Shedding light on unnoticed gems in India:

Small towns' development perspective

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Abstract

Though a large portion of India's urban population is living in large cities, the latest Census period (2001-2011) showed that small towns (population less than 0.1 million) such as Census towns have contributed 30% of the country's urban growth. This phenomenon calls for bringing small towns into the limelight of the current urban development policies of India. In this context, the present paper investigates the determinants of the growth of small towns and their locations. The empirical exercise is performed by considering cluster analysis. Descriptive analysis suggests that in terms of coverage of cities and towns under different important urban policies the small towns are highly neglected. Cluster analysis suggests that different groups among the small towns are noticeable. The availability of infrastructure and amenities is very important for the growth of small towns in India and they are emerging in the vicinity of large cities with low variation in distance and population size. The results reveal that their emergence is the second-best solution after the scope for expansion gets exhausted within the city proper. Finally, policy options are recommended to make small towns more productive in the future so that they contribute to sustainable and higher economic growth in India.

Keywords: small towns, population size, infrastructure, distance, cluster analysis, India

JEL Classification: R10, R12, O18

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1. Introduction

Small towns, technically known as census towns and which are not even recognized by the government of India as urban spaces, are too many in number. Where exactly these small towns are emerging, what are the basic determinants of their growth and what needs to be done to make these spaces productive are some of the questions which can be explored. Also, the distance between these towns and the large cities is an important indicator of the dynamics of urban change. The agglomeration literature would suggest that with the saturation of the large cities the rural areas in the hinterland are likely to undergo a significant transformation. The new firms and the new entrants/migrants both locate themselves in the spaces outside the cities as the operational costs are less. In fact, in the urban economics literature this phenomenon is recognized as the second-best solution after the exhaustion of scope within the city proper. Can the new towns, particularly the ones which emerged recently (between 2001 and 2011), be interpreted as the second-best solution in the light of the agglomeration economies? This paper proposes to analyze the population size of the small towns in the light of this framework.

In the New Economic Geography (NEG) framework of industry location[1] (Krugman, 1991), external-scale economies make people and companies more productive through the following mechanisms, as pointed out by Frick and Rodriguez-Pose (2018): (a) knowledge spill-overs between workers enabling learning and spur innovation; (b) forward and backward linkages between companies, suppliers, and buyers, making interactions between economic actors more efficient; and (c) a pooled labour market allowing for an easier matching between firms and employees. They indicate that a high share of industries, a well-developed urban infrastructure, and an adequate level of governance effectiveness allow countries to take advantage of agglomeration benefits from larger cities. Besides, the productivity impact of metropolitan governance structures is well documented by Ahrend et al. (2017). However, these external benefits tend to get dissipated soon and the question is what next then? Once one city reaches the saturation level either another urban area will have to be groomed for reaping the external economies or the existing one can be rejuvenated with a fresh round of investment. After all, saturation concept is relative; it is in reference to the investment already undertaken. With new

[1]Though the modern sector in the historical sense was manufacturing, in the present context the services sector falls within its scope and firms in this sector not only supply to consumers and manufacturing firms but also serve each other (Ottaviano and Thisse, 2004).

investment and setting up of new infrastructure further expansion in activities and population of a given city can take place which may also result in transformation of the hinterland. Weerdt et al. (2021) argue that while city migrants see their welfare increase much more than those moving to towns, many rural-urban migrants end up in towns. The study also mentions that about two thirds of the rural populations in low-income countries are living within two hours of travel distance from the towns. These findings underscore the importance of vibrant towns for inclusive development. Intermediate cities are important for poverty reduction and more efficient ecosystems to live and work (Rodríguez-Pose, and Griffiths, 2021).

With this perspective we need to assess some of the attributes of the small towns. For example, we consider the population size and figure out the number of clusters that can be identified. Similarly, in terms of the distance from the large cities we try to gauge the number of clusters. One hypothesis that emerges in the light of the transformation of the hinterland suggests that there should not be large variations in the size of the small towns. Similarly, there should not be much variations in the distance from the large city. However, if the findings suggest that there are many clusters it would mean that different forces are in operation in giving rise to the growth of small towns and in that case the policy initiatives will have to be envisaged by addressing several issues. So as a starting point, we try to estimate the number of clusters that are identifiable among the small towns.

The paper adopts the following structure. The next section reviews the related literature to find out the research gap. The empirical analysis is presented in section 3. Interpretations of results are presented in section 4. Finally, major conclusions and policy implications are made in Section 5.

2. Review of literature

As a starting note, between 2001 and 2011, the growth in urban population was about 32% and the major part of this growth was contributed by small towns and census towns [Himanshu, 2017]. The main reason behind this rise of census towns is the changing nature of employment structure. More workers are moving away from agriculture to non-agriculture jobs i.e., non-farm employment. Chatterjee et al. (2015) found that small towns have contributed significantly in generating non-farm employment than large cities in India. Gibson et al. (2017) pointed out that the growth of small town matters more for rural poverty reduction than the growth of big cities in India.

Very few studies have attempted to study small towns in India in the light of the agglomeration economies. Current urban policies are mostly biased towards large cities [Kamath and Zachariah, 2015 and Khan, 2014]. Alam and Choudhury (2016) investigated the spatio-functional determinants of small towns to determine their centrality. Scrase et al. (2015) attempted to understand and analyze how globalization is transforming smaller, regional towns, e.g., Anand in Gujarat and Darjeeling in West Bengal, in India. Tripathi (2021) finds that infrastructure, economic, environmental, historical, and administrative factors have a strong positive impact on the population growth rate of small towns. The study also suggests that consideration of small towns for future urban growth is important for creating sustainable urban system in India. Nonetheless, the recent emergence of census towns (generally very small towns with an average population size of 6186) has been explored in quite a few studies [Pradhan, 2013; Mitra and Kumar, 2015; Chatterjee, 2014; Jain, 2017; and Jain and Korzhenevych, 2020; Mitra and Tripathi, 2021].

3. Empirical Analysis

3.1 Neglected small towns in urban development in India

The Census of India defines urban areas by considering Statutory Towns (STs) and Census Towns (CTs). STs are defined as all places with a municipality, corporation, cantonment board or notified town area committee, etc. On the other hand, a town is a Census Town if it follows the following criteria; a minimum population of 5,000; at least 75 percent of the male main working population engaged in non-agricultural pursuits; and density of population of at least 400 persons per sq. km. Based on population size of a town, Census classifies urban centers in to following six categories; Class I (100,000 or more); Class II (from 50,000 to 99,999); Class III (from 20,000 to 49,999); Class IV (from 10,000 to 19,999); Class V (from 5000 to 9999); and Class VI (below 5000). In India, the share of the urban population in the total increased from 17.97 percent (78.94 million) in 1961 to 31.16 percent (377.10 million) in 2011.[2] The number of cities/towns has increased from 2657 to 7935 during the same period.

Table 1: Trends in India's urbanization

Year	***Cities with population more than 0.1 million***	***Towns with population less than 0.1 million***

[2] Data on number of cities and towns are not adjusted for definitional changes in urban areas, especially, prior to 1961 Census.

	Number of cities	Percentage of urban population	Number of towns	Percentage of urban population
1961	107	51.4	2592	48.6
1971	151	57.2	2975	42.8
1981	226	60.4	3723	39.6
1991	322	65.2	4293	34.8
2001	441	68.6	4720	31.4
2011	468	70.2	7467	29.8

Source: Authors' compilation.

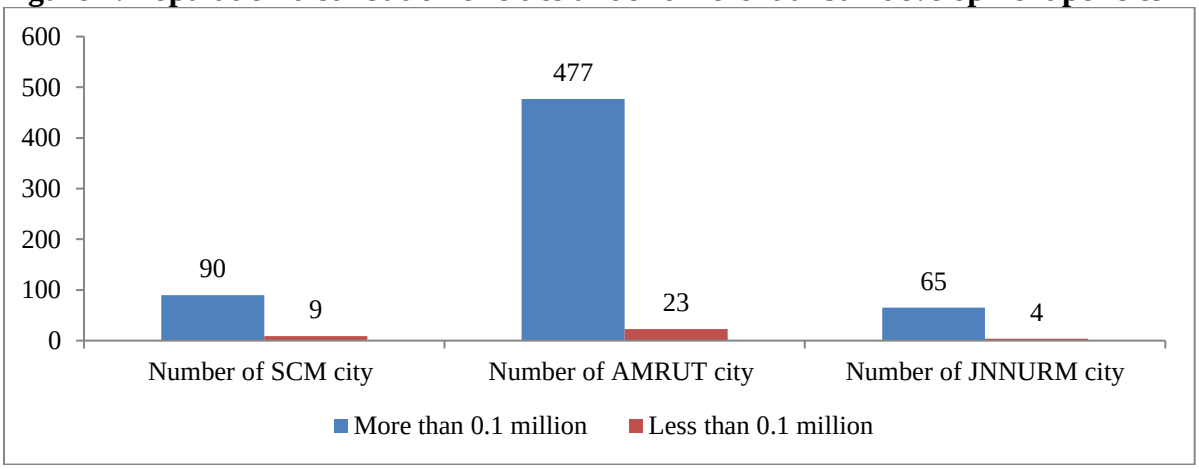
In this study, we define a small town with a population of less than 0.1 million. This indicates that small towns basically fall in the category of class II to Class VI based on the Census definition. Among 6939 small towns, 3874 towns are Census towns which are about 56% of the total small towns considered for the analysis. Though Census towns belong to Class II to Class VI categories, the majority of the Census towns (i.e., 74% of the total town) fall within the category of Classes IV and V. Table 1 shows that the number of cities (population with 0.1 million and more) has increased from 107 in 1961 to 468 in 2011, i.e., an increase of 337%. On the other hand, small towns (population with less than 0.1 million) have increased from 2592 in 1961 to 7467 in 2011 which is about a 65% increase. The percentage of the urban population located in cities has increased from 51.4 % in 1961 to 70.2 % to in 2011. However, the percentage of the urban population for small towns has decreased from 48.6 % to 29.8 % during the same period. This shows that cities accommodate more 19% of the urban population than small towns during the period of 1961 to 2011.

At the central level, the Ministry of Housing and Urban Affairs (MoHUA) is in charge of implementing various policies and programs for urban development in India. Though centrally sponsored scheme of Integrated Development of Small & Medium Towns (IDSMT) was initiated in the year 1979-80, the importance of urbanization was majorly recognized by the Union government when Jawaharlal Nehru National Urban Renewal Mission (JNNURM), a flagship reform linked to the infrastructure development program, was launched by Government of India under the Ministry of Urban Development, in December 2005.[3] Currently, only a few policies are supported by the Union government, these are— Smart Cities Mission (SCM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission, National Heritage

[3] JNNURM was discontinued in 2014 and succeeded by AMRUT.

City Development and Augmentation Yojana (HRIDAY), North Eastern Region Urban Development Programme (NERUDP), Pradhan Mantri Awas Yojana (PMAY), and scheme for satellite towns around seven mega cities. Among these, the currently ongoing major urban policies, SCM and AMRUT, have received greater importance.

Figure 1: Population distribution of cities under different urban development policies



Source: Author's compilation using data from The Ministry of Housing and Urban Affairs

Figure 1 presents the distribution of cities and small towns under three major government policies and programs. It shows that out of a total of 99 cities considered under the SCM only 9 (i.e., 9 %) towns are small. Similarly, within 500 cities considered under the AMRUT, only 23 (about 5%) are small. On the other hand, only 6% of the total towns are small among the cities considered under the JNNURM. It is also important to note that SCM covers about 29% and the AMRUT program covers about 58% of the total urban population in 2011, whereas JNNURM covered about 43% of the total urban population in 2001. The SCM and the AMRUT cover about 8 % of the total number of cities and towns in 2011. This descriptive analysis informs us that the major urban policies and programs in India are very much limited in terms of coverage as far as the number of cities/towns is concerned and secondly, the small towns are the neglected lot.

3.2 Cluster analysis

Cluster analysis has been conducted to find out whether within the category of small towns different groups are traceable. Cluster analysis helps us group similar observations into a number of clusters based on the observed values of several variables for each individual. In other words, it is done to identify the set of objects with similar characteristics. Though the K means clustering

method is more efficient to handle big data sets; it requires prior knowledge of K, that is, the number of clusters we want to divide our data into. As we do not have any prior information regarding the number of clusters, we use the hierarchical cluster method for the analysis. This creates a series of models with cluster solutions from 1 (all cases in one cluster) to n (each case is an individual cluster). We follow agglomerative clustering in which most hierarchical methods fall into. We use Ward's minimum variance method to specify a linkage algorithm to define the distance from a newly formed cluster to other clusters in the solution. The method combines those objects whose merger increases the overall cluster variance (i.e., the homogeneity of clusters) to the smallest possible degree. The approach is typically used in combination with (squared) Euclidean distances. The squared Euclidean distance increases the importance of a large distance over small distances. It is very important to select clustering variables.

Table 1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	C.V.
Total number of households (V1)	7436	4282.534	3938.369	1	26508	91.96352
Total population (V2)	7437	20071.02	18145.05	5	99979	90.40422
State H.Q. Road Distance (in kms.) (V3)	7434	275.4372	202.4157	0	1145	73.48888
Nearest City with Population of 1 Lakh and more Road Distance (in kms.) (V4)	7432	49.48551	55.58652	0	798	112.3289
Nearest City with Population of 5 Lakh and more Road Distance (in kms.) (V5)	7433	112.2257	114.1622	0	1200	101.7255
Railway Station Road Distance (in kms) (V6)	7196	19.22478	43.77858	0	1200	227.7195
Total number of latrines (V7)	7437	3198.636	3672.808	0	40222	114.8242
Total water supply (V8)	7437	12206.45	167458.3	0	7200000	1371.884
Total number of electricity connections (V9)	7437	4755.558	5300.355	8	67669	111.456
Total number of hospitals (V10)	7437	277.2701	7994.423	0	494414	2883.262
Total number of schools, colleges, and universities (V11)	7437	13.03873	15.38932	0	630	118.0278
Total number of other infrastructure variables (stadium+ Cinema Theatre+ Auditorium/Community Hall+ Private-Public Library, etc.) (V12)	7437	10.66586	17.71936	0	772	166.1316
Area (sq. km.) (V13)	7402	12.31253	99.01436	0.02	7020	804.1756
Temperature differences (V14)	7129	27.43216	12.3191	-70	427	44.90751
Total road length (kms.) (V15)	7436	32.36544	41.63463	0	723	128.6392

Source: Authors'

Table 1 presents the descriptive statistics of the variables used for cluster analysis. Data has been sourced from the town amenities, District Census Hand Book, Census of India 2011. The coefficient of variation (CV) measures the dispersions of data points in a data series. Total number

of hospitals, total water supply, and area of a small town has higher values of CV which indicates that there are higher differences in their means, implying a less symmetrical distribution. However, it is not the case for town-wise temperature differences, state H.Q. road distance from a town, and population size of a small town.

Table 2: Raw correlation coefficients

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
V1	1.00														
V2	0.97	1.00													
V3	0.06	0.04	1.00												
V4	0.00	0.01	0.10	1.00											
V5	-0.05	-0.05	0.04	0.45	1.00										
V6	-0.10	-0.10	-0.04	0.33	0.41	1.00									
V7	0.87	0.82	0.02	-0.01	-0.05	-0.10	1.00								
V8	0.03	0.03	-0.02	0.06	0.02	0.02	0.04	1.00							
V9	0.89	0.85	0.05	0.02	-0.05	-0.09	0.84	0.03	1.00						
V10	0.07	0.06	-0.01	0.06	0.05	0.01	0.05	0.08	0.05	1.00					
V11	0.59	0.63	0.07	0.10	0.04	0.00	0.48	0.01	0.60	0.06	1.00				
V12	0.48	0.47	0.09	0.06	0.00	-0.02	0.41	0.01	0.50	0.02	0.40	1.00			
V13	0.05	0.05	0.01	0.03	0.01	0.00	0.03	0.00	0.04	0.12	0.03	0.03	1.00		
V14	-0.12	0.00	-0.14	0.00	-0.04	-0.03	-0.19	0.03	-0.17	0.02	0.10	-0.07	0.01	1.00	
V15	0.55	0.53	0.08	0.12	0.06	0.00	0.52	0.02	0.55	0.10	0.39	0.38	0.08	-0.20	1.00

Note: See table 1 for variable definitions. Correlation coefficients are based on 6939 observations. Source: Authors' calculation

Table 2 presents the pair-wise correlation coefficients of the variables used for the cluster analysis which show that collinearity is not at a critical level. The variables such as total population size and the total number of households have the highest correlation (0.97). However, the correlations between other variables that are considered for the clusters are lower than 0.90 thresholds. This indicates that we can proceed to the analysis using all 15 clustering variables.

Following this, we decide on the number of clusters depending on the statistical and graphical measures. Table 3 suggests that the largest Duda–Hart Je(2)/Je(1) stopping-rule value is 0.6219, corresponding to the 8th group. However, for this group, the pseudo-T-squared value is not the lowest, and Calinski–Harabasz pseudo-F value is not the highest. Keeping this in mind, we consider a 13-group solution with the third-largest Duda–Hart Je(2)/Je(1) stopping-rule value (0.5101) and lowest pseudo-T-squared value (3.84) and a higher Calinski–Harabasz pseudo-F

value (84572.85). Appendix Figure 1 which presents the dendrogram for Wards linkage cluster analysis also suggests similar numbers of clusters for the analysis.

Table 3: The Variance ratio criterion (VRC) and Duda-Hart indices

	Duda/Hart Je(2)/J2(1) index		VRC
No. of clusters	Je(2)/Je(1)	pseudo T-squared	Calinski/ Harabasz pseudo-F
1	0.3249	14412	
2	0.3706	11773.77	14412
3	0.3845	11086.86	25084.45
4	0.1439	41.65	34123.8
5	0.2522	186.77	39991.72
6	0.48	7430.37	50615.62
7	0.225	154.98	62428.5
8	0.6219	3723.14	61651.38
9	0.0762	12.12	63127.75
10	0.484	2644.66	65618
11	0.0011	900.23	69403.44
12	0.2492	48.21	75635.46
13	0.5101	3.84	84572.85
14	0.6049	480.11	88192.35
15	0.5017	2381.23	93220.6

Source: Authors' calculation

The output in Table 4 shows that the cluster analysis applied to all 6939 small towns unravels thirteen segments. The first cluster comprises 3642 towns (52 %), the second cluster 2399 towns (35%), and the fourth cluster 737 towns (11 %). These three are the major ones among the thirteen clusters. The rest of the clusters do not comprise more than 2 percent of each of the observational units. As we can see, 5th cluster onwards there are hardly any observations in each clusters. Therefore, from the 6th to 13th clusters are clubbed with the 5th one.

Table 4: Number of clusters

Cluster	Frequency	Percent	Cumulative percentage
1	3,642	52.49	52.49
2	2,399	34.57	87.06
3	84	1.21	88.27
4	737	10.62	98.89
5	31	0.45	99.34
6	16	0.23	99.57
7	12	0.17	99.74
8	6	0.09	99.83
9	2	0.03	99.86

10	1	0.01	99.87
11	6	0.09	99.96
12	2	0.03	99.99
13	1	0.01	100
Total	6,939	100.00	

Source: Authors' calculation

The mean values for the 5 clusters are given in Table 5. Comparing the mean values across the clusters, we find that among the different variables, the first cluster stresses on the total number of households of a town, population size of a town, state H.Q. road distance from a town, town-wise total number of latrines, total water supply, and the total number of electricity connections. The other variables hold comparatively less importance. Similar variables, such as population size, the total number of households, total number of latrines, total water supply, state H.Q. road distance from a town, and total electricity connections of town have higher significance in second, third, fourth, and fifth clusters. In addition to that, the total number of hospitals of a town has higher importance in the fourth and fifth clusters.

Table 5: Comparison of means

Cluster	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
1	1894.1	8818.2	270.7	47.4	115.7	20.3	1265.3	903.1	1931.3	21.4	6.8	5.0	9.3	28.0	17.8
2	5375.6	25201.8	302.1	47.1	101.6	16.0	4141.1	1678.7	6142.4	181.7	16.4	14.3	15.4	26.1	41.0
3	4085.7	20106.1	245.8	78.0	164.8	42.3	2857.8	66553.8	4718.4	172.5	15.2	11.2	10.7	31.7	37.0
4	13376.7	63117.4	286.5	50.6	105.6	10.3	10560.3	3589.8	15648.5	756.4	36.8	30.9	18.8	28.0	82.1
5	5472.3	26705.9	252.5	114.9	182.5	46.3	4100.4	873259.4	6337.9	4220.9	17.6	12.3	9.5	30.8	55.4
Total	4383.5	20584.8	282.7	48.8	111.1	18.3	3297.5	11931.6	4926.8	203.3	13.5	11.1	12.4	27.4	33.3

Note: See Table 1 for variable definitions
Source: Authors' calculation

Clusters 1 and 2 comprise about 87% of the total towns (i.e., 6041). Therefore, it is very important to compare the means of clusters 1 and 2 by dividing different main indicators (e.g., the population size of a town, road distance from a town to the nearest city with a population of 5 lakhs, and more, etc.) into reasonable threshold levels. Table 5 presents the comparison of means for clusters 1 and 2 by considering different indicators. In the context of the population size of small towns, cluster 1 consists of a maximum population size (of a town) of 23565 and in cluster 2 it is 57011. So we divide clusters 1 and 2 into two components; one is with a population of 20000 and more and another one with a population of less than 20000. Table 5 again shows that the number of households, population size, state H.Q. road distance, number of latrines, water supply, and

number of electricity connections are important for clusters 1 and 2 for towns with a population size of 20000 and more. However, though similar variables are important for towns with a population size of less than 20000 in clusters 1 and 2, distance to the nearest city with a population of 5 lakh and more has higher significance compared to towns with a population size of more than 20000 and more.

In the context of road distance to the nearest city with a population size of 5 lakh and more from a town, the maximum distance for clusters 1 and 2 is seen to be 1200 kilometers. So, we divide clusters 1 and 2 into two components: one with a 'distance of 600 km and more' and another, 'less than 600 km'. The results show that the number of households, population size, total number of latrines, total water supply, and the total number of electricity connections have greater importance than other variables in both the clusters. Comparing the mean values across the clusters, we find that among the different variables, both the clusters stress more on 'road distance to the nearest city with population 5 lakh and more' under the category of 'distance of 600 km and more'. On the other hand, variable such as 'road distance to state H.Q.' unravel greater importance in both the clusters under the category of 'less than 600 km'.

Now we consider road distance from a town to the nearest city with a population of 1 lakh and more. The maximum road distance from a town to the nearest city with a population of 1 lakh and more for clusters 1and 2 is 462 km. So, we divide clusters 1 and 2 into two components: one with a 'distance of 231 km and more' and another, 'less than 231 km' to the nearest city with a population of 1 lakh and more. The main variables in both the clusters under the category of 'distance of 231 km and more' are number of households, population size, state H.Q. road distance, 'road distance to the city with a population of 1 lakh and more', 'road distance to city with 5 lakh and more', distance to the nearest railway station, the total number of latrines, water supply, and the total number of electricity connections.

Among the infrastructure variables, the maximum number of electricity connections is 31922 for cluster 1 and 12473 for cluster 2. So we divide clusters 1 and 2 by two components; one with the town with electricity connections of '10000 and more' and another 'less than 10000'. The results show that the 'road distance to the nearest city with a population of 5 lakh and more' has greater importance for the towns with the number of electricity connections 'less than 10,000' in clusters 1 and 2 than a town with the number of electricity connections '10,000 and more'.

The results indicate that there exists a small heterogeneity within clusters 1 and 2 depending on the consideration of different threshold levels of the indicators.

Table 5: Comparison of means for clusters 1 and 2

Cluster	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
Town population of 20000 and more															
1	3886.0	22172.0	186.7	27.3	80.3	12.8	2153.0	30951.0	2794.0	15.3	24.0	9.3	9.4	35.3	26.3
2	6128.4	28975.7	298.5	46.6	98.9	15.6	4633.8	1758.7	6898.2	255.6	18.5	16.3	18.1	26.6	45.2
Total	6124.3	28963.2	298.3	46.6	98.8	15.6	4629.2	1812.3	6890.7	255.2	18.5	16.3	18.1	26.6	45.1
Town population of less than 20000															
1	1892.4	8807.2	270.7	47.5	115.8	20.3	1264.6	878.3	1930.6	21.4	6.8	5.0	9.3	28.0	17.8
2	3782.9	17217.8	309.7	48.0	107.5	16.7	3098.8	1509.5	4543.4	25.3	12.0	10.1	9.9	24.9	32.2
Total	2222.6	10276.1	277.5	47.5	114.3	19.7	1584.9	988.5	2386.9	22.1	7.7	5.9	9.4	27.5	20.3
The road distance to the nearest city with a population of 5 lakh and more is 600 km and more															
1	1956.8	8319.1	123.5	83.2	670.3	131.8	1710.7	2169.7	1464.4	5.9	7.7	4.5	4.3	24.9	25.9
2	5273.3	21428.9	101.8	39.3	626.8	36.1	4873.5	3220.6	5249.4	3.1	13.1	6.3	11.5	30.0	52.2
Total	2603.9	10877.1	119.3	74.7	661.8	113.2	2327.8	2374.7	2202.9	5.4	8.7	4.8	5.7	25.9	31.0
The road distance to the nearest city with a population of 5 lakh and more is less than 600 km															
1	1893.5	8822.8	272.0	47.1	110.7	19.3	1261.2	891.5	1935.6	21.5	6.8	5.1	9.3	28.0	17.7
2	5375.9	25214.4	302.8	47.1	99.9	15.9	4138.7	1673.5	6145.4	182.3	16.5	14.3	15.4	26.1	41.0
Total	3281.2	15354.9	284.3	47.1	106.4	17.9	2407.9	1203.1	3613.2	85.6	10.6	8.7	11.7	27.2	27.0
The road distance to the nearest city with a population of 1 lakh and more is 231 km and more															
1	1595.8	7305.2	405.1	305.3	319.6	155.6	1090.0	1534.5	1726.1	8.7	8.5	6.2	6.2	29.1	23.9
2	5361.7	26070.9	400.8	284.2	303.1	132.4	4360.7	3987.1	6066.2	16.5	21.1	12.7	14.8	32.9	60.6
Total	2683.7	12726.4	403.8	299.2	314.8	148.9	2034.9	2243.1	2979.9	10.9	12.1	8.1	8.7	30.2	34.5
The road distance to the nearest city with a population of 1 lakh and more is less than 231 km															
1	1896.7	8831.7	269.5	45.2	113.9	19.1	1266.9	897.5	1933.1	21.5	6.8	5.0	9.3	28.0	17.7
2	5375.7	25197.1	301.6	45.8	100.5	15.3	4139.9	1666.1	6142.8	182.6	16.4	14.3	15.4	26.0	40.9
Total	3281.1	15344.0	282.2	45.4	108.6	17.6	2410.1	1203.3	3608.3	85.6	10.6	8.7	11.7	27.2	26.9
Number of electricity connection is 10,000 and more															
1	1655.6	7563.4	212.6	69.4	105.4	47.0	3485.6	185.0	11778.8	49.6	8.4	13.6	5.1	23.6	36.9
2	8022.2	34082.7	273.2	42.0	87.3	13.3	7128.7	2316.7	12661.1	600.6	20.3	23.3	39.5	21.3	63.5
Total	7910.5	33617.5	272.1	42.5	87.6	13.9	7064.8	2279.3	12645.6	591.0	20.0	23.2	38.9	21.3	63.1
Number of electricity connection is less than 10,000															
1	1894.4	8820.0	270.8	47.4	115.8	20.3	1262.2	904.1	1917.8	21.3	6.8	5.0	9.3	28.0	17.7
2	5025.9	24028.3	305.9	47.7	103.5	16.3	3746.3	1594.4	5281.0	126.4	15.9	13.1	12.3	26.7	38.0
Total	3047.2	14418.7	283.7	47.5	111.3	18.8	2176.7	1158.2	3155.9	60.0	10.2	8.0	10.4	27.5	25.2

Note: See Table 1 for variable definitions

Source: Authors' calculation

Therefore, we redo the clustering by considering only clusters 1 and 2. Again we consider Duda–Hart Je(2)/Je(1) stopping-rule, the pseudo-T-squared values, and Dendrograms (Appendix figures 2 and 3) to decide the number of the clusters within clusters 1 and 2. Table 6 presents the statistical measures. Based on the results we decide to take 13 sub-clusters from cluster 1 and 11 sub-clusters from cluster 2.

Table 6: The Variance ratio criterion (VRC) and Duda-Hart indices for Clusters 1 and 2

Sub cluster	Cluster 1			Cluster 2			
	Duda/Hart Je(2)/J2(1) index		VRC		Duda/Hart Je(2)/J2(1) index		VRC
	Je(2)/Je(1)	pseudo T-squared	Calinski/ Harabasz pseudo-F	Sub cluster	Je(2)/Je(1)	pseudo T-squared	Calinski/ Harabasz pseudo-F
1	0.6316	2123.44		1	0.5017	2381.23	
2	0.4396	1834.51	2123.44	2	0.7414	316.66	2381.23
3	0.5955	1493.4	3104.57	3	0.6699	444.55	1669.42
4	0.3705	112.13	2786.89	4	0.7139	596.03	1519.68
5	0.7068	568.79	2652.84	5	0.7644	136.50	1439.59
6	0.734	431.91	2619.09	6	0.6317	406.97	1304.90
7	0.7178	240.2	2373.34	7	0.7430	149.04	1215.24
8	0.7558	244.95	2204.09	8	0.6404	256.63	1164.13
9	0.7648	308.99	2078.52	9	0.7944	203.63	1110.86
10	0.3187	91.91	1988.74	10	0.7848	142.32	1076.43
11	0.7145	233.79	1910.36	11	0.5050	3.92	1033.78
12	0.7412	325.76	1856.33	12	0.7606	79.95	997.51
13	0.5069	20.43	1822.38	13	0.7123	70.67	966.52
14	0.7294	190.67	1789.54	14	0.6215	71.86	938.50
15	0.7612	222.06	1762.19	15	0.7574	93.20	917.26

Source: Authors' calculation

The output in Table 7 shows that the sub-cluster analysis assigned to all 3642 (or 2399) small towns unravels 13 (or 11) segments for cluster 1 (or cluster 2). Within cluster 1, the major sub-clusters such as the fourth sub-cluster comprises 516 towns (14.17 %), the ninth sub-cluster 877 towns (24.08 %), and the twelfth sub-cluster 710 towns (19.49 %). Within cluster 2, the major sub-clusters such as the fourth sub-cluster comprises 580 towns (24.18 %), the ninth sub-cluster 321 towns (13.38 %), second sub-cluster 293 towns (12.21 %), and the first sub-cluster 268 towns (11.17 %). Table 7 shows that the differences are less among the towns under different clusters. However, the eleventh sub-cluster within cluster 2 has very few observations; therefore, this sub-cluster is clubbed with the tenth sub-cluster.

Table 7: Number of clusters within Clusters 1 and 2

Cluster 1				***Cluster 2***			
Sub cluster	Frequency	Percent	Cumulative percentage	Sub cluster	Frequency	Percent	Cumulative percentage
1	173	4.75	4.75	1	268	11.17	11.17
2	399	10.96	15.71	2	293	12.21	23.38
3	188	5.16	20.87	3	228	9.5	32.89
4	516	14.17	35.04	4	580	24.18	57.07
5	97	2.66	37.7	5	120	5	62.07
6	23	0.63	38.33	6	177	7.38	69.45
7	18	0.49	38.82	7	256	10.67	80.12
8	27	0.74	39.57	8	12	0.5	80.62
9	877	24.08	63.65	9	321	13.38	94
10	58	1.59	65.24	10	138	5.75	99.75
11	72	1.98	67.22	11	6	0.25	100
12	710	19.49	86.71				
13	484	13.29	100				
Total	3,642	100		Total	2,399	100	

Source: Authors' calculation

The mean values for the sub-clusters are given in Table 9 and 10 for clusters 1 and 2, respectively. Comparing the mean values across the sub-clusters within cluster 1, we find that among the different variables, the number of households, population size, road distance to state H.Q., the total number of latrines, total water supply, and the total number of electricity connections have greater importance than the other variables. On the other hand, comparing the mean values across the sub-clusters within cluster 2, we find that among the different variables, the number of households, population size, road distance to state H.Q., the total number of latrines, total water supply, the total number of electricity connections, and distance to the nearest city with a population of 5 lakh and more road distance have higher significance than the other variables. The results indicate that more or less similar variables are responsible for the creation of sub-clusters within clusters 1 and 2, respectively.

Table 8: Comparison of means of the sub clusters within cluster 1

Sub cluster	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
1	2333.8	12938.0	241.5	39.3	95.4	14.9	932.6	357.1	1209.0	8.5	7.9	3.9	6.5	36.0	16.8
2	2979.9	13142.8	296.2	47.0	109.8	16.1	2404.5	651.2	3561.6	11.0	9.2	8.1	9.2	23.3	26.5
3	3054.0	15146.4	307.8	45.4	99.2	19.0	1335.5	455.2	2861.0	14.4	11.3	7.2	36.0	31.2	21.0
4	2436.2	10649.8	302.6	44.0	108.2	17.9	1926.3	523.3	2905.2	9.2	7.7	6.3	7.9	24.5	24.3
5	2331.1	10521.3	288.6	45.4	109.4	16.7	1548.0	4088.6	2719.0	15.5	9.3	7.2	7.2	27.5	20.8
6	2485.7	12847.1	216.0	54.8	139.6	34.3	1538.3	28365.8	2130.5	13.3	9.6	5.2	6.5	33.1	24.8
7	1496.9	7179.6	169.4	33.1	193.7	43.0	1161.6	18553.2	1307.5	2.9	4.9	3.5	4.8	30.4	10.1
8	1146.4	5831.0	141.7	50.4	173.7	50.5	804.8	10378.1	1191.6	8.5	5.9	2.7	5.9	32.9	16.0
9	1133.2	5230.3	252.4	49.7	124.0	19.6	767.4	326.0	1155.6	6.2	4.6	3.5	7.6	28.5	12.7
10	1308.1	5716.1	276.9	56.6	141.7	33.4	950.4	3883.7	1560.6	9.2	5.6	4.8	5.9	26.3	20.8
11	417.1	1764.2	222.7	70.4	145.1	43.2	355.7	430.9	708.8	3.8	3.7	3.1	3.6	29.5	13.9
12	1574.6	7274.7	268.4	45.6	115.2	20.8	1075.6	343.2	1578.5	72.9	5.8	4.6	7.4	27.5	15.7
13	1891.1	9251.4	264.4	49.7	114.8	21.8	1026.5	336.3	1492.8	9.0	7.3	4.3	9.2	30.8	14.7
Total	1894.1	8818.2	270.7	47.4	115.7	20.3	1265.3	903.1	1931.3	21.4	6.8	5.0	9.3	28.0	17.8

Note: See Table 1 for variable definitions

Source: Authors' calculation

Table 9: Comparison of means of the clusters within cluster 2

Sub cluster	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
1	4126.8	21667.6	311.5	50.9	105.6	17.8	2227.0	684.1	3384.1	48.4	15.2	10.2	11.9	33.0	28.2
2	4956.2	21267.5	315.8	49.7	111.6	15.3	4488.0	1380.5	7146.1	130.6	13.6	14.7	11.3	22.7	37.8
3	5455.1	25321.4	323.0	47.8	103.2	16.2	4316.1	1529.4	5848.5	20.6	16.7	14.3	13.5	25.5	39.3
4	3771.5	17105.6	308.3	44.2	101.8	15.3	3049.7	736.5	4367.7	18.0	11.7	9.8	9.8	24.0	32.9
5	3523.0	18055.4	278.3	56.1	110.9	21.9	2583.8	7704.6	4010.1	35.9	13.8	9.8	9.6	31.7	30.4
6	7319.7	38044.0	313.9	46.5	99.9	15.9	4771.4	2089.1	5974.2	48.6	23.5	16.7	16.6	29.8	57.8
7	8586.9	37245.0	284.3	44.1	89.3	13.8	7372.5	2039.5	11956.0	22.6	22.3	22.9	14.8	22.2	61.0
8	6689.5	33422.0	284.8	85.7	115.9	45.7	5236.1	24036.4	10259.1	19.8	23.3	17.4	14.3	28.5	42.8
9	6673.6	29866.1	294.3	42.6	92.2	13.7	5490.1	1379.9	8236.2	21.1	19.6	18.2	15.2	22.6	52.0
10	5330.1	29882.8	254.6	49.7	107.5	17.8	2796.4	802.7	3484.9	2388.1	19.0	15.4	61.0	34.7	34.6
Total	5375.6	25201.8	302.1	47.1	101.6	16.0	4141.1	1678.7	6142.4	181.7	16.4	14.3	15.4	26.1	41.0

Note: See Table 1 for variable definitions

Source: Authors' calculation

4. Interpretation of the results

Descriptive results suggest that in India very few urban development policies are in force. Urban policies and programs also cover very few cities/towns and the small towns are mostly neglected. In fact, a large percentage of the urban populations are living in cities compared to the small towns. Over the years urban dwellers from small towns are also moving towards the cities. The city-centric

urbanization in India has originated because of the benefit of agglomeration economies. The large cities are advantageous in terms of creating jobs and also, they receive a higher fraction of investments, while the small towns are usually ignored as far as the investment and growth initiatives are concerned.

Cluster analysis suggests that within the category of small towns different groups are traceable. Due to the paucity of data, out of 7467 small towns as per 2011 Census, 6939 small towns are considered for the cluster analysis. Results suggest that these towns can be grouped into 5 main clusters. Again, clusters 1 and 2 that comprise a large number of small towns compared to the other clusters; hence, they are regrouped into 13 and 11 sub-clusters, respectively. We also assessed heterogeneity within the groups by dividing the clustering variables with respect to the threshold levels. Clustering variables for small towns are considered based on population size, availability of infrastructure, and distance from a large city. Based on these clustering variables cluster analysis groups small towns in such a way that the variables in the same group are similar to each other compared to other groups. The estimated results suggest that among the different variables, the total number of households of a town, the population size of a town, state H.Q. road distance from a town, distance to the nearest city with a population of 5 lakh and more, distance to the nearest city with a population of 1 lakh and more, the total number of latrines, total water supply, the total number of electricity connections, and the total number of hospitals are very important indicators in forming the groups. The results also suggest that heterogeneity within groups is highly negligible and it depends on the consideration of different threshold levels of the indicators.

In accordance to the earlier hypothesis, our results suggest that the population size of the small towns, distance to a large city from a small town, and availability of infrastructure play a vital role for the growth of the small towns. The transformation of hinterlands to small towns suggests that there is not much variation in the population size of the small towns. Similarly, there is not much variation in the distance to a large city from a small town. Also, the similar availability of infrastructure facilities plays an important role in the emergence of small towns in India. These indicators are very crucial for explaining the dynamics of urban changes that give rise to the small towns.

The results also indicate that the small towns are located near the cities owing to the benefits of lower operating costs such as lower land prices, lower wage rates, lower infrastructure costs, etc. Small towns are emerging as the second-best solution after the exhaustion of scope within the city proper,

particularly in the light of the agglomeration economies. Hence, urban planning will have to take up a huge task of developing these small towns and make them livable for the residents and profitable for the business and industry.

5. Conclusions and policy implications

The study has attempted to identify the economic determinants of growth and the location of small towns where they are emerging. The review of current urban development policies suggests that the major urban policies such as JNNURM, 'Smart City Mission', and AMRUT have highly neglected the small town's development in India as the coverage of these towns under the programs is very limited. Cluster analysis suggests that different groups among the small towns are noticeable. The availability of infrastructure and amenities such as the total number of latrines, electricity connections, hospitals is very important for the growth of small towns in India. Results also suggest that there are not much variations in the size of small towns. The small towns are emerging in the neighborhood of the large cities with low variations in the distance from a city. It is also suggested that small towns are emerging due to the significant transformation of rural areas as the growth of large cities are saturated. Our findings support the emergence of the small towns as the second-best solution after exhaustion of scope within the city proper.

Based on our empirical analysis we suggest the following policy options for the development of small towns in India.

Our results suggest that infrastructure variables such as the number of latrines, amount of water supply, number of electricity connections are the key drivers behind the growth dynamics of the small towns in India. Though a large proportion of the urban populations are living in cities, the major part of the recent growth of the urban population is driven mainly by the small towns (census towns). Now the question arises regarding the location of investment: in cities or small towns. The growth of small towns indicates that cities in India reached their saturation level and the hinterlands are going through a structural transformation by converting the rural areas into urban. So, here we have two major options; either a fresh round of investment in the cities is required or we can invest in the small towns. With the limited availability of infrastructure investment in India, we suggest it is much better to invest in the small towns than in the large cities the relative cost of investment is very less over there and several advantages associated with agglomeration economies can be created. The abundant

availability of land and the low wage rate is the main source of lower operating costs in the small towns. Therefore, the potential benefits of investment are also higher in small towns than in cities. Also, the apparent uniformity in the small towns that we observed can actually make policy initiatives simpler: in other words, for a number of small towns the policies can be similar in nature rather than being complex and heterogeneous.

Indian policies always targeted "checking" rural to urban migration by facilitating rural development. For instance, the green revolution from 1967-68 to 1977-78 significantly increased agriculture productivity and the launching of Mahatma Gandhi National Rural Employment Act (MGNREA) in 2006 increased rural employment. The emergence of the small towns, especially the census towns informs us that the structural transformation is happening and it is an inevitable part of the urban development process which is experienced by many countries in the world. So the development of small towns in terms of provision of basic services will make the rural area even more productive. And this will lead to a new generation of 'agglomeration economies'. So, rural areas which are transforming themselves into urban spaces will become more productive and be the key drivers of future economic growth in India.

Finally, our results suggest that most of the small towns are emerging near the cities. In this context, Tripathi (2021) suggested that the small towns which are located within a radius of 52 km from a city have a higher population growth rate and they are important for future urban development in India. Therefore, small towns located closer to the city should be given the top priority in the context of current urban development policies and programs.

Overall, small town's development policies should be put in place for higher productivity, encouraging non-farm economic activities and generating new 'agglomeration economies', creating greater employment opportunities, and increasing the rate of urbanization. It will also contribute to sustainability in the urban system and result in higher and sustainable economic growth in India.

References

Ahrend, R., Farchy, E., Kaplanis, I., Lembcke, A.C. 2017. What makes cities more productive? Evidence from five OECD countries on the role of urban governance, Journal of Regional Science, 57 (3), 385-410.

Alam, A., Choudhury, B. 2016. Spatio-functional determinants of small towns: A case study of selected Indian small towns. Review of Urban and Regional Development Studies, 28(2), 75–88.

Chatterjee, M. 2014. Regional variation in urbanisation in India and the emergence of new towns. ERSA conference papers ersa14p1459, European regional science association.

Chatterjee, U., Murgai, R., Rama, M. 2015. Job opportunities along the rural-urban gradation and female labor force participation in India. Policy Research Working Paper; no. WPS 7412. Washington, D.C. World Bank Group.

Frick, S.A., Rodríguez-Pose, A. 2018. Change in urban concentration and economic growth, World Development, 105, 156-170.

Gibson, J., Datt, G., Murgai, R., Ravallion, M. 2017. For India's rural poor, growing towns matter more than growing cities. World Development, 98(October), 413–429.

Himanshu. 2017. Making small towns a priority for growth. Livemint. Retrieve from: https://www.livemint.com/Opinion/ 1duwvJZqyB5oZKVFFxm55H/Making-small-towns-a-priority-for-growth.html (Accessed on 25 February, 2020).

Jain, M. 2018. Contemporary urbanization as unregulated growth in India: The story of census towns. Cities, 73, 117–127.

Jain, M., Korzhenevycha, A. 2020. Urbanisation as the rise of census towns in India: An outcome of traditional master planning? Cities, 99, 1–9

Kamath, L., Zacharia, Y. 2015. Impact of JNNURM/UIDSSMT/IHSDP programs on infrastructure and governance outcomes in cities/towns in India. TISS working paper 7. Tata Institute of Social Sciences, Mumbai, India.

Khan, S. 2014. The other JNNURM: What does it mean for small towns in India? Centre for Policy Research (CPR), working paper no. 4, Center for Policy Research, New Delhi.

Krugman, P. 1991. Increasing returns and economic geography. Journal of Political Economy, 99 (3), 483– 499.

Mitra, A., Kumar, R. 2015. New patterns in Indian urbanization: Emergence of census towns. Environment and Urbanization ASIA, 6(1), 18–27.

Mitra, A., Tripathi, S. 2021. Rural non-farm sector: Revisiting the Census towns, Environment and Urbanization ASIA, 12(1), 148-155.

Ottaviano, G. and Thisse, J. 2004. Agglomeration and economic geography, Chapter 58 in Handbook of Regional and Urban Economics, vol. 4, pp 2563-2608 from Elsevier.

Pradhan, K. C. 2013. New census towns of India: Unacknowledged urbanisation. Economic & Political Weekly, 48(36), 43–51.

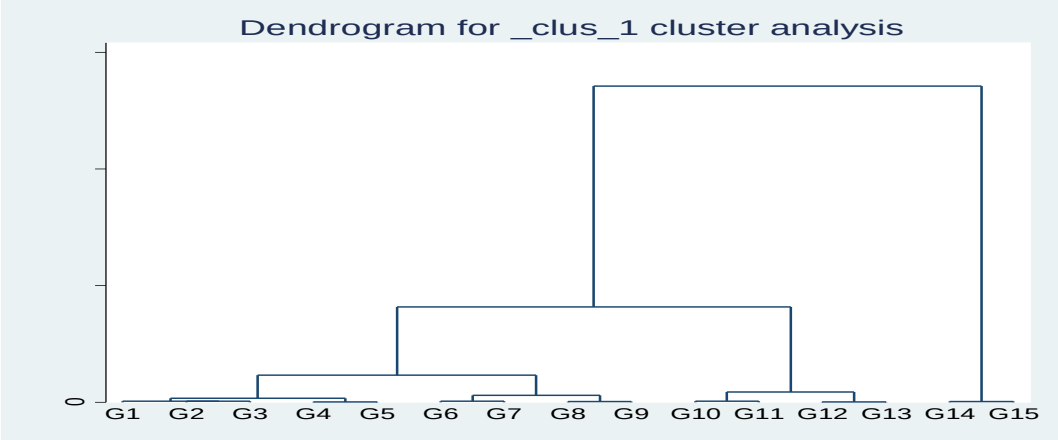
Rodríguez-Pose, A., Griffiths, J. 2021. Developing intermediate cities, Regional Science Policy and Practice, 13 (3), 441-456.

Scrase, T. J., Rutten, M., Ganguly-Scrase, R., Brown, T. 2015. Beyond the Metropolis-regional globalisation and town development in India: An introduction. South Asia: Journal of South Asian Studies, 38(2), 216–229.

Tripathi, S., 2021. Towards sustainable urban system through the development of small towns in India. Regional Science Policy and Practice, 13 (3), 777-797.

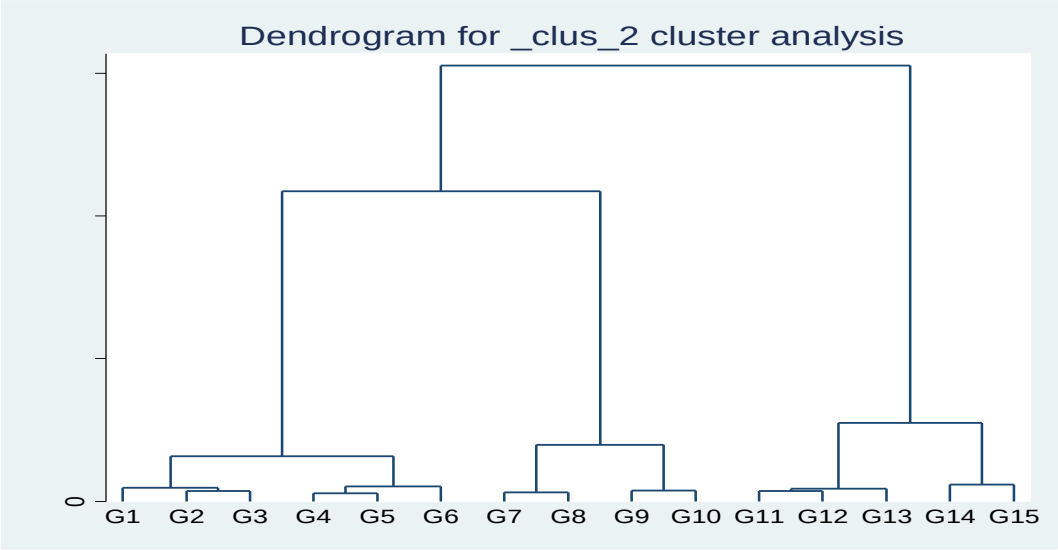
Weerdt, J. D., Christiaensen, L., Kanbur, R. 2021. When distance drives destination, towns can stimulate development. Policy Research Working Paper No. 9622. World Bank, Washington.

Appendix Figure 1: Dendrogram for wards linkage cluster analysis



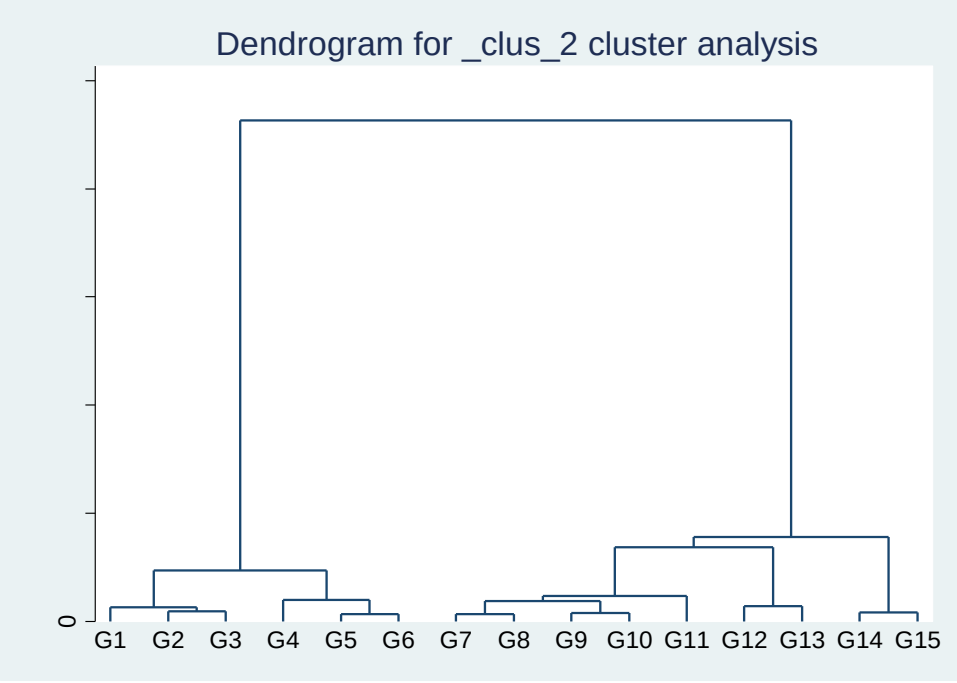
Source: Authors' calculation

Appendix Figure 2: Dendrogram for wards linkage for cluster 1



Source: Authors' calculation

Appendix Figure 3: Dendrogram for wards linkage for cluster 2



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