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Measurement Of Urbanisation : An Indian Perspective

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INTRODUCTION

Population scientists accept that the phenomenon of urbanisation has more than one features which should be taken into account in its characterisation. The most popular measure is one which divides the total urban population by the total population, including rural, of a geographical or administrative entity. While it is an improvement over count measure which takes into account only the size of the urban population without relating it to the total population, it is deficient in a crucial respect that it ignores the distribution of urban population over different units. Population scientists have suggested to improve the matter by supplementing this traditional index, often called level or degree measure of urbanisation by a measure of relative dispersion of its additive inverse such as Gini coefficient of concentration. They did not succeed in properly combining the two and thus produce a composite index. I do not, however, suggest that no attempts have been made in that direction but only that the results were less than satisfactory.

MOTIVATION

In order to bring the point home, let me draw a parallel with national income. Most people were not happy with the size of national income alone and accepted that a better measure depicting welfare is per capita income. Comparison of per capita income over time and across space makes a better sense. So is the case with urbanisation. The size of urban population for many purposes may not be a proper description. Per capita urban population which is nothing but the proportion of total population that is urban, is a better measure and makes better sense when a comparison has to be made over time or across space.

Development economists were not happy with the idea of per capita income as it ignored the compositional and distribution aspects. Considering that distribution is an important aspect from the view point of welfare, Sen (1974) developed a computable social welfare measure which can be described as the product of (i) the per capita income and (ii) the additive inverse of Gini coefficient of concentration. Formally it is:

$$W = \frac{Y}{P}(1-G) \qquad (1.1)$$

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Where
W= the level of social welfare,
Y= the national income,
P= the size of population, and
G= the Gini measure of inequality of distribution of income over individuals.

We may note that the present Human Development Reports, prepared under the aegis of United Nations Development Programmes are taking due notice of this suggestion.

In parallel, one can develop an urbanization index I_U, which can be written as:

$$I_U = \frac{U}{P}(1-G_U) \qquad (1.2)$$

were
U = the size of urban population,
P = the size of total population,
G_U = the Gini measure of inequality of urban population over (urban) units of habitation.

If one thinks that the distribution of population over urban units is an important aspect and has to be taken into consideration simultaneously with its level aspect, (1.2) is a satisfactory answer.

It is not to suggest that the two indices – one by Sen in the realm of welfare and the other by me in the realm of urbanisation – are exactly parallel. For example, while (1.2) is unitless, (1.1) is not. Further, while (1.2) is bound between zero and unity, (1.1) is not. Yet, it helps in setting up the stage.

DEMOGRAPHERS' DISSATISFACTION

Indian demographers have also been showing their dissatisfaction with the level or degree index of urbanisation. Bose (1978:49) has specifically pointed out that the trends of urbanisation based on such a measures may even be misleading as this index grossly underestimates the concentration of urban population and its growth. He suggests that concentration indices such as proportion of city population to urban population should usefully supplement the above index. It may be noted that this proportion has become almost 2/3 in the last census, rising from less than 1/4 in the beginning of the century. Bose (1978:85) even develops the dichotomy of effective urban and quasi urban.

That the presently popular measure ignores the distribution aspect is also taken due notice by the office of the Registrar General of India (1984:1). The regions/states having the same degree (level) of urganisation in terms of percentages, it specifically mentions, 'may have quite different structure of urbanisation', implying that measuring the degree of urbanisation by way of calculating percentage of population needs to be supplemented with measures of size-structure as well.

I hold that the consideration of the two dimensions viz., level and structure, through their respective measures goes only half way whether they are applied simultaneously or sequentially. We cannot rank different geographical/administrative entities according to the two considerations discussed above unless we construct on single index encompassing the two dimensions.

Some attempts such as the ones by the office of the Registrar General of India (1985), Ramachandran (1989) and Rukmini (1996), are either partial or concentrate on aspect of geographical area. The index of urbanisation is defined by the Registrar General of India as the unweighted average of the reciprocals of the classwise population density of town. If we do not resort to grouping, it becomes the average of reciprocals of population size. In other words $I = (I/n) \Sigma (1/U_i)$.

Ramachandran (1989) normalises (subtracts the mean value) and standardises (divides by the standard deviation) three variables viz., (i) degree of urbanisation, (ii) rural population served by a town, and (iii) average distance to a town from a village in the area. The index is just the average of the three scores.

Rukmani (1996) has instead considered degree of urbanisation and geographical town density (number of towns per 1000 sq. km.) and defined the index as the sum of the two normalised and standardised varieties. I choose to ignore them here and move instead to look at the traditional index a little more closely.

A NEW LOOK AT THE OLD INDEX

The level index of urbanisation is an improvement over count (size) index. It can be described as proportion index or ratio index. Despite the suggestion made by Kingsley Davis (1972:46) that urbanisation be better measured by the ratio of urban population to rural population, the proportion index expressed as percentage of urban population to total population, could never be dislodged. Since human beings cannot live without food and towns do not grow much food, the ratio of urban population to rural population could be put in terms of support, holds Davis (1972:46). It can be sen that he is taking a radically different view.

We know that a given size of urban population will yield the same number whether it is actually concentrated in one unit or thinly spread over the rest of them or it is evenly spread over all the urban units, so long as the size of total population is given. In the former case, the diversification of economic activities which underlies the notion of urbanisation is just nominal. In the latter case, the diversification is well entrenched, well dispersed.

If dispersal of economic diversification is of considerable value, we should try to capture this dimension. Demographers have, however, proxied the phenomenon by the size of population in an urban unit. Demographers, economists and geographers look at the phenomenon from their respective angles. They could at most appreciate the other angles but could not make very fruitful use of the appreciation.

With a view to developing more meaningful indices, let us start with the traditional index I_T and look it from new angle. We know,

$$I_T = \frac{U}{P} \qquad (3.1)$$

whree U an P stand for total urban population and total population, We also know,

$$U = \Sigma U_i \qquad (3.2)$$

where U_i is the population of the i-the urban unit. We can therefore write (3.1) as,

$$I_T = \frac{1}{P} \Sigma U_i \qquad (3.3)$$

which can further be written as,

$$I_T = \left[\frac{n}{p}\right] \Sigma \left[\frac{1}{n}\right] U_i \qquad (3.4)$$

where n can be interpreted as the number of urban units. It is easy to see that (I/n) is a weight attached with U_i, which is invariant with U_i, (n/p) is a normalisation parameter depending upon n and P. we can generalise the index by varying W_i with U_i. We can then use a general normalistion parameter Q, and write a generalised urbanisation index I as,

$$I = Q \Sigma W_i U_i \qquad (3.5)$$

such that,

$$\Sigma w_i = 1 \qquad (3.5\ a)$$

For fixing Q, some normalisation axiom is needed. In case, the urban population is evenly spread, the weights are all equal. In other words, for $U_i = U/n$, i= 1,2,....n, we have $W_i = 1/n$, i=1,2,.....n. Naturally, urbanisation level is equal to (U/P) only. Substituting these values in (3.5), we find that $Q = n^2/P$.

GENERALISATIONS IN THE OLD FRAME

We can try making, W_i a function of U_i or i. In this section we try two weighting schemes both making, W_i a function of U_i. In the first case, let us use,

$$W_i = \frac{U_i}{U} \qquad (4.1)$$

substituting it in (3.5) one gets,

$$I_a = Q \Sigma \left[\frac{U_i}{U}\right] U_i \qquad (4.2)$$

Now if we apply the normlisation axiom which says that the level of urbanisation is (U/P) when all urban units share the same population. Using,

$U_i = U/n$, i= 1,2,....,n

and,

$W_i = U_i/U = (U/n)/U = 1/n$, i = 1,2,....,n

in (4.2) we find,

$$\frac{U}{P} = Q \Sigma \left[\frac{1}{n}\right] \left[\frac{U}{n}\right]_i = \frac{Q}{n} U \qquad (4.3)$$

which gives us,

$$Q = \frac{n}{P} \qquad (4.4)$$

The index is therefore,

$$Ia = \frac{n}{PU} \Sigma U_i^2 \qquad (4.5)$$

which preserves the properties of I_T and goes beyond. We may note that, in addition to P and U, it is depending upon the number of urban units n. If we translate ΣU_i^2 in such terms as include coefficient of vaiation of population distribution over urban units, if σ_u denotes the standard distribution, then

$$n \; \sigma_u^2 = \sum \left(U_i - U/n\right)^2 = \sum \left(U_i^2 + U^2/n^2 - 2UU_i/n\right) = \left(\sum U_i^2 - U^2/n\right)$$

which can be written as

$$\sum U_i^2 = n \;\; \sigma_i^2 + U^2/n = \left(U^2/n\right) \left(n^2 \sigma_u^2/U^2 + 1\right) = \left(U^2/n\right) \left(1 + C^2\right)$$

where C is the coefficient of variation ($n\sigma_u/U$),

we can see that Ia can be reduced as,

$$Ia = \frac{U}{P} (1+C2) \qquad (4.6)$$

where C is the coefficient of variation which is used as one of the important measures of inequality.

One can note that I_a in a way is normalised version of Kundu index (I_k) of urban accretion which Kundu and Raza (1975:111) define the distored growth of urban centres in relation to their own economic bases on the one hand an to the regional economy on the other. Kundu's index of urban accretion is given as $I_k = (U/n)(1+C^2)$. The relationship between the two therefore, is $I_a = (n/P) I_k$. Kundu (1980:36) interprets his index as the expected value of the size of the town for the urban population. A person randomly selected from the towns of the region in question, on an average, reports I_k as his town size. If however, the person were randomly selected from the region, we would lend up with the index of mean city size (I_A) developed by Arriaga (1969, 1974, 1975). Arriaga index, I_A, normally given as $(I/P) \Sigma U_i^2$, can be shown to be $(U/n)(U/P)(1+C^2)$. It is easy to see in Kundu index probability attached with U_i is U_i/U, wherein in Arriaga index is U/P.

Arriaga and Kundu index could be taken as modifications of the count measures of urbanisation for they are not unitless, the index developed here could be seen as normalisations of Arriaga and Kundu indices. It is easy to see the three indices being discussed here give greater weights to larger cities. They therefore, look at the phenomenon from a different angle. From our angle they show perverse property. Arriaga (1975) has though suggested truncation of urban units at some cutoff level, say L. The weights are equal to the size of the urban unit in case the size is less than L and equal to L if it is equal to greater than L. Translating the idea in our language, we can state it as:

$$I_A^* = \left(\frac{1}{P}\right)\left(L \sum_{Ui>L} + \sum_{Ui>L} U_i^2\right)$$

However, if we require binding between 0 and 1, we have to divide it by U. This reduces the extent of perversity but it remains.

The index also closely resembles to Gibbs scale of urbanisation (Gibbs 1966), in which U_i has to be interpreted as the sum of populations of the unit i and of those bigger than it. Gibbs index in our language can be written as,

$$I_G = (1/UP)\, \Sigma (\Sigma U_i)^2$$

In other words, U_i has to bo to replaced by $\Sigma (U_i)$. It means that in the Gibbs index the term associated with the lowest unit contributes the most and the term associated with the biggest unit contributes the least. In the index developed here the case is just the reverse and therefore, is expected to develop some perverse property. To be very specific, we will find that migration of a person from a smaller unit to a larger unit would produce a higher level of urbanisation according to this index. If we wish an index to show it, it is a good index. Normally we do not wish so.

Let us now use the following weighting scheme:

$$W_i = \frac{U-U_i}{U} \quad (4.7)$$

The index would then be given as,

$$I_b = Q\,\Sigma \frac{U-U_i}{U} U_i = \frac{Q}{U}(U^2 - \Sigma U_i^2) \quad (4.8)$$

Again imposing the same normalisation axiom as earlier, we get,

$$\frac{U}{P} = \frac{Q}{U}\left(U^2 - \frac{U^2}{n}\right) = Q\,U\frac{n-1}{n} \quad (4.9)$$

which in turn yields,

$$Q = \frac{n}{(n-1)p^*} \quad (4.10)$$

When we substitute be value of Q in (4.7) we finally get,

$$I_b = \frac{n}{(n-1)}\frac{1}{PU}(U^2 - \Sigma U_i^2) \quad (4.11)$$

which is independent of n for large n. Since the sum of squares of positive real numbers is always smaller than the square of their sum, the index is a positive number. Substituting the value of ΣU_i^2 in (4.11) and ignoring the difference between n and (n-1) one obtains,

$$I_b = (U/P)\,(1-(1/n)\,(1+C^2)) \quad (4.12)$$

One would note that in case of migration I_b would reduce for the reason I_a increases and vice versa. This property matches with our requirement.

A NEW FRAME AND A NEW INDEX

As suggested earlier I have developed a new index in recent years. It takes a view that it is actually the excess of population in a habitation unit beyond a threshold level (United Nations 1973), that defines it as an urban unit. One can see that Q is indeterminate in (3.5) if U_i is replaced by $(U_i - U^*)$ where U^* is the level which divides the habitations into rural and urban ones. We can therefore, reformulate (3.5) as below:

$$I = Q\Sigma W_i\,(U_i - U^*) + R \quad (5.1)$$

Using this formulation I have constructed a new index (Chaubey 1992; 1993) and given a couple of variants thereof (Chaubey 1994). It has then to be taken as an offshoot of my work in the area of poverty measurement. I have taken cues from Sen (1974, 1976) and Takayama (1979). The test axioms and normalisation axioms are appropriately set up by me.

The index proposed considers the view that the urbanisation index should reflect both the (i) division of population between urban and rural segments and (ii) distribution of population among urban units of habitation. In other words, its should reflect both (a) between class distribution of population and (b) within class distribution of urban population. Thus, it becomes a matter of converting a partial ordered population vector truncated at threshold line into a scalar.

The desirable features that this scalar should posses are two. One when all urban units grow simultaneously at the same rate, there could hardly be a disagreement that the magnitude of urbanisation index should rise. We can call it growth axiom. When they do not rise at the same rate, one is not sure whether urbanisation increases at all. We hold that disproportionate rise in favour of bigger units should lower the magnitude of the index. We can call it distribution axiom. Formally:

Growth Axiom: Other things remaining the same, an increase in average size of urban units results in an increase in the urbanisation index.

Distribution Axiom: Other things remaining the same, relative distribution in favour of bigger units results in the urbanisation index.

Let the unit-wise populations be ordered as below:

$$U^* \leq U_1 \leq U_2 \leq \ldots\ldots \leq U_i \leq \ldots\ldots \leq U_n \qquad (5.2)$$

and the excess population be defined as,

$$E_i = U_i - U^* \qquad (5.3)$$

so that the unitwise excess population be ordered as below:

$$O \leq E_1 \leq E_2 \leq \ldots\ldots \leq E_i \leq \ldots\ldots \leq E_n \qquad (5.4)$$

Keeping in mind the distribution axiom, let us assign larger weights to smaller excesses, i.e.,

$$W_1 > W_2 > \ldots\ldots > W_i > \ldots\ldots > W_n \qquad (5.5)$$

so that the contribution of unit i to the urbnisation unit is proportional to W_iE_i.

Although there could be various weighting schemes satisfying (5.4), we can make use of the practice popularised by Sen in the area of measurement of poverty, inequality and social welfare. It is the de Borda rule of ordinal rank weighting:

$$W_i = n + 1 - i. \qquad (5.6)$$

Making use of the aggregation scheme outlined in (5.1), we can write the new index I as below:

$$I_c = Q\,\Sigma\,(n+1-i)\,(U_i - U^*) + R \qquad (5.7)$$

which can be simplified as,

$$I_c = Q\,[\,\Sigma\,(n+1-1)\,U_i - \frac{n^2}{2}U^*] + R \qquad (5.8)$$

when we ignore the difference between n and n+1.

From the standard definition of Gini coefficient of concentration (Sen 1973; Chaubey 1996), we can write,

$$\Sigma\,(n+1-1)\,U_i = \frac{nU}{2}(1-G) \qquad (5.9)$$

Substituting (5.9) in (5.8) one gets,

$$Ic = Q\frac{n^2}{2}\left[(1-G)\frac{U}{n} - U^*\right] + R \qquad (5.10)$$

Now in order to fix the normalisation parameters Q and R, we make use of the traditional index which ignores distribution aspect. G is zero when all units have the same population. Let us then set up following two axioms:

NA1: When all units have population equal to U*, according to traditional index, the urbanisation is equal to (nU*/P).

NA2: When all units have equal population (U/n) > U*, then urbanisation is equal to (U/P).

Invoking NA1 and NA2 we get,

$$\frac{nU^*}{P} R \qquad (5.10)$$

and

$$\frac{U}{P} = Q\frac{n^2}{2}\left[\frac{U}{n} - U^*\right] + R \qquad (5.11)$$

On substitution (5.10) in (5.11), we get,

$$Q = \frac{2}{np} \qquad (5.12)$$

Substituting (5.10) and (5.12) in (5.9) and doing a little algebraic transposition we finally obtain,

$$Ic = (U/p)\,(1-G) \qquad (5.13)$$

where (1-G) can be described as the Gini coefficient of dispersion.

A couple of variants, under similar considerations have been discussed in Chaubey (1994).

PROPERTIES

In this section we compare the traditional index I_T, two generalisations I_a and I_b and the new index I_c.

The new index is simple and easy to compute in view of the fact both (U/P) and G are often readily available. Calculating I_a and I_b for ungrouped would be tedious and for grouped data modifications would be needed. The virtue of computational ease is now underplayed in view of the availability of computational facility. For showing how well it fares in comparison to other indices we formulate three polar cases with their ideal values.

Case 1 : When there exists no urban unit, the urbanisation level is zero.

Case 2 : When all habitations are urban and have equal population, the urbanisation level can be set at one.

Case 3 : When all urban habitations share equal population, the urbanisation level is equal to (U/P).

When we put the four indices to this test we find that all four indices pass three tests except I_a and I_b in the very first case they are indeterminate.

If we take up the issue of migration we find that all the four indices find favour with it. However, if we consider urban to urban migration, the traditional index is a non starter. While I_a reduces when a migration takes place from a bigger urban unit to a smaller urban unit, I_b and I_c do the reverse. Most people would like Pigou-Dalton condition of income transfer to hold here as well, which means people would like urbanisation index to lower the level when a person migrates from a smaller urban unit to a bigger urban unit.

One may note that all indices suffer from one weakness. If all habitations are urban and are of the same size, the level of urbanisation shown by all indices is unity irrespective of the case whether population is just equal to the threshold population U* or a large multiple of it. Once all habitations achieve the urban status and share equal population, the indices considered herein fail to recognize the gains to all habitations that are equal. Only the count measure to which we have not given any importance recognises it.

A specific property of I_c is worth noting. If urban population is so disproportionately distributed as to make G approach unity, the level of urbanisation approaches to zero even if a very large proportion of population is living in urban units. Some variants suggested in Chaubey (1994) are not so extremist.

AN EMPIRICAL EXERCISE

According to the traditional index I_T the level of urbanisation had been improving in all states since 1951 except between 1951-1961 when a few major states like Gujarat, Karnataka, Rajasthan, and Uttar Pradesh lost because of drastic declassification of many urban units as a result of major revision in the definition of the urban place. The country as a whole also showed a reduction in the level in 1961 over 1951. But according to the new index I_c the case had never been so even. It has shown improvement and deterioration as a balance of positive feature of the rise in urban population and negative feature of unbalanced urban development. Better distribution of urban population would mean improvement of landscape and living conditions in metropolitan cities and of economic conditions of smaller towns in terms of activities. Since non-statutory census towns play a significant role, economic policies of a state will also be reflected in the new index. The phenomenon of urbanisation, according to the new index I_c has shown flip-flop tendencies (Annexure Table 1).

One can also see that the rankings of the states by the two indices are significantly different. While it is Maharashtra which shows highest level of urbanisation according to I_T since 1961, one would find that it is either Tamilnadu or Karnataka which dominates the scene according to I_c. Similarly while Orissa is the worst performer on I_T scale, Bihar share with Orissa on I_c scale, (Annexure Table 2) which shows the rankings of the state according to I_T and I_c along with *count measure* U.

If we single out West Bengal for case study, West Bengal is the state having fourth largest share of urban population in all the censuses. When we make use of index traditionally measuring the degree of urbanisation, the state which was the third in 1951 becomes the fourth in 1961 and 1971, sixth in 1981 and 1991. But in terms of the index which takes care of disparity in the distribution of population over urban, the state of West Bengal which was the sixth from below in 1951 and fluctuates between the fifth and the seventh from below between 1961-1981, becomes the third after Bihar and U.P., while its urbanisation pattern is better than Bihar and U.P., it is worse than Orissa and Madhya Pradesh.

Similarly if we take out Maharashtra, we find, whether by *count measure* or by *traditional index*, that it occupies the first place among the major states. But when we apply the index I_c, most of the times it occupies the seventh place but in 1981 it stands tenth. It is understandable because out of the ten most populous cities three (viz., Mumbai, Pune, and Nagpur) are in Maharashtra. Take the case of U.P., it occupies the second place by *count measure* after Maharashtra. But it occupies the place second from the bottom by the other two measures.

CONCLUSION

Those who believe that urbanisation is good for the humanity do favour policies that allow conversion of rural units into urban ones through diversification of economic activities. In India we have many large villages, approaching 50000 which need urgent diversification of their economic activities. All indices will favour it. All indices except I_c also favour migration from rural units to urban ones. I_b and I_c weigh the rise in proportion with that in concentration. I_c may not even favour migration from rural habitations to larger urban habitations as it may raise the level of concentration.

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ANNEXURE

Table 1
Level of Urbanisation Measured By I_T and T_C

State	Index	1951	1961	1971	1981	1991
INDIA	I_T	17.59	18.24	20.12	23.70	25.72
	I_C	07.85	20.21	07.52	08.63	08.23
Andhra Pradesh	I_T	17.42	17.44	19.31	23.32	26.84
	I_C	08.95	08.64	08.23	09.82	10.70
Bihar	I_T	06.77	08.43	10.00	12.47	13.17
	I_C	03.39	04.29	05.12	05.94	05.22
Gujarat	I_T	27.23	25.77	28.08	31.10	34.40
	I_C	13.15	10.82	10.98	11.63	10.57
Haryana	I_T	17.07	17.23	17.66	21.88	24.79
	I_C	09.75	09.29	09.25	10.15	08.94
Karnataka	I_T	22.95	22.23	24.31	28.88	30.91
	I_C	11.87	10.21	10.33	11.99	08.58
Kerala	I_T	13.47	15.11	16.24	18.74	26.44
	I_C	07.15	08.39	07.99	10.55	10.29
Madhya Pradesh	I_T	12.02	14.29	16.29	20.29	23.21
	I_C	05.95	06.96	07.20	08.95	08.56
Maharashtra	I_T	22.75	28.22	31.17	35.03	38.73
	I_C	08.69	08.38	08.42	08.86	09.41
Orissa	I_T	04.06	06.32	08.41	11.79	13.43
	I_C	02.62	03.92	04.63	06.21	07.42
Punjab	I_T	21.72	23.06	23.73	27.68	29.72
	I_C	10.51	10.40	10.18	10.85	10.54
Rajasthan	I_T	18.50	16.28	17.63	21.04	22.88
	I_C	10.18	08.25	08.00	09.45	09.53
Tamil Nadu	I_T	24.35	26.69	30.26	32.95	34.20
	I_C	11.27	11.66	11.62	11.56	10.71
Uttar Pradesh	I_T	13.64	12.85	14.02	17.95	19.89
	I_C	05.91	04.93	05.12	07.12	06.65
West Bengal	I_T	23.88	24.45	24.75	26.46	27.39
	I_C	07.57	08.04	08.12	09.26	07.23

Source: Cmpiled by the Author basd on *Indian Urbanisatin 1901-2001*, Vikas Publishing House, Delhi.

Table 2
States Ranked According To Different Measures

1951			1961			1971			1981			1991		
U	I_T	I_C	U	I_T	I_C	U	I_T	I_C	U	I_T	I_C	U	I_T	I_C
MHR	GUJ	GUJ	MHR	MHR	TN	MHR	MHR	TN	MHR	MHR	KRT	MHR	MHR	TN
UP	TN	KRT	UP	TN	GUJ	TN	TN	GUJ	UP	TN	GUJ	TP	GUJ	AP
TN	W B	TN	TN	GUJ	PJB	UP	GUJ	KRT	TN	GUJ	TN	TN	TN	GUJ
W B	KRT	PJB	W B	W B	KRT	W B	W B	PJB	W B	KRT	PJB	W B	KRT	PJB
AP	MHR	RJS	AP	PJB	HRN	AP	KRT	HRN	AP	PJB	KRL	AP	PJB	KRL
KRT	PJB	HRN	KRT	KRT	AP	GUJ	PHB	MHR	KRT	W B	HRN	MP	W B	RJS
GUJ	RJS	MHR	GUJ	AP	KRL	KRT	AP	AP	GUJ	AP	AP	GUJ	AP	MHR
MP	AP	AP	AP	HRN	MHR	MP	HRN	W B	MP	HRN	RJS	KRT	KRL	HRN
RJS	HRN	W B	BHR	RJS	RJS	BHR	RJS	RJS	BHR	RJS	W B	BHR	HRN	KRT
BHR	UP	KRL	RJS	KRL	W B	RJS	MP	KRL	RJS	MP	MP	RJS	MP	MP
PJB	KRL	MP	PJB	MP	MP	KRL	KRL	MP	KRL	KRL	MHR	KRL	RJS	ORS
KRL	MP	UP	KRL	UP	UP	PJB	UP	UP	PJB	UP	UP	PJB	UP	W B
ORS	BHR	BHR	HRN	BHR	BHR	ORS	BHR	BHR	ORS	BHR	ORS	ORS	ORS	UP
HRN	ORS	ORS	ORS	ORS	ORS	HRN	ORS	ORS	HRN	ORS	BHR	HRN	BHR	BHR

Source: Computed by theAuthor based on the source as of the Table 1.