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Cities and Towns in India: Judging the Quality of Urbanisation

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Abstract

In this paper we examine the quality of urbanisation in terms of deprivation index developed at a highly disaggregated level of urban centres (city/town) on the basis of dwelling conditions, basic amenities and assets in possession. Further, the demographic and economic characteristics in relation to the deprivation index and city size are examined. Very large cities endowed with better living conditions and infrastructural facilities are displaying lower magnitude of the index, though this relationship is not very strong, suggests the importance of other variables that are impacting on the index value. Although large cities experience agglomeration economies, they do not benefit all sections of the population equally which in turn does not necessarily bring in proportionate decline in deprivation index with a rise in city size. The group of "smart cities" selected by the present government for further investment and making cities the key centres of growth comprises a number of million-plus and other large cities, which have already benefitted from the past investment. However, a number of counter-intuitive results follow from the exercises carried out for the 'smart cities'– for example, the phenomenon of inclusive growth seems missing. This paper argues that at least all class 1 cities (each with a population of 100,000 and above) could have been considered to form the category of 'smart cities'.

Keywords: deprivation index, smart cities, infrastructure, agglomeration economies, growth

JEL: R10, R11, R12

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1. Introduction

This paper makes an attempt to construct deprivation index in terms of dwelling conditions, availability of basic amenities and asset base of the households for all urban centres (statutory towns and census towns both) in India and examines its linkage with other economic and demographic variables. This provides a basis to assess the quality and nature of urbanisation in the country. In particular, we try to judge the dynamic nature of the million plus cities and other class I cities (each with a population of 100,000 and above), which comprise around 60 per cent of the total urban population and are expected to be the engine of growth. The selection of 100 smart cities by the present government is another interesting issue which the paper delves into. The growth dynamics of the census towns which are emerging so rapidly in the country is also addressed in the paper. The organisation is as follows. In the present section we deal with framework based on agglomeration literature which envisages a direct relationship between city size and growth potentiality. Section 2 covers the estimation of deprivation index and its relationship with city size. Section 3 examines the association between deprivation index and other demographic and economic variables. Issues related to smart cities are taken up in section 4 and section 5 summarises the major findings.

It may be useful to begin with some of the questions such as how large cities emerge and play a crucial role in augmenting productivity. The concept of agglomeration economies which leads to productivity gains is associated with unequal urbanisation but that may be desirable from the point of view of resource conservation or optimal use of resources. As cities get exhausted in terms of productivity gains the city limit expands further in order to minimise the negative externalities on the one hand and continue to reap some of the benefits associated with largeness. Since agglomeration economies attenuate across geographical space the cities expand to cover the rural hinterland. Can the phenomenon of urban sprawl be rationalised with such advantages associated with the urbanisation process? Perhaps yes because agglomeration economies, as mentioned above enhance productivity; consequently productive regions grow more rapidly. Glaeser and Kahn (2004) argue that sprawl is not the result of government policies or the lack of good planning; rather it is the outcome of people's preference to reside in faraway localities in the midst of green environment, and commute to work places, using their own transport. As commuting costs fall, the edge of the city expands.

The new economic geography uses general equilibrium models with monopolistic competition and the existence of two sectors (modern and traditional). Though the modern sector in the historical sense was manufacturing, in the present context the service industry falls within the scope of the modern sector because the firms in this industry not only supply consumers and manufacturing firms but also serve each other as highlighted by Ottaviano and Thisse (2004). The trade-off between increasing returns and mobility costs as envisaged in new economic geography framework also generates limits to the growth of the existing cities. People from rural areas at times migrate to nearby towns even if a great deal of opportunities do not exist in comparison to the large centres which are attractive in terms of agglomeration economies manifested not only through higher productivity growth but also higher wages and better wellbeing levels. High cost of land, difficulty to access housing, high transport cost,

overuse of the existing amenities and other kinds of struggle set limits to migration into large cities.

Further, with agglomeration economies economic growth is positively associated but regional divergence tends to increase. Even when countries tend to experience growth and convergence, divergence within a given country is most likely to occur as agglomeration benefits are exploited to raise the non-input driven component of growth. In such a situation the government policy at times deliberately chooses to create new urban centres so that with more growth centres divergence and related problems of inequality and social and political unrest may decline. As Mohan (1993) pointed out most of the governments in developing countries, in fact, tried being against the principle of concentration though it actually could benefit them to experience higher growth without proportionate increase in resource use. Thus ,in the face of under capacity utilisation fresh capacity is created to curb inequality.

The other important source of new urban centre can be found in the rural transformation literature. The demand induced explanation would rationalise it in terms of population shifting from agriculture to non-agriculture activities in response to growing demand in the latter, resulting in the change in the designation of the same areas from rural to urban. On the other hand, the supply push theory perceives excess supplies of labour in the agriculture sector being absorbed residually in low productivity non-agricultural activities such as petty trade and services. In such a situation though urbanisation of the area takes place from definitional point of view, it is not generative in nature, meaning it does not lead to economic growth and poverty reduction. The agglomeration economies in large cities not only benefit business firms but also consumers. For example, in large cities there are usually a number of labour recruitment centres (informal), and as the new contacts develop, individuals tend to access more than one labour recruitment centres simultaneously, which in turn raises the options leading to occupational mobility and the possibility of accessing higher incomes (Mitra, 2010). Better connectivity, cheap transport system and the availability of alternative modes of transport help individuals commute faster, which does not restrict them to secure jobs in the neighbourhood of where they reside. Further, labour exploitation in large cities is less as unions and various voluntary organizations in some form or the other safeguard the interest of the general public. The anonymity of individuals particularly from the point of view of those who belong to disadvantaged castes helps break the legacy of the caste-based occupations (Kumar, Kumar and Mitra 2009). The sense of urbanism is supposedly more prevalent in large cities which help people overcome the barriers of caste and other social hindrances and follow a more market oriented approach. From all this it may be inferred that individuals across various socio-economic sections benefit in terms of accessing sustainable livelihoods in large urban settlements vis-à-vis small towns.

In the backdrop of these views it will be interesting to examine the nature of cities and towns in India. Whether large cities have better infrastructure and living conditions, resulting from higher public as well as private investment? Higher public investment might have been incurred to reap the agglomeration economies while higher private investment could be related to the productivity gains. Whether these improved living conditions and earnings also reflect in better demographic and economic indicators is the other question which we investigate in the paper and that justifies why we first estimate a deprivation index and then relate it to the other variables. Two sets of data from the population census 2011 are pursued: (a) data specific to amenities and housing quality and (b) the demographic and economic data. The second set is quite limited in terms of the number of variables. Nevertheless it provides a basis to focus on some of the issues related to urban development.

2. Deprivation y Index

We begin our analysis by estimating the deprivation index for all the urban centres (statutory and census towns) based on the variables given in Table 1. These variables cover dwelling conditions, access to basic amenities and certain assets which are important for wellbeing, awareness and mobility in the labour market. The poor quality of houses people reside naturally reflects on poor levels of living and their vulnerability in relation to a number of exigencies. Similarly the lack of safe drinking water, electricity and sanitation make them more susceptible to ill health and poor productivity. On the whole these indicators give us a broad idea of the quality of urbanisation that the country has experienced. On priori basis one may hypothesise that population pressure may lead to the growth of urban centres but not necessarily in such a situation urbanisation can be taken as an indicator of development if many of these variables are large in magnitude.

Table 1: List of Variable Used for Estimating the Deprivation Index

Variable	Definition
Condition of census house	% of Households with dilapidated census houses
Material of roof	% of Households with house roof made of Grass/ Thatch/ Bamboo/ Wood/Mud/Plastic/ Polythene
Material of wall	% of Households with house wall made of Grass/ Thatch/ Bamboo/Plastic/ Polythene/Mud/Unburnt brick
Material of floor	% of Households with house floor made of Mud/Wood/ Bamboo
No of dwelling room	% of Households with no exclusive room or one exclusive room
Ownership status	% of Households living in rented house
Source of drinking water	% ofHouseholds using untreated tap water or water from un-treated source/Un-covered well/Spring/River/ Canal/Tank/Pond/Lake etc.
Main source of light	% of Households without electricity connection
Latrine facility	% of Households who do not have latrine facility within premises
Waste water outlet	% of Households without connection to closed drainage
Type of fuel used for cooking	% of Households who use cooking fuel other than LPG/Electricity/biogas
Banking service	% of Households without availing banking services
Availability of television	% of Households who don't own television

Number of specified assets	% of Households who do not own Radio/Transistor, Television, Computer, Telephone/mobile phone, Bicycle, Scooter/Motorcycle/Moped, Car/Jeep/Van, Households with TV, Computer/Laptop, Telephone/Mobile phone and Scooter/ Car

Note: All variable are in percentage terms

Source: Primary Census Abstract, Population Census 2011

Factor analysis has been carried out on these variables in order to work out a single index value for each of the urban centres. Since the variables are highly heterogeneous combining them to form a single index poses certain challenges. In order to avoid the problem of assigning weights on subjective basis factor analysis has been carried out on the variables. The factor analysis results presented in Table 2 are not counter intuitive. Hence, the results can be used to construct a meaningful index. All the variables have the same sign except one (% of households exposed to unsafe drinking water) in factor 1; but the magnitude of factor loading is very low. Similarly in factor 2 the households with inadequate space and percentage of households living in rented units take negative signs but again the magnitudes are highly insignificant. These are the two factors which are significant and corresponding to these factors the variables which have significant factor loadings also have the right signs, indicating the fact that the movement in the set of variables representing vulnerability at the city or town level unravel a consistent relationship. In other words, cities/towns with a high percentage of bad dwelling units also registered a high percentage of households without basic amenities, suggesting considerable overlaps between attributes, i.e., households deprived of one particular facility are also deprived of another.

Table 2: Factor Loadings of Variables Considered for Vulnerability Index

Variable	Factor 1	Factor 2
Condition of Census House	0.4105	0.3019
Material of roof	0.1927	0.2320
Material of wall	0.1484	0.7966
Material of floor	0.05833	0.6846
No of dwelling room	0.2299	-0033
Ownership status	0.6279	-0.0698
Source of drinking water	-0.0817	0.1124
Main source of light	0.7797	0.1765
Households latrine facility	0.4059	0.0927
Waste water outlet	0.2253	0.3128
Type of Fuel used for Cooking	0.7264	0.2293
Banking services	0.4027	0.0992
Availability of Television	0.9365	0.1658
None of the assets specified	0.7488	0.1877
Eigen Value	5.06	1.25
Percentage Variation explained	0.67	0.17

N =6279;

Note: There are a total of 7935 urban centres in India classified as census towns and statutory towns as per the 2011 census. In total, there are 3894 census towns and 4041 statutory towns. In our dataset we have considered

urban agglomerations - all urban towns which are part of the urban agglomeration are taken together. (Besides 6 census towns are missing in our dataset.) Finally, we get a total of 6279 urban centres of which 2563 are census towns and are not part of any urban agglomeration.

Source: Based on Population Census, 2011

Using the factor loadings as the weights the index has been formed at the city/town level. Since there are two factors which are statistically significant two sets of indices have been generated and both have been combined using the Eigenvalues as the weights. The other factors are not being considered because they are not statistically significant. Factors 1 and 2 are the only sets each of which has an Eigenvalue greater than 1. Thus, two indices are formed at the first stage using the factor loadings of each of the two factors. Then both are combined (using the proportion of the respective Eigenvalue to the total sum of the Eigenvalues of all real factors as the weight) to form one index.

The findings suggest that a large percentage of urban centres, particularly the ones which are small in size, correspond to a high level of vulnerability index (Table 3). In other words, the urban centres which belong to the bottom size classes of the index are mostly large in size. Conforming to this pattern most of the million plus cities have a low index value. As regards the other class I cities, again many of them are better off though a sizeable chunk (97 in absolute terms) among the ones of population base 100,000 to 500,000 have an index value of more than 125. The density plots (probability density function) of all cities and towns (both statutory and census) appear like a log normal distribution, i.e. the highest frequency of urban centres (mode) corresponds to a relatively lower magnitude of the index value (Plot 1 in the appendix).

Table 3: Distribution of Index Value by Population Size of Cities and Towns

	Statutory town						Census Town
No of Town	3716						2563
	Million Plus	5-10 lakh	5-1 lakh	50,000-1lakh	50000-10000	<10000	
Total	53	40	370	451	2230	572	2563
Index Range							
0-100	44	27	179	157	361	134	595
100-125	7	9	94	111	352	48	365
125-150	1	1	44	69	350	78	336
150-200	1	3	42	81	577	125	518
200-250	0	0	9	24	380	99	394
250-300	0	0	0	7	152	66	222
>300	0	0	2	2	58	22	133

Source: Based on Population Census, 2011

Statutory towns include all places with a municipality, corporation, cantonment board or notified town area committee area etc. On the other hand, the definition of census towns is based on the following criteria: (a) a minimum population of 5000 (b) at least 75 percent of the male main working population being engaged in non-agricultural pursuits, and (c) a density of population of at least 400 per square kilometre. The census towns are urban as per the definition of the registrar general (population census) but not declared as urban centres by the government of India. Among the total census towns of 3894 only 2563 appear in Table 3 because the rest are part of the urban agglomerations of the existing cities and six are non-traceable. The statutory cities and towns shown in Table 3 include urban agglomerations; not the metropolitan areas only. Table 3 verifies that nearly half of the census towns which are not part of the urban agglomerations have a vulnerability index value of more than 150.

There are several states which have cities with very high index values, particularly so in some of the low income states, though West Bengal is an exception in this respect, i.e., without being a low income state it has a number of cities and towns with high index values. In some of the low income states the level of urbanisation is also low but in some other low income states the rural transformation has taken place to a sizeable extent as agriculture is not able to provide sustainable livelihood opportunities, compelling many to take recourse to petty activities in the non-farm sector, which in turn resulted in the emergence of urban centres (Table 4).

Table 4:Number of statutory Cities/Towns by Deprivation Index Range across States

			Index Range						
No	State	No of cities	<100	100-125	125-150	150-200	200-250	250-300	>300
1	JAMMU & KASHMIR	111	49	12	17	23	8	2	0
2	HIMACHAL PRADESH	58	57	1	0	0	0	0	0
3	PUNJAB	211	161	37	11	2	0	0	0
4	CHANDIGARH	1	1	0	0	0	0	0	0
5	UTTARAKHAND	91	64	8	7	11	1	0	0
6	HARYANA	143	77	34	14	15	2	1	0
7	NCT OF DELHI	1	1	0	0	0	0	0	0
8	RAJASTHAN	285	58	73	66	76	10	2	0
9	UTTAR PRADESH	800	55	69	90	194	228	128	36
10	BIHAR	173	2	5	9	30	43	48	36
11	SIKKIM	9	7	0	1	1	0	0	0
12	ARUNACHAL PRADESH	27	8	5	6	8	0	0	0
13	NAGALAND	25	3	1	4	11	6	0	0
14	MANIPUR	34	2	1	5	6	10	7	3
15	MIZORAM	23	2	1	9	8	2	1	0

16	TRIPURA	42	1	2	6	18	12	3	0
17	MEGHALAYA	11	1	2	1	2	5	0	0
18	ASSAM	196	16	27	29	51	44	20	9
19	WEST BENGAL	665	20	27	44	178	175	119	102
20	JHARKHAND	187	4	21	28	62	48	16	8
21	ORISSA	216	10	13	22	58	77	29	7
22	CHHATTISGARH	172	4	3	13	54	63	26	9
23	MADHYA PRADESH	438	29	58	59	151	100	35	6
24	GUJARAT	282	73	58	77	55	15	3	1
25	DAMAN & DIU	8	2	1	1	4	0	0	0
26	DADRA & NAGAR HAVELI	6	1	1	0	3	0	1	0
27	MAHARASHTRA	502	176	110	80	110	23	3	0
28	ANDHRA PRADESH	269	101	84	62	22	0	0	0
29	KARNATAKA	318	119	77	48	56	18	0	0
30	GOA	63	57	3	2	1	0	0	0
31	LAKSHADWEEP	6	5	1	0	0	0	0	0
32	KERALA	63	39	19	5	0	0	0	0
33	TAMIL NADU	832	288	229	161	135	16	3	0
34	PUDUCHERRY	6	3	3	0	0	0	0	0
35	ANDAMAN & NICOBAR ISLANDS	5	1	0	2	2	0	0	0
	TOTAL	6279	1497	986	879	1347	906	447	217

Source: Based on Population Census, 2011

In section 1 we argued that large cities exhibit higher levels of agglomeration economies, resulting in higher levels of productivity. Hence, large cities are expected to have generated greater investment. Thus population size and deprivation index may move in the opposite direction, indicating an inverse relationship. However, in order to capture the non-linearity that may exist in the real world we have estimated a quadratic function between deprivation index and population size. In other words, both population size and the square of population size have been considered. Population size is measured in terms of logarithmic transformation of the population magnitude as the absolute values are too large. This is only a transformation on the scale without violating the basic principle of the relationship.

The regression of deprivation index on city size and its square shows that larger the city size, lower is the magnitude of index after there is a positive relationship between the two at the initial stages. This is understandable as large cities may be attracting large investments. However, the explanatory power of the equation is very poor, implying that the size variable alone is not able to explain a significant variation in the deprivation index. Though with the

insertion of state dummies the adjusted R2 improves substantially, the t ratios corresponding to the coefficients of many of the state dummies are insignificant, indicating the problem of multicollinearity (Table 5). The adjoining states possibly do not differ significantly from each other when it comes to state averages in the index value and the influence of state specific variables. From this point of view regrouping of states had to be done and we introduced regional dummies instead of state dummies (see tables in the appendix). There are some overlaps between the geographical location and the growth levels. For example, some of the geographical spaces comprise mostly the low income states, and similarly some of the high incomes states are also located in adjoining space though there is no one to one correspondence, strictly speaking. Hence, we have re-estimated the equations with dummies for geographic regions as well as income levels, separately. Besides, we have regrouped states on the basis of their level of urbanisation. The (probability) density plots of cities/towns (according to the index value) in different geographical regions or income categories are different as can be verified from graphs (2 to 4) presented in the appendix.

As per the regression results, while the inverted u shaped relationship between size and index remains intact in all the formulations, the dummies after regrouping are all significant (Table 6). Region-wise four and five correspond to lower indices while two and three are characterised by higher values relative to the comparison group, which is one. In terms of per capita state domestic product the states with very high income levels (category 1) have a lower index value compared to the third category while the second, fourth and fifth unravel a higher value, not showing a clear cut relationship between income categories and index values. However, with respect to urbanisation there is an inverse relationship: in comparison to the fifth category which represents the least urbanised states the other categories have lower magnitudes of the intercept. On the whole, we are able to observe that the relationship between per capita income and the deprivation index is not very distinct. In other words, in the process of growth not necessarily the cities are able to reduce the deprivation index, suggesting the possibility of non-inclusive growth taking place in the country. However, as regards urbanisation, its beneficial effect is evident with declining deprivation index.

Table 5: Regression table

Variable	Coefficient	t value
Log Population	30.09311	5.8
Log Population Square	-2.039416	-8.26
Jammu & Kashmir	-95.85	-1.89
Himachal Pradesh	-158.75	-3.12
Punjab	-129.75	-2.56
Chandigarh	-72.4822	-1.03
Uttarakhand	-128.75	-2.54
Haryana	106.17	-2.1
Rajasthan	76.59	-1.51

Uttar Pradesh	-15.33	-0.3
Bihar	40.89	0.81
Sikkim	-132.21	-2.49
Arunachal Pradesh	-90.65	-1.77
Nagaland	-44.46	-0.86
Manipur	-4.45	-0.09
Mizoram	-62.85	-1.22
Tripura	-29.45	-0.58
Meghalaya	-31.95	-0.61
Assam	-36.64	-0.72
West Bengal	6.25	0.12
Jharkhand	-26.13	-0.52
Odisha	-16.7854	-0.33
Chhattisgarh	-6.12	-0.12
Madhya Pradesh	-35.33	-0.7
Gujarat	-79.97	-1.58
Daman & Diu	-87.58	-1.64
Dadra & Nagar Haveli	-46.12	-0.85
Maharashtra	-86.68	-1.72
Andhra Pradesh	-92.3	-1.83
Karnataka	-89.66	-1.77
Goa	-145.66	-2.86
Lakshadweep	-131.44	-2.42
Kerala	-103.55	-2.04
Tamil Nadu	-96.31	-1.91
Puducherry	-99.84	-1.84
Andaman & Nicobar Islands	-81.01	-1.47
Constant	114.87	2.15
R-squared	0.4961	
Adj R-squared	0.4932	
Number of observations	6279	

Note= Delhi is the omitted category.

Index = $b+b_1$ (Log Population)$+b_2$ (Log Population)^2 + State Dummy + error

Table 6: **Regression table**

	Income Level		Geographic Dummy		Urbanization Level	
Variable	Coefficient	t value	Coefficient	t value	Coefficient	t value
Log Population	27.59	4.95*	56.33	9.58*	27.93	4.44*
Log Population Square	-1.88	-7.1*	-3.16	-11.29*	-2.003	-6.68*
1	-32.72	-5.13*	Omitted		-98.32	-15.25*
2	13.44	6.31*	63.36	2.18*	-70.17	-24.51*
3	Omitted		21.49	3.4*	-40.52	-14.19*
4	80.6	35.32*	-11.43	2.12*	-13.36	-4.81*
5	87.05	41.97*	-33.97	2.15*	Omitted	
Constant	19.16	0.66	-93.89	-3.06*	111.8727	3.42
R-squared	0.3762		0.3059		0.2048	
Adj R-squared	0.3756		0.3053		0.2041	
Number of observations	6279		6279		6279	

Note: For details related to classification and dummies see appendix tables. * represents significance at 5 per cent level.

Index = $b+b_1$ (Log Population)$+b_2$ (Log Population)^2 + Region Dummy/Per Capita Dummy/Urbanisation Dummy +error

3. Deprivation Index and Other Demographic Characteristics

How does the deprivation or vulnerability index stand in relation to the demographic and economic variables information on which is available at the city/town level? This question is pertinent because the deprivation index is estimated based on a limited number of variables only. So the quality of urbanisation also needs to be assessed through a number of other indicators which can be treated as an outcome of development. Whether large cities are endowed with better demographic, social and economic development indicators is an important policy question since these cities have attracted a great deal of investment for last several decades.

Table 7 presents the results from the factor analysis conducted on a wide range of city specific variables. The list has been augmented by adding the city specific deprivation index (described in the previous section) and the city size (taken in terms of log transformation).This is done for all urban centres, statutory towns and census towns separately. The factor analysis is noted to be the appropriate framework because these variables mutually reinforce one act other giving rise to a complex simultaneous equation system. Since such a model is not estimable due to the paucity of information on a number of control variables at the city level, factor analysis is used for capturing the mutual impact of variables.

Table 7: Factor Analysis Result for All Urban Areas, Statutory Towns and Census Towns.

	All cities (6279)			Statutory town(3716)			Census town(3888)*		
Variable	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Sex Ratio	0.0492	0.3729	-0.084	0.2784	0.1333	0.0189	0.2663	0.2528	-0.1019
Percentage male SC/ST population	0.025	0.3154	0.9409	0.1026	0.0346	0.9863	-0.053	-0.026	0.09942
Percentage female SC/ST population	0.0413	0.3054	0.9428	0.1023	0.048	0.9873	-0.052	-0.027	0.9936
Male literacy rate	0.8323	0.1127	0.0368	0.0915	0.9014	0.0722	0.910	-0.06	-0.0446
Female literacy rate	0.8657	0.0907	-0.000	0.0369	0.8883	0.0732	0.9003	-0.026	-1302
Age 6 child per 1000 women	-0.6199	0.4046	0.0781	-0.393	0.5409	0.0406	-0.623	-0.174	-0.077
Percentage main male workforce	0.398	0.4046	-0.214	0.4803	0.2702	-0.053	0.1869	0.2243	-0.0412
Percentage main female workforce	0.0138	0.9142	-0.221	0.9462	0.0695	0.1044	-0.014	0.9503	-0.0302
Sex Ratio in main workforce	-0.0814	0.9105	-0.159	0.9165	0.0668	0.1703	-0.014	0.9676	-0.0277
Per share of male in non-agriculture (excluding household manufacturing) activities	0.6984	-0.367	0.0689	-0.2107	0.3522	-0.054	0.2912	-0.105	0.0105
Per share of female in non-agriculture (excluding household manufacturing) activities	0.6202	-0.524	0.1506	-0.3827	0.2539	-0.035	0.2898	-0.286	0.0393
Index	-0.623	-0.067	0.1317	-0.0815	-0.452	0.1337	-0.347	-0.156	0.0695
Log population	0.15	-0.126	-0.192	-0.0904	0.0273	-0.182	0.1355	0.0207	-0.1603
Eigen Value	3.28	2.77	1.98	3.64	3.247	1.24	3.25	2.44	1.91
Percentage Explain	0.35	0.3	0.21	0.37	0.33	0.19	35.52	26.61	20.83

*urban agglomerations include census towns which are not taken separately; hence the total number of urban centres is not equal to the sum of census towns and statutory towns.

For all urban centres three factors are found to be statistically significant, i.e. each with an Eigenvalue greater than 1. In none of the factors the city size, however, takes a significant factor loading though the factor loading (in absolute terms) corresponding to the deprivation index is relatively high in factor 1 (-0.62). The only variable which is highly significant in explaining the variations in factor 1 is literacy which in turn is inversely related to the proxy for fertility rate taken in terms of child-women ratio and also the vulnerability index. The overall gender ratio (female-male) which has a moderate factor loading is positively related to literacy. With city size its relationship remains positive though one would expect very

large cities to have a strong negative association with gender ratio because of male migration. But in the Indian context female migration (rural to rural and rural to urban both) is much more in absolute terms than males, though female migration is mainly for social reasons such as marriage while male migration is prompted by employment related factors and education(Mitra and Murayama, 2008). The male work force participation rate taken as a broad indicator of dynamism in the job market shows a positive relationship with city size, very mild though. The percentage of work force employed in non-agriculture and non-household manufacturing also tends to increase with a rise in male work force participation rate.

In factor 2 the most noteworthy point is that both gender ratio in the work force and the female work force participation rate take high factor loadings suggesting that both are not only highly significant but also strongly associated. However, this relationship is not positively related to women being engaged in non-agricultural activities. Rather the percentage of women work force in non-household manufacturing and services sector seems to decline with a rise in the women work participation rate, implying that women tend to work more in activities such as agriculture (and related activities) and household manufacturing. Further, city size is not significant in this factor suggesting that not necessarily the large cities bring in more opportunities for women to participate in the labour market.

The results pertaining to the census towns by and large conform to these patterns though the absolute value of factor loading corresponding to the vulnerability index in factor 1 is only 0.35 (Table 7). For statutory towns the findings are, however, quite different compared to those of the census towns or the combined results for all urban centres. The inverse relation between city size and deprivation index becomes somewhat noteworthy only in factor 3 and the absolute value of the factor loading for the deprivation index reaches a maximum of 0.45 only in factor 2 (not factor 1). The most important variables in factor 1 are the female-male ratio of the work force and the women work participation rate which move inversely with fertility rate. Literacy raises the proportion of work force in non-agricultural activities other than household manufacturing.

On the whole, among the statutory towns in India large cities do not seem to have benefitted the population as the decline in deprivation index in relation to size is not very striking. In other words, with an increase in city size agglomeration economies may have shown up but all that has not benefitted the residents to reduce their deprivation proportionately. Indirectly it means that productivity growth, increase in investment and earnings involve a great deal of inequality. On the other hand, the census towns which have emerged in the periphery of the large cities are able to provide access to the residents to the agglomeration benefits available in the large cities, resulting in a decline in the deprivation index. Even in the remote areas the census towns which have emerged in response to the lack of productive employment in agricultural activities and the subsequent shift of the work force to non-agricultural activities, reveal better outcomes as city size reduces deprivation and improves demographic cum economic indicators.

4. Smart Cities

The Smart Cities initiative of the present government aims at creating cities with basic infrastructure built on a sustainable model. With assured water and electricity supply, sanitation and solid waste management, urban mobility and efficient public transport, IT connectivity, e-governance and citizen participation and the safety and security of citizens investment is expected to go up resulting in productivity induced higher rates of economic growth. One hundred cities and towns[3] have been selected by the Ministry of Urban Development with at least one city from each state. The Smart Cities Council India has been formed which is a part of the US-based Smart Cities Council, operating in 140 countries.

First of all more than half of the smart cities are very large in size: either million plus or each with a population of 500,000 and above but less than one million (Table 8). Another group of 28 cities are in the size class of one to five hundred thousand population. Besides, around five are in the close proximity of some of the large cities, forming part of the urban agglomerations. Pertaining to the deprivation index value of the smart cities the following results can be discerned: the smart cities to begin with are mostly large in size; hence, their index values are low in magnitude, which conforms to the inverse pattern between size and index observed in the context of all urban centres. However, what is interesting to note is that even the small towns which belong to this smart group do not have a high index value (see plot 5 in the appendix). Hence, they may have been chosen in such a manner that they have already benefitted from the past investment to some extent. But the worry is why more such urban centres were not selected instead of a few.

Table 8: Smart Cities' Deprivation Index and Population Size

Index Range	Smart Cities					
	Million Plus	5-10 lakh	5-1 lakh	50,000-1lakh	50000-10000	<10000
No of Cities	37	23	28	2	5	0
0-100	34	16	16	2	4	0
100-125	3	7	6		0	
125-150	0		3		1	
150-200	0		3			
200-250	0					
250-300	0					
>300	0					

[3]New Town Kolkata and Bidhannagar are part of Kolkata UA; Navi Mumbai, Thane, Greater Mumbai and Kalyan Dombivali are part of Mumbai UA; and Gandhinagar and Ahmadabad are part of Ahmadabad UA. In total we have 95 smart cities (urban agglomeration).

From the factor analysis results carried out for the smart cities we note a number of counter-intuitive results (Table 9: last three columns). First of all in factor 1 city size and deprivation index are positively associated, not so strongly though. Literacy tends to decline while fertility increases with city size. Female to male ratio among the workers and the female work participation rate correspond to highest factor loading and both the variables, as per expectation, are positively associated but the percentage of female work force engaged in non-agriculture (excluding household manufacturing) activities takes a negative factor loading and that too with a negligible magnitude. This suggests that the females are not necessarily able to get employment in non-agricultural activities with increased participation in the job market. Further, the male work participation rate which is taken to indicate the dynamism in the job market does not take a significant value in terms of factor loading. Only in factor 3 the literacy rate and percentage of workforce engaged in non-household manufacturing and services show a positive relationship.

In the second factor, however, the city size and deprivation index move in the opposite direction. But the percentage of scheduled caste and scheduled tribe population tend to decline with city size. This result is also evident from the combined results for all cities and towns. But there it is distinct in factor 3 which is less important than factor 2 in statistical sense. Smart cities are selected to serve a specific purpose, i.e., acting as growth centres. Hence, it is of interest to see whether they also tend to follow the principle of inclusive growth. But the results for smart cities rather reveal a stronger inverse relationship between city size and the presence of lower castes in factor 2 (which is of greater statistical importance compared to factor 3). Since large cities are more productive, resulting in higher growth, the negative association between size and the incidence of lower caste population (representing disadvantaged classes) then to begin with suggests that smart cities are not germane to deliver inclusive growth. Further, only in factor 3 the male and female work participation rates and the percentage of work force engaged in services and non-household manufacturing are moderately associated with each other in positive direction.

Table 9: Factor Analysis Result for Class1, Million plus and Smart Cities

	Class I cities (466)			Million Plus (53)			Smart Cities (94)		
Variable	Factor 1	Factor 2	Factor 3	Factor 1	Factor2	Factor3	Factor 1	Factor2	Factor 3
Sex Ratio	0.4348	0.2258	-0.0234	0.5669	0.2953	-0.26	0.4276	0.0072	0.1757
Percentage male SC/ST population	0.0428	0.0407	0.9962	-0.1085	-0.0052	0.9919	0.1583	0.9782	0.0956
Percentage female SC/ST population	0.0584	0.0458	0.9946	-0.1035	0.0021	0.9909	0.1724	0.9747	0.0965
Male literacy rate	0.1515	0.8619	0.0878	0.895	0.2218	-0.079	0.2413	0.1046	0.8715
Female literacy rate	0.1507	0.8848	0.0333	0.8945	0.2634	-0.155	0.2567	0.1752	0.8551
Age 6 child per 1000 women	-0.2892	0.4445	-0.0553	-0.4158	-0.3815	0.1714	-0.3243	0.1709	-0.3118
Percentage main male workforce	0.3548	0.1593	-0.0007	0.089	0.3077	-0.084	0.192	-0.2125	0.264

Percentage main female workforce	0.9449	0.119	0.055	0.1804	0.8955	0.0319	0.9147	0.1641	0.2286
Sex Ratio in main workforce	0.9635	0.116	0.0677	0.3207	0.9295	-0.013	0.9131	0.2609	0.2017
Per share of male in non-agriculture (excluding household manufacturing) activities	-0.0208	0.3057	0.0724	0.1707	0.0998	0.0738	0.1612	0.0546	0.3843
Per share of female in non-agriculture (excluding household manufacturing) activities	-0.2661	0.3474	0.0761	0.2693	-0.3083	0.1747	-0.0961	0.1102	0.2429
Index	-0.1366	-0.2665	0.0743	0.0714	-0.3083	0.1747	-0.1272	0.112	-0.0981
Log population	0.0905	0.0827	-0.1014	0.046	0.0892	-0.177	-0.2111	-0.162	-0.0737
Eigen Value	4.2161	2.39517	1.9827	4.45	2.17	1.71	4.61599	2.4618	1.668
Percentage Explain	0.418	0.237	0.197	0.42	0.2	0.16	0.45	0.24	0.16

From one point of view the selection of the smart cities seems problematic because many of them are very large and are about to get saturated. Though one may argue that it is an attempt to take advantage of the agglomeration economies already existing in these cities, the diseconomies which may have become substantial given the age of the cities also need to be considered. Rather some of the census towns located in the close vicinity of the large cities could have been considered in large number though for a handful of them (five or so) this criterion has actually been applied (forming part of the city urban agglomeration). The problems of very large cities have to be mitigated before making further investment to reap new benefits. Nevertheless for the first time it seems the government policy very explicitly has recognised the productivity augmenting effects of urbanisation, particularly the economic efficiency of the big cities. Otherwise, the major concern has been for concentration and the regional policy always argued in favour of anti-concentration.

The definition used to identify smart cities should not only be applied to a handful of cities but also to a large number of urban centres at least to those which comprise a large majority of the urban population. All the class 1 cities, for example, (466) which comprise more than 60 per cent of the urban population should have been included in the list of smart cities. Some of the counter intuitive results obtained for the smart cities are not evident in the case of million plus cities and the class 1 cities. For example, in the case of million plus cities literacy and the percentage of work force in non-household manufacturing and services show a positive association in factor 1 itself. In the case of class I cities the same relationship emerges in factor 2. City size and deprivation index show an inverse relationship both in factor 2 and factor 3 while in factor 1 both the variables are highly insignificant, in the case of million plus cities. Corresponding to class 1 cities again both the variables are inversely related in all the three factors. City size and gender ratio show a positive relationship in factor 3 among the million plus cities and in factors 1 and 2 among the class 1 cities. Literacy and

gender ratio show a positive relationship in factor 1 among the million plus cities and in factor 2 among the class 1 cities whereas in the case of smart cities it is revealing only in factor 3. On the whole, we argue that it would have been desirable to take all the class I cities as smart cities.

5. Conclusion

In this paper we examined the quality of urbanisation through deprivation index developed primarily on the basis of dwelling conditions, access to basic amenities and possession of certain assets. Further, the demographic and economic characteristics in relation to the deprivation index and city size are analysed. Very large cities are endowed with better living conditions and infrastructural facilities; thus, they are characterised by lower magnitude of the index. However, size alone does not explain much as the prominence of the dummies suggest. In fact, both index (representing infrastructure and living conditions) and city size are endogenous and could be influenced by two different sets of factors. Growing inequality and the lack of inclusive growth can result in less than proportionate decline in deprivation index in relation to city size though agglomeration benefits grow with city size.

As regards the variables other than the deprivation index, it is observed that with city size fertility declines and literacy improves. Though very large cities may have a lower gender ratio because of single male migration, findings suggest that gender ratio improves with city size. However, with improved gender ratio though one may expect women participation in the job market to rise, there is no significant evidence in favour of women getting opportunities in non-household manufacturing and services. In the case of males the job market prospects seem relatively better in large cities. In general, urbanisation does not appear to be inclusive as the percentage of lower castes shows a declining tendency with city size. The opportunities for those who are skilled, as various other studies suggest, are growing alongside the agglomeration benefits associated with large cities but the unskilled and semi-skilled do not appear to be benefitting on a large scale which may be discouraging their pace of migration to large cities. Also, the slum demolition policies adopted on a large scale and the 'greed' to grab land in big cities may have led to lower incidence of disadvantaged classes.

The group of "smart cities"(100) chosen by the present government comprises a number of million plus and other large cities. Hence, they seem to have already benefitted from the past investment reflected in lower magnitudes of the deprivation index. However, a number of counter-intuitive results follow from the exercises carried out for the "smart cities" apart from the non-inclusiveness which seems to be more pronounced. Keeping this in view the paper argues that cities and towns in India, particularly the ones which already have been in existence with functional urban local bodies, have not been favourable to the equitable distribution of the benefits of growth. The selection of smart cities by the present government seems to aggravate this unequal situation. In the backdrop of these findings it is felt that at least all class 1 cities could have been considered as "smart cities". Not only the number of cities but also a much larger percentage of urban population would have then benefited from the new investment that the "smart cities" are likely to draw. The facilities which are likely to

be made available to "smart cities" should, in fact, have accrued to the entire urban population. Otherwise, the urbanisation phenomenon would simply be based on a mere change in the sources of livelihood, from agriculture to non-agriculture, without resulting in transformation on a larger scale encompassing, social, economic and cultural spheres. However keeping in view the huge cost involved in providing the status of "smart cities" to the entire urban space we argue in favour of the class I cities at least. Further, the aspect of productive employment opportunities has to be emphasised while developing the urban centres, else, the larger national objective of inclusive growth will be defeated and the growth differentials across rural-urban and the large versus small urban centres may get accentuated. How the strategy of creating growth centres at world class level can be combined with the policy initiatives of creating productive jobs in the non-agricultural activities is a key challenge that the present government needs to address while reworking on urbanisation.

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Appendix

Table A1: Classification of states based on per capita income(2011)

Income Level	Dummy	State/UT	Per Capita Income (Rs)
Very High	1	Delhi, Chandigarh, Puducherry, Goa, Sikkim	>1,00,000
High	2	Haryana, Maharashtra, Andaman & Nicobar, Gujarat, Tamil Nadu	1,00,000-75,000
Medium	3	Uttarakhand, Punjab, Kerala, Himachal Pradesh, Karnataka, Arunachal Pradesh, Andhra Pradesh, Nagaland, Dadra & Nagar Haveli, Lakshadweep	75,000-50,000
Low	4	Meghalaya, Mizoram, West Bengal, Tripura, Rajasthan, Jammu & Kashmir, Chhattisgarh	50,000-40,000
Very Low	5	DAMAN & DIU, Odisha, Jharkhand, Assam, Madhya Pradesh, Manipur, Uttar Pradesh, Bihar	<40,000

Table A2: Classification of states based on location

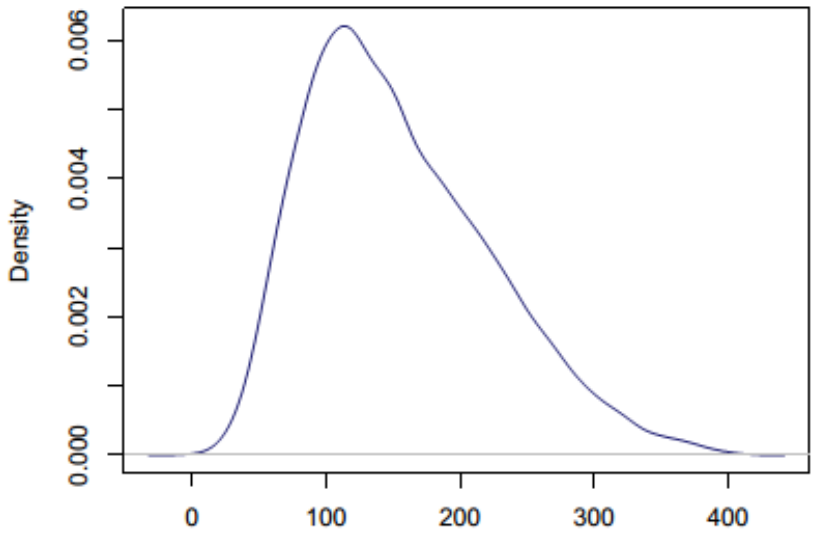
Region	Dummy	State/UT
North	1	,Jammu & Kashmir, Chandigarh, Haryana, Uttarakhand, Punjab, Himachal Pradesh, Delhi, Uttar Pradesh
East	2	West Bengal, Chhattisgarh, Odisha, Jharkhand, Bihar

North East	3	Sikkim, Arunachal Pradesh, Nagaland, Meghalaya, Mizoram, Tripura, Assam, Manipur
Western	4	Goa, Maharashtra, Gujarat, Dadra & Nagar Haveli, Lakshadweep, Rajasthan, Daman & Diu
Southern	5	Puducherry, Andaman & Nicobar Islands, Tamil Nadu, Kerala, Karnataka, Andhra Pradesh

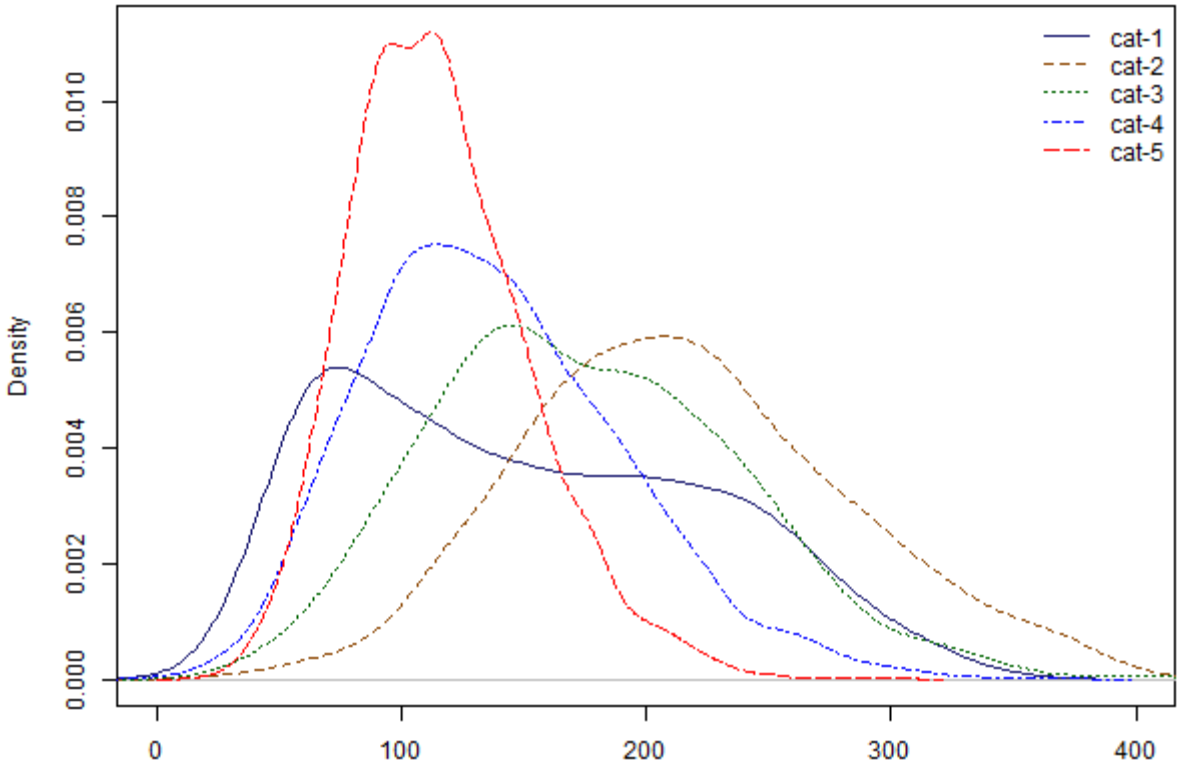
Table A3: Classification of states based on level of urbanisation

Urbanization Level	Dummy	State/UT	Percentage Urbanization
Very High	1	Delhi, Chandigarh, Mizoram, Goa, Lakshadweep, Daman & Diu, Puducherry	>50%
High	2	Maharashtra, Gujarat, Dadra & Nagar Haveli, Tamil Nadu, Kerala	50-40%
Medium	3	Haryana, Uttarakhand, Punjab, West Bengal, Andaman & Nicobar, Karnataka, Andhra Pradesh	40-30%
Low	4	Jammu & Kashmir, Uttar Pradesh, Chhattisgarh, Jharkhand, Sikkim, Arunachal Pradesh, Nagaland, Tripura, Manipur, Rajasthan, Madhya Pradesh	30-20%
Very Low	5	Himachal Pradesh, Odisha, Bihar, Meghalaya, Assam	<20%

Plot 1: Deprivation Index: Probability Density Function for All Cities and Towns

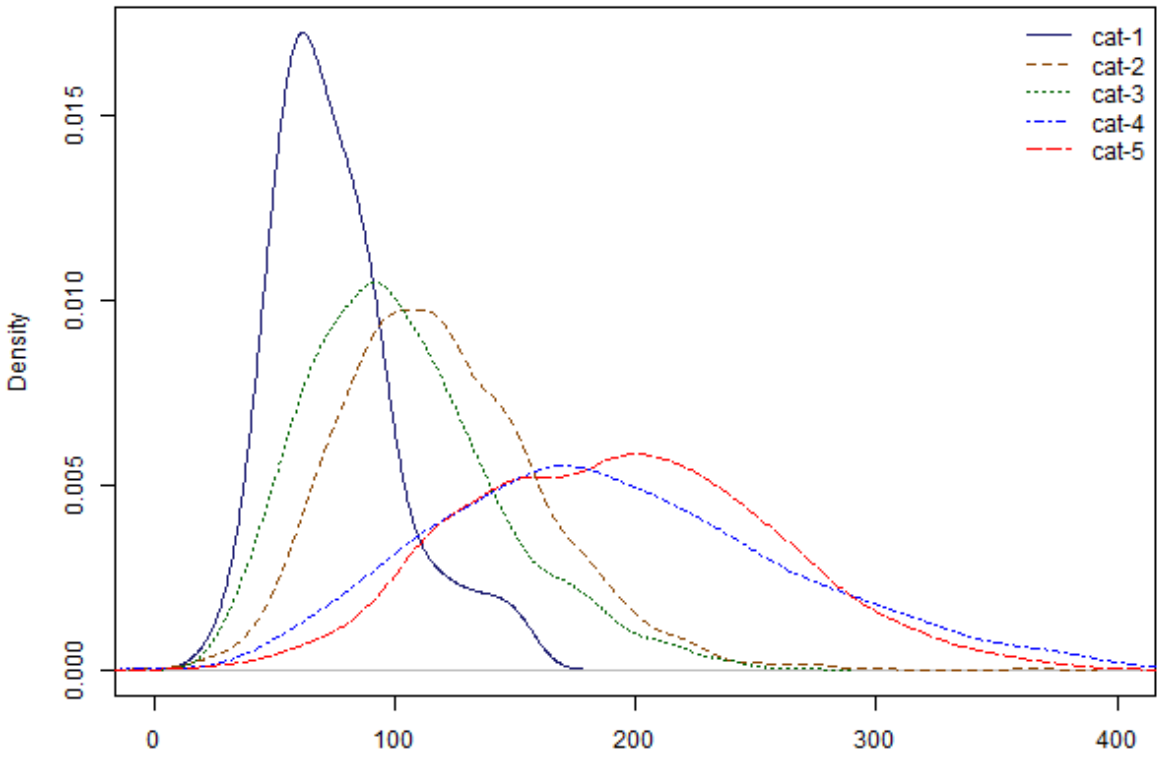


Plot 2: Probability Density Plot of City Deprivation Index (Grouping State/UT as per Geographical Category)

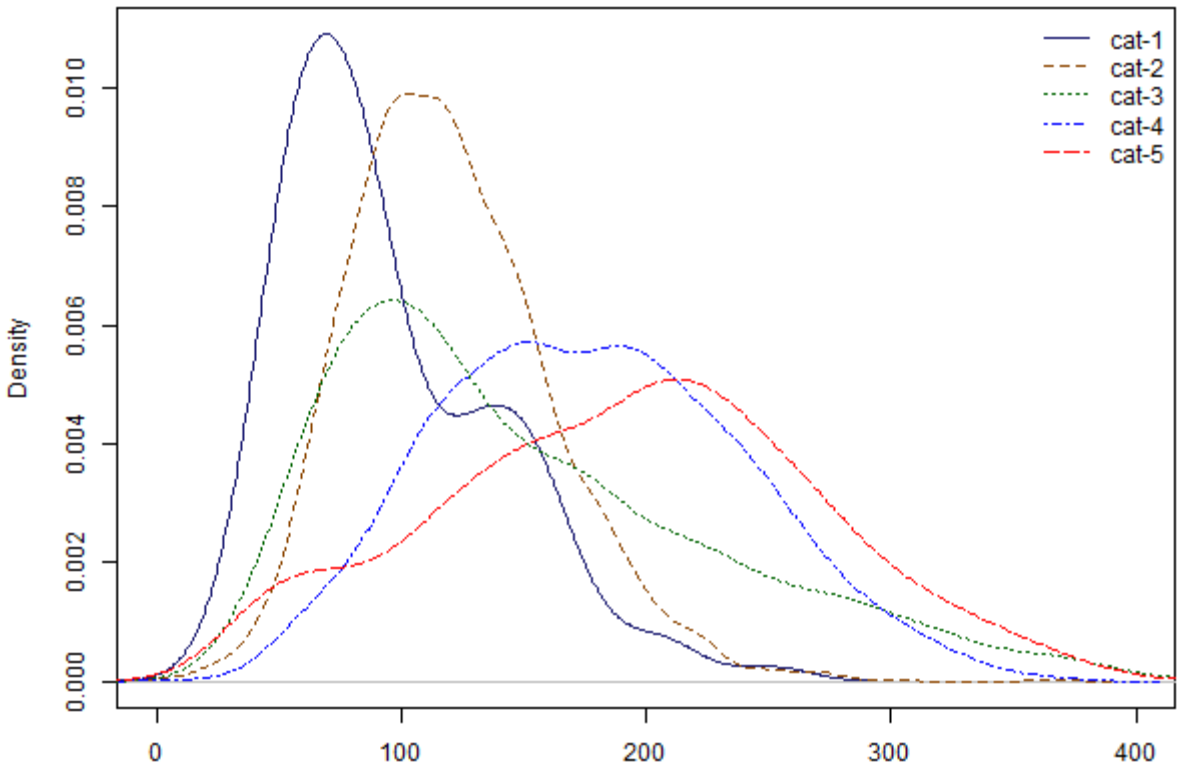


Plot 3 : Probability Density Plot of City Deprivation Index (Grouping State/UT as per Income

category)



Plot 4: Probability Density Plot of City Deprivation Index (Grouping State/UT as per Urbanisation Level)



Plot 5: Smart cities vs Other cities: Probability Desnity Plot of City Deprivation Index