T. K. Pachal

Internal Migration in India—Pattern, Implications and Policies

THE pattern of inter-state internal migration in India for the period 1901-1931 was studied among others by Zachariah [1]. For the subsequent period the availability of migration data in 1961 Census [2], has made it possible to study migration patterns in detail. This census included several new questions for collecting more information about migration. They are as follows : 4(*a*) Birth Place, 4(*b*) Birth Place R/U (Rural/Urban), 4(*c*) Duration of Residence, if born elsewhere, 5(*a*) Nationality. From the cross-tabulations of these data the migration pattern was studied among others by Bose [3] and Mitra [4]. But the long term effect of the migration pattern was not discussed. In this article, an attempt is made to study the long-run effect of the migration on population.

From the tables D-II and D-III of volume I (India), Part II C (iii) (Migration Tables) [2], an Interstate Inmigration-outmigration Table (Annual—Residence less then one-year) was constructed (Appendix I). Here whole of India is divided into 17 contiguous geographical areas. Now we define

(1) M_{ii} = Population who were enumerated in State i, were born in State i, or were in State i itself, before one year.

(2) M_{ij} = Population who were born in State i and enumerated in State j, duration of residence in State j being less than one year.

$\therefore$ $M_i = \sum_{j=1}^{17} M_{ij}$ = Total Population now enumerated at the date enumeration at different states ($j = 1, 2, \ldots, 17$) were in State i one year before.

$M \cdot j = \sum_{i=1}^{17} M_{ij}$ = Total population enumerated at the State j at the date of enumeration who were either in State j before one year or migrated to State j from different states ($i = 1, 2, \ldots, 17$) during the last one year.

Let $P_{ij} = \frac{M_{ij}}{M_i} (j = 1, 2, \ldots, 17; \quad i = 1, 2, \ldots, 17).$

$\therefore$ P_{ij} = Probability that person who was in State i moved to State j during the last one year.

Also $$\sum_{j=1}^{17} = 1.$$

Hence $P = ((P_{ij}))$ is a transition matrix (Appendix II).

Now from the transition matrix, it is obvious that from any state a person can move to any other state with positive probability. It implies that all states communicate and there is only one equivalent class. Also since diagonal elements of the transition matrix are positive, the periodicity of any state is 1, such a transition matrix is a regular transition matrix. Then it can be shown [5]

(1) The power P^n approach a probability matrix A.
(2) Each row of A is the same probability vector

$$\alpha = (\alpha_1, \ldots, \alpha_{17}).$$

(3) The components of α are positive.

Also

(*a*) For any probability vector π, πP^n approaches the vector α as n tends to infinity.

(*b*) The vector α is the unique probability vector such that $\alpha P = \alpha$.

(*c*) $PA = AP = A$. α is determined by the relation $\alpha (P - I) = 0$ subject to the condition

$$\sum_{i=1}^{17} \alpha_i = 1.$$

The value of α is as follows :

$\alpha_1 = 0.00216768$, $\alpha_2 = 0.02289086$, $\alpha_3 = 0.00203913$, $\alpha_4 = 0.01090250$
$\alpha_5 = 0.01741764$, $\alpha_6 = 0.18435448$, $\alpha_7 = 0.06634378$, $\alpha_8 = 0.05227423$
$\alpha_9 = 0.16988619$, $\alpha_{10} = 0.06057054$, $\alpha_{11} = 0.00370503$, $\alpha_{12} = 0.04517343$
$\alpha_{13} = 0.02318400$, $\alpha_{14} = 0.00869919$, $\alpha_{15} = 0.07137539$, $\alpha_{16} = 0.18320073$
$\alpha_{17} = 0.07581499$,

The distribution of population will be as follows.

TABLE 1—DISTRIBUTION OF POPULATION

States	*Initial distribution of population*	*Distribution of population after one year*	*Limiting distribution of population*
1. Jammu & Kashmir	0.00850164	0.00846668	0.00216768
2. Punjab & Haryana	0.04392115	0.04384776	0.02289086
3. Himachal Pradesh	0.00326724	0.00327587	0.00203913
4. Delhi	0.00487526	0.00515311	0.01090250
5. Rajasthan	0.04818250	0.04789934	0.01741764
6. Madhya Pradesh	0.07731276	0.07776467	0.18435448
7. Uttar Pradesh	0.17758473	0.17695533	0.06634378
8. Bihar	0.11205243	0.11170673	0.05227423
9. West Bengal	0.07613793	0.07658298	0.16988619
10. Assam, NEFA, Nagaland, Manipur and Tripura	0.03110841	0.03121182	0.06057054
11. Orissa	0.00436099	0.00431732	0.00370503
12. Andhra Pradesh	0.08711348	0.08693209	0.04517343
13. Madras, Pondicherry, Andaman & Nicobar Islands	0.08240784	0.08220458	0.02318400
14. Kerala, Laecadive, Minicoy & Amindivi Islands	0.04101192	0.04085770	0.00869919
15. Mysore	0.05663248	0.05606953	0.07137539
16. Maharashtra, Goa, Daman & Diu, Dadra & Nagar Haveli	0.09603513	0.09639755	0.18320073
17. Gujarat	0.04949391	0.04955695	0.07581499

From the Table 1, it is obvious that population of Madhya Pradesh, West

Bengal and Maharashtra group will increase from 7.7%, 7.6% and 9.6% to 18.4%, 17% and 18.3% of the total all India Population in the long run ,under the prevailing migration pattern. The population of Uttar Pradesh and Bihar will decrease from 17.8% and 11.2% respectively to 6.6% and 5.2% of all-India population in limiting situation. The gaining regions will be the Assam group, West Bengal, Mysore, Madhya Pradesh, Maharashtra group and Gujarat. Three major migration attraction centres have emerged and they are Madhya Pradesh, Maharashtra group and West Bengal. By controlling the underlying push and pull factros, the population distribution can be maintained at a desired pattern.

Acknowledgements

Thanks to S. R. Mohan and Prithwis Dasgupta for useful discussions.

References

1. **Zachariah, K. C.,** 1964, *A Historical Study of Internal Migration in the* ***Indian Sub-continent*** *1901-1931.* Asia **Publishing House.**
2. **Census of India, 1961,** Volume **I, INDIA,** Part **II C (iii) and** (iv), *Migration* ***Tables.***
3. **Bose, Ashish, 1975,** ***Studies*** *on India's Urbanization, 1901-1971.* **Tata McGraw Hill,** New **Delhi.**
4. **Mitra, Asok,** *Internal Migration and Urbanization of India.*
5. **Kemeny, J. C.** and Snell, J. L., *Finite Markov Chains.*

APPENDIX I

INTER-STATE INMIGRATION—OUT MIGRATION TABLE, INDIA 1961 (RESIDENCE LESS THAN ONE YEAR)

State where either born or resident one year before	*State of Enumeration*								
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1.	3493612	13724	1601	2195	360	757	2010	189	289
2.	5532	17988423	12035	42070	26906	12279	43981	4918	5342
3.	293	9145	1336980	1107	36	175	3311	28	69
4.	489	11584	219	1983510	1657	1745	11624	461	780
5.	266	33564	74	15153	19744456	63852	12984	4250	5321
6.	82	1810	44	1576	12120	31891686	18606	5152	4446
7.	1173	63788	3847	71941	18845	83609	73066985	35639	34234
8.	111	2672	67	1799	813	9761	16917	46114257	158090
9.	141	2315	55	2269	1344	5130	9198	29403	31425302
10.	19	1634	33	315	235	1789	1897	1581	13916
11	27	430	1	303	66	18079	532	5530	21319
12.	48	1029	11	969	373	11780	1251	1476	2140
13.	211	2512	17	2575	1034	6168	2678	2166	3818
14	58	1773	70	1918	597	4153	1795	1372	1261
15.	176	748	11	871	237	1358	804	421	614
16.	138	2872	26	2504	2252	48650	4807	1778	1745
17.	20	420	32	605	3107	7803	1423	909	1262
Total $(M \cdot j)$	3502396	18138425	1355123	2131680	19814438	32168774	73200803	46209530	31679948
Proportion to Grand Total	.00846668	0.04384776	0.00327587	0.00515311	0.04789934	0.07776467	0.17695533	0.11170673	0.07658298

	State of Enumeration								Total (M_t)	Proportion to Grand Total
	10	11	12	13	14	15	16	17		
1.	361	117	322	132	50	70	967	102	3516858	0.00850164
2.	4054	1531	2830	1160	603	1580	13101	2442	18168787	0.04392115
3.	147	6	53	26	13	32	120	14	1351555	0.00326724
4.	262	259	388	821	192	398	1829	606	2016824	0.00487526
5.	2236	662	1721	883	97	1502	14550	29999	19931570	0.04818250
6.	1234	8282	3382	991	177	447	27008	4791	31981834	0.07731276
7.	10087	1862	3392	1510	474	1557	50543	11680	73461166	0.17758473
8.	30548	10486	973	2560	163	328	2416	572	46352533	0.11205243
9.	5727	6809	1524	1277	403	734	3131	1085	31495847	0.07613793
10.	12844972	946	328	112	49	147	520	69	12868562	0.03110841
11.	5975	1745901	4140	266	71	154	1035	175	1804004	0.00436099
12.	1062	6098	35875872	14573	628	62302	54551	1920	36036083	0.08711348
13.	1982	1469	25482	33927967	30650	63458	14435	2885	34089507	0.08240784
14.	1486	553	5528	39165	16861070	29431	13029	2070	16965329	0.04101192
15.	378	95	19114	10856	2966	23333673	53212	1525	23427059	0.05663248
16.	673	560	15223	2362	2350	27282	39572420	41043	39726685	0.09603513
17.	157	301	774	763	1577	2024	53739	20399161	20474059	0.04949391
	12911341	1785937	35961046	34005424	16901533	23525119	39876606	20500139	413668262	1.00000000
	0.03121182	0.00431732	0.08693209	0.08220458	0.04085770	0.05686952	0.09639755	0.04955695	1.00000000	

State numbers are given in Table 1.

APPENDIX II

TRANSITION MATRIX

i/j	1	2	3	4	5	6	7	8
1.	0.99339012	0.00390235	0.00045524	0.00062414	0.00010236	0.00021525	0.00057153	0.00005374
2.	0.00030448	0.99007287	0.00066240	0.00231551	0.00148089	0.00067583	0.00242069	0.00027068
3.	0.00021679	0.00676628	0.98921613	0.00081906	0.00002664	0.00012948	0.00244911	0.00002072
4.	0.00024246	0.00574368	0.00010859	0.98348195	0.00082159	0.00086522	0.00576352	0.00022858
5.	0.00001335	0.00168396	0.00000371	0.00076025	0.99061218	0.00320356	0.00065143	0.00021323
6.	0.00000256	0.00005659	0.00000138	0.00004928	0.00037897	0.99718127	0.00058177	0.00016109
7.	0.00001597	0.00086832	3.00005237	0.00097931	0.00025653	0.00113814	0.99463416	0.00048514
8.	0.00000239	0.00005765	0.00000145	0.00003881	0.00001754	0.00021058	0.00036496	0.99485948
9.	0.00000448	0.00007350	0.00000175	0.00007204	0.00004267	0.00016288	0.00029204	0.00093355
10.	0.00000148	0.00012698	0.00000256	0.00002448	0.00001826	0.00013902	0.00014741	0.00012286
11.	0.00001497	0.00023836	0.00000055	0.00016796	0.00003659	0.01002160	0.00029490	0.00306540
12.	0.00000133	0.00002855	0.00000031	0.00002689	0.00001035	0.00032688	0.00003472	0.00004096
13.	0.00000619	0.00007369	0.00000050	0.00007554	0.00003033	0.00018094	0.00007856	0.00006354
14.	0.00000342	0.00010451	0.00000413	0.00011305	0.00003519	0.00024479	0.00010580	0.00008087
15.	0.00000751	0.00003193	0.00000047	0.00003718	0.00001012	0.00005797	0.00003432	0.00001797
16.	0.00000347	0.00007229	0.00000065	0.00006303	0.00005669	0.00122462	0.00012100	0.00004476
17.	0.00000098	0.00001963	0.00000156	0.00002955	0.00015175	0.00038112	0.00006950	0.00004440

i|j	9	10	11	12	13	14	15	16	17
1.	0.00008218	0.00010265	0.00003327	0.00009156	0.00003753	0.00001422	0.00001990	0.00027496	0.00002900
2.	0.00029402	0.00022313	0.00008427	0.00015576	0.00006365	0.00003319	0.00008696	0.00072107	0.00013441
3.	0.00005105	0.00010876	0.00000444	0.00003921	0.00001924	0.00000962	0.00002368	0.00008879	0.00001036
4.	0.00038675	0.00012991	0.00012842	0.00019238	0.00040708	0.00009520	0.00019734	0.00090687	0.00030047
5.	0.00026696	0.00011218	0.00003321	0.00008635	0.00004430	0.00000487	0.00007536	0.00073000	0.00150510
6.	0.00013902	0.00003858	0.00025896	0.00010575	0.00003099	0.00000553	0.00001398	0.00084448	0.00014980
7.	0.00046601	0.00013731	0.00002535	0.00004617	0.00002056	0.00000645	0.00002119	0.00068802	0.00015900
8.	0.00341060	0.00065904	0.00022622	0.00002090	0.00005523	0.00000352	0.00000708	0.00005212	0.00001234
9.	0.99776018	0.00018183	0.00021619	0.00004839	0.00004055	0.00001280	0.00002330	0.00009941	0.00003445
10.	0.00108140	0.99816685	0.00007351	0.00002549	0.00000870	0.00000381	0.00001142	0.00004041	0.00000536
11.	0.01181760	0.00331208	0.96779220	0.00229490	0.00014745	0.00003936	0.00008527	0.00057372	0.00009701
12.	0.00005938	0.00002947	0.00016922	0.99555415	0.00040440	0.00001743	0.00172888	0.00151379	0.00005328
13.	0.00011200	0.00005814	0.00004309	0.00074750	0.99526130	0.00089910	0.00186151	0.00042344	0.00008463
14.	0.00007433	0.00008759	0.00003260	0.00032584	0.00230853	0.99385458	0.00173477	0.00076798	0.00012201
15.	0.00002621	0.00001614	0.00000406	0.00081589	0.00046340	0.00012661	0.99601375	0.00227139	0.00006510
16.	0.00004393	0.00001694	0.00001410	0.00038319	0.00005946	0.00005915	0.00068674	0.99611684	0.00103313
17.	0.00006164	0.00000767	0.00001470	0.00003780	0.00003727	0.00007702	0.00009886	0.00262474	0.99634181

State numbers are given in Table 1.