w_i$  ( $w_j$ ). This refers to the per capita net state domestic product at factor cost in current prices. *Source*: Central Statistical Organisation (1989).

$t_i$  ( $t_j$ ). This refers to the per capita owned tax revenue of a state government. Owned tax revenue includes taxes on income, taxes on property and capital transactions, taxes on commodities and services etc. *Sources*: Reserve Bank of India (1973 and 1976).

$s_i$  ( $s_j$ ). This variable refers to the per capita total federal transfers in region  $i$  to region  $j$ ; where total federal transfers to a region are the same as defined in the text. *Sources*: Reserve Bank of India (1973 and 1976).

$P_i$  ( $P_j$ ). This refers to the total population size where 1971 figures refer to census figures and 1972-74 figures refer to estimated population figure. *Source*: Economic Intelligence Service (1991).

$C_{ij}$ . This refers to the total railway distance between state capitals/major cities in India. For states which are not connected by railways, an approximate road distance to the nearest important railway (e.g. between Shillong and Gauhati) is added to the total railway distance. *Source*: Computed by the author based on: A Guide for Railway and Air Travellers, July 1986, No. 1445, Newman and Co., New Delhi.