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Urbanisation in the Philippines, 1903-2020: historical changes in a log-normal mirror

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Introduction

This paper explores historical patterns of change in urban growth during the American and post-independence periods. In this area of study, it has been suggested that there was a pattern shift from that of Manila City dominating the nation's economy to that of the Manila-centred megaregion becoming the major force. Until the last decade of the twentieth century, Philippine urbanism has been led by the growth of Manila City and the expansion of that city to a megaregion of Metro Manila. Although the pace of urbanisation has started to slow down recently, problems associated with this Manila-centred urban growth, such as urban primacy (a concept associated with the dominance of a single city or urban region), excess migration driven by a disparity in wages and earnings and persistently high levels of poverty incidence within the urban sector, remain in Manila and its surrounding areas.[1] However, this interpretation can be problematic as it turns a blind eye to what was happening in other layers of the nation's urban hierarchy, especially middle- and small-sized cities and municipalities in provincial regions.[2]

The paper applies a technique of displaying size distributions against their ranks on a log-normal scale to a set of data covering a 118-year period from 1903 to 2020. The methodology, developed by urban geographers, is centred around the concept of rank-size rule.[3] By using this formula as a yardstick the paper will identify what kind of

[1] IDE (1989), chs. II-III, Cuervo and Lim Hin (1998) and World Bank (2017).
[2] See for example Costello (1998), which is an attempt to go beyond the primacy argument by focussing levels below the primate city.
[3] The rank-size rule expressed as a log-normal relationship is also called Zipf's law.

changes took place to the shape of urban hierarchy in the Philippines.

1. Methodology

The rank-size rule is an empirical regularity concerning the relationship between the population size of an urban settlement and its rank on the country's size hierarchy. If displayed on a diagram, both axes of which are logarithmically scaled, it is often the case that a set of rank-size plots turn out to be more or less linear and 'log-normal' with its slope becoming -1. Figure 1 shows one such case, a display for the United States in 1940, and data assembled over a long period confirm that the slope of the American rank-size distribution line remained in the vicinity of -1 throughout the twentieth century,[4] and is found for many other countries. In this rank-size diagram, the population of the second largest city is expected to be half of the largest – more generally, the population of the nth city to be 1/n of that of the 1st.

This particular form of log-normal distribution is regarded by urban geographers as the 'normal' rank-size distribution to be expected for any urban system in a developed or well-integrated society. Carol Smith, among others, suggests that any hierarchal system of urban settlements will move towards this 'normal' situation whenever the system becomes well-integrated with institutional and other barriers removed, a developmental process which may be described as a development from an 'immature' to a 'mature' system of urban hierarchy.[5] What is suggested by them is a view that history is a process in which forces of integration became stronger to counter the forces of diversification. According to this line of thinking, more specifically, nearness to the sources of raw materials works as the force of diversification while both manufacturing growth and the development of transport and market services will allow a few large urban settlements to emerge, hence making the observed slope steeper.

2. Realistic approaches to the history of urban hierarchies

In reality, however, there are cases in which an actual rank-size distribution is deviated from the normal shape. For medieval and early modern periods, for example, no one will expect that the forces of integration were strong enough to counter the effects of diversification. According to Jan de Vries, the slopes of distributions in 1500 for several

[4] Dobkins and Ionnides (2000).
[5] Smith (1982) and Smith (1990).

countries on the European continent were all shallower than the expected value.[6] Between 1000 and 1950, in fact, the shape of the European distribution showed a back-and-forth between the two modes, i.e. a shallower and a steeper ones of urbanisation (see figure 2).[7] It is, therefore, safe not to assume that the rank-size rule is at work in the same manner at all times and places. Given the verdict given by more recent economic geographers in their 1999 book that 'at this point nobody has come up with a [theoretically] plausible story about the process that generates the rank-size rule',[8] it will probably be useful for anyone conducting empirical research on city-size distributions in development studies to work with typologies, rather than to count on the applicability of a single theory.

Three types may be considered here. The first one is what the above example of rank-size distributions for Europe in 1500 suggested, i.e. a linear but shallower pattern was commonplace for countries economically and socially underdeveloped. However, empirical studies in development areas have revealed that there are a couple of other types. One is urban primacy in which the largest city dominates and is unproportionally greater than the second largest. The unproportionally fast growth of Manila in the American period can be seen in this light. Another is a corollary to the second type of primacy pattern with two or several cities together dominate the urban hierarchy, making the pattern quasi-convex. This third type is associated often with the emergence of a megaregion, a large area made of multiple cities that have grown so much that they are inter-connected. The emergence of Metro Manila is a case in point. Researchers working on contemporary developing countries believe that these two are the dominant patterns for urbanising South-east Asia.

Any change in the structure of urban hierarchy can be analysed by examining how the slope and shape of rank-size distribution, plotted on a double-logarithmic graph, evolved over a certain period of time. This constitutes the core part of the paper. There are two issues: one is to check to what extent the measured slope of a distribution line is closer to -1, and the other is to see to what extent the actual plots are deviated from the straight line. In this paper, by assembling the largest 100 urban settlements from the comprehensive lists of cities and municipalities in the census reports for 1903, 1939, 1970, 2000, and 2020, therefore, the question of how the structure of Philippine urban hierarchy

[6] de Vries (1984), figures 6.14-6.17, pp. 110-17.
[7] de Vries (1984), pp. 264-65. For more focused discussions on the 1500-1850 period, see also de Vries (1990), p. 52.
[8] Fujita, Krugman and Venebles (1999), ch. 12. The quotation is from p. 225.

changed over the hundred-plus years will be explored.

3. Two earlier works

There are two studies so far made to show us displays of rank-size distributions of the Philippine cities. One is the Institute of Developing Economies (IDE)'s publication in the late 1980s, and the other a journal article published in 1998.

In 1989 an IDE research team published a project report on rank-size distributions of cities in developing countries, which included a graph showing Philippine rank-size distributions for 1970 and 1980. A similar diagram for 1960 and 1990 is found in a paper on city-ward migration and primacy by two Singapore scholars, J. C. Cuervo and D. H. O. Kim Hin. Both publications suggest that urban primacy was the Philippine pattern. More specifically, Cuervo and Kim Hin's article provides us with two measures of primacy, the primary index (P-index, the ratio of the largest to the second largest) and the four-city index (F-index, the ratios of the largest to the combined populations of the next three largest). Between 1960 and 1990, the former measures show a slight drop and the latter a similarly modest increase in the ratio – the results supporting the findings by IDE's work for the middle years.[9] On the other hand, the IDE study gives us the estimates of the slope of a line regressed on the distribution plots for the two survey years. They are -0.87 for 1970 and -0.84 for 1980 (on the right margin of figure 3).[10] The coefficients seem to suggest that the slope of the distributions in those years was not particularly low, certainly not at a level found for rather poorly integrated Europe in 1500.

It seems certain, therefore, that the post-independence Philippine urban hierarchy was, like other developing countries in Asia, characterised by urban primacy. Nonetheless, if and only if the IDE's regression results are trusted, the comparatively greater steepness of the slope line suggests that the country's urban system may have been not as 'immature' as one might have imagined. But can we accept the IDE's regression exercise?

There are two technical issues here. One is the unit of observation. For Manila, both studies seem to have chosen the area surrounding Manila City. How that area was defined is not clear in the two studies, but such a treatment produces a problem of exaggerating

[9] Cuervo and Lim Hin (1998), p. 248. IDE (1989) gives the same set of indices for 1980, but the estimated values differ between the two (the IDE estimates for the P- and F-indices are provided on the right margin of figure 3).

[10] IDE (1989), p. 90. R^2s are not as high as one might expect: 0.77 and 0.84 respectively (regression results are set out on the right margin, figure 3).

primacy. Throughout this exercise I would like to stick to the administratively defined City of Manila and to explore the impact of a megaregion formed around the city in a different manner.

Another is concerned with a queer shape appearing on the graph in figure 3. That shape suggests that beyond a certain rank, the size of urban settlement became unproportionally small, which I believe made the computed regression line steeper than it should be with a proper data sample.[11] It is likely that the sample used for their work was not an adequate one. It seems that the researchers took urban settlements having the status of city only, leaving out municipalities whose population size was comparable to smaller cities. As a matter of fact, there is always a case in which there exist a number of large municipalities while small cities are very small. Taking a larger sample with those municipalities included will create a much more smoothly-shaped distribution line. For any benchmark year, therefore, I took both cities and municipalities, sorted them out according population size, and took the largest 100, regardless of their settlement status, for analysis and display.

4. Changes in urban hierarchy, 1903-2020

Having prepared a list of information about the rank and size of population for 100 urban settlements thus selected from five benchmark-year census reports, the rank-size distributions are set out in one graph (figure 4), with the regression results summarised in table 1. They make it clear, first, that the slope was substantially shallower (the regression coefficient is lower than -0.6) until 1970 but the longer-term tendency was for the slope becoming steeper. Second, the pre-war period of 1903-1939 exhibited a clear pattern of concavity, shaped largely by the unproportionally larger population of Manila, which grew faster than other cities over the American era. Third, the 1939-2000 period saw the pattern changing from that of primacy to the emergence of a megaregion around the capital, while the slope kept getting steeper until the turn of the century (with the regression coefficient changed from -0.4 to -0.7). These changes were accompanied by the replacement of the primate city from Manila to Quezon. Fourth, in the decades after 2000 the tendency for the slope to get steeper came to a halt. The urban population was still on the increase but the slope remained at about the same level, which implies that the century-long urbanisation process has failed to get close to -1. The Philippines' archipelagic geography and linguistic diversity may account – at least in part – for this

[11] A similarly queer pattern appears on a rank-size distribution graph in Cuervo and Kim Hin (1998), p. 248. Regression results are not provided therewith.

failure. Finally, a new pattern emerged after 2000 in the shape of the distribution. Now the curve is slightly convex with the portion above rank 20 being shallower than the larger group of below 20.

All this endorses the currently dominant theses about urban primacy and megaregion: there did take place a shift from the former to the latter during the past hundred years. Table 2, which cross-tabulates the growth rate of urban population by ranking category and compares their growth rates with that of national population, shows what this meant in relation to urban hierarchy. The post-independence years saw the centres of population growth within the urban system shifted down along the scale. In the 1939-1970 period it was in ranks 2-10 where population grew faster than that of the whole country; in 1970-2000 the momentum reached lower rank cities of below 10.

However, this cross-tabulation exercise tells us that there was another story. The tendency for growth momentum to shift down to lower ranks continued from the 1970-2000 period to that of 2000-2020. In the past, the level of growth rate for smaller cities tended to be lower than the average growth rate of national population. Now, however, even the cities in ranks 51-100 are growing faster than the national total. In other words, a new tendency of smaller cities increasing their importance started after 1970 and keeps the momentum going in the first decades of the twenty-first century.

So far, exploration has been made on the basis of break-down by ranking category only. Now it will be interesting to see how cities constituting the Metro Manila megaregion fared in each ranking category. The region of Metro Manila formally came into being in 1975 with 16 cities and one municipality as its constituents, but we may trace them back to earlier censuses. As table 3 indicates, most of those constituents did not show up in the table of above 100 in the 1903-1939 period; the numbers increased in the post-independence period while in 2000 and 2020 most of them are found in the group above rank 50. However, table 4 makes it clear that the share of those Metro Manila cities in ranks 1-10 peaked in 1970, 76 per cent, and then decreased to 60 per cent in 2020. The share in ranks 11-50 peaked in 2000 at 30 per cent, which also slipped to 27 per cent during the same period. Table 5 looks this by comparing the growth rate of population in the Metro Manila cities with that of the non-Metro Manila counterparts for the two ranking category s of 1-10 and 11-50. In the 1939-1970 period the Metro Manila cities' population growth was far stronger in both groups. For the 1-10 ranking category in the next period, the population growth of non-Metro Manila cities – most of which were located in islands outside Luzon – outstripped that of the constituents of Metro Manila, and in the period after 2000 the tendency shifted down to the 11-50 ranking category. The

growth of middle-sized cities was an unmistakable tendency throughout the half-century period since 1970.

5. Conclusion

The above analysis of the urban rank-size data has revealed a hitherto unidentified aspect of the Philippines' changing urban hierarchy. The analysis does confirm the consensus that the dominance of Manila in the American period transformed itself into an expanded pattern of the Metro Manila megaregion in the post-1946, However, it has also found a couple of tendencies which have so far been given due attention. One is that the share of the Metro Manila megaregion stopped expanding by the turn of the century. It is not a new finding,[12] but what was taking place underneath seems to have been the growth of smaller cities, which became unmistakable from 1970 onwards.

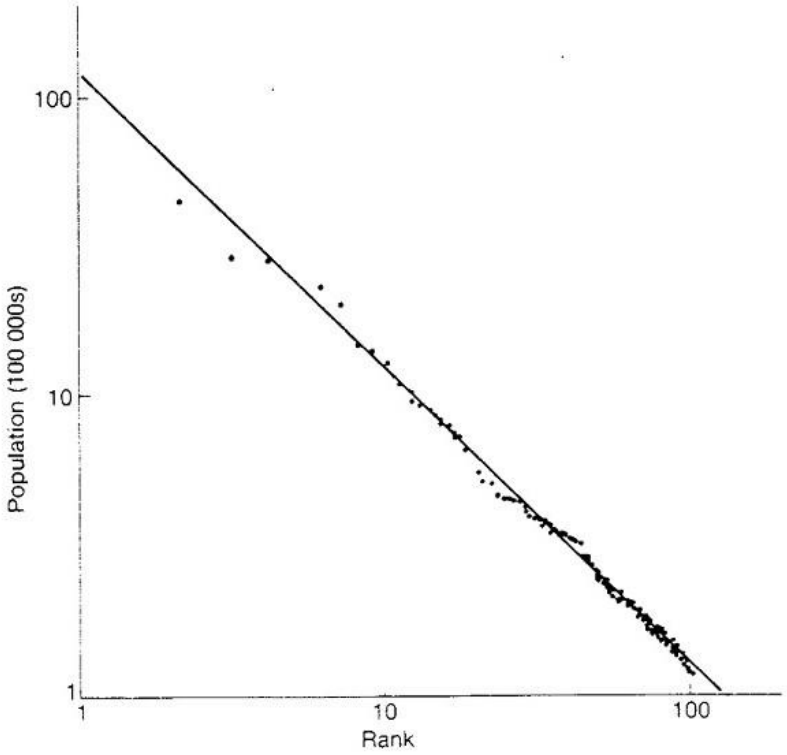
At this stage, it is difficult to identify what kinds of economic, social and demographic changes account for the growth of population in those middle- and small-sized cities since no straightforward correlation is found between the observed pattern of urban hierarchical change and population growth or per capita GDP growth.[13] Without a body of regionally focussed research results, it is also premature to endorse a suggestion that the national picture of Philippine urban hierarchy should be portrayed as a vertically structured web of provincial metropoles with Metro Manila on top.[14] What is certain, however, is that the finding is part of a longer-term, historical process. As figure 1 has shown, the overall pattern of urbanization in the Philippines was for the slope of rank-size distribution to become steeper since 1903 onwards, and it was particularly the case for smaller cities.

[12] World Bank (2017) gives a table showing average annual growth rates of urban population between 2000 and 2010 by size category (p. 3), which shows the Philippines' large cities (10 million pr more) grew a little slower that their smaller peers (0.5 to 5 million). However, no comment on this interesting finding is provided in the text.

[13] According to Maddison Project Database (GGDC 2020), the Philippines' population growth was high until the end of the twentieth century (the pace accelerated in the post-independence period), while the rate of growth in GDP per capita in the four time periods shows a up-and-down pattern: 1.8, 0.5, 1.2, and 4.0 respectively (% per annum).

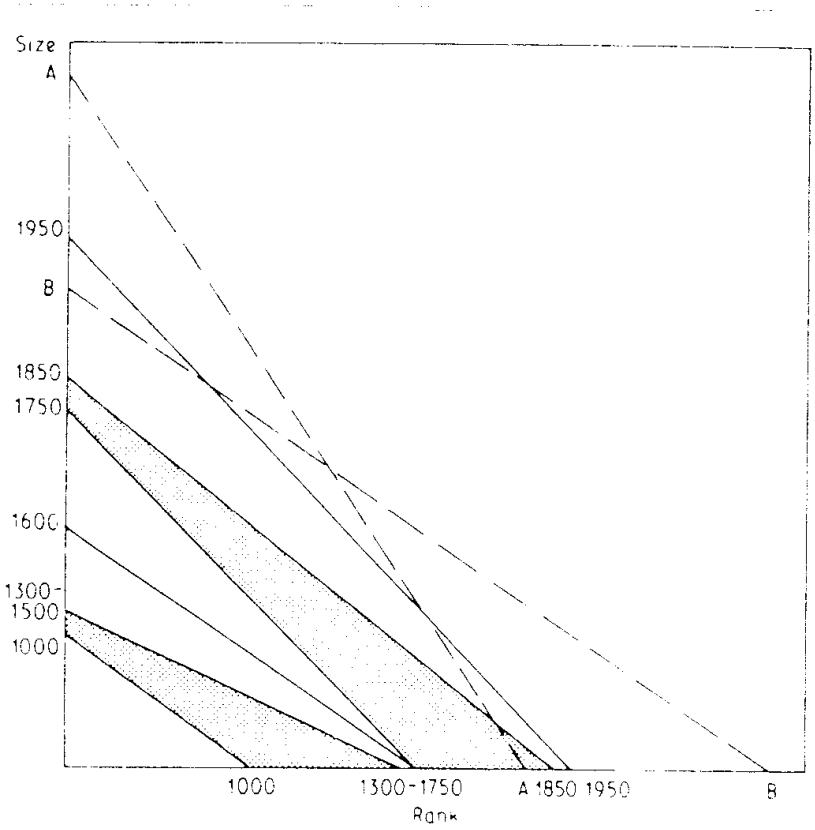
[14] This is what Costello (1998)'s finding suggests on the basis of the Northern Mindanao evidence.

Figure 1. Rank-size distribution for the United States, 1940



Reproduced from Smith (1990), p. 21. The slope of the solid line is -1.

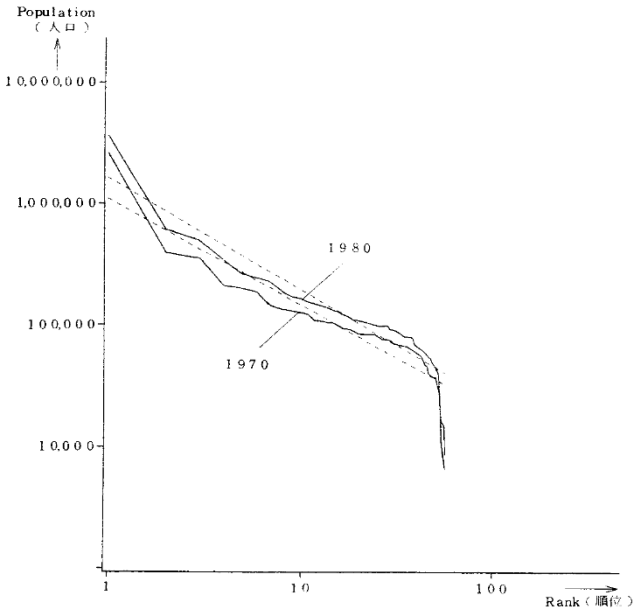
Figure 2. Two modes of European urbanisation, 1000-1950 (and the future)



Reproduced from de Vries (1984), p. 264.

Mode I: getting shallower,
1000-1500, 1750-1850
Mode II: getting steeper
1500-1600, 1600-1750, 1850-1950

Figure 3. Rank-size curves and regression lines estimated by IDE



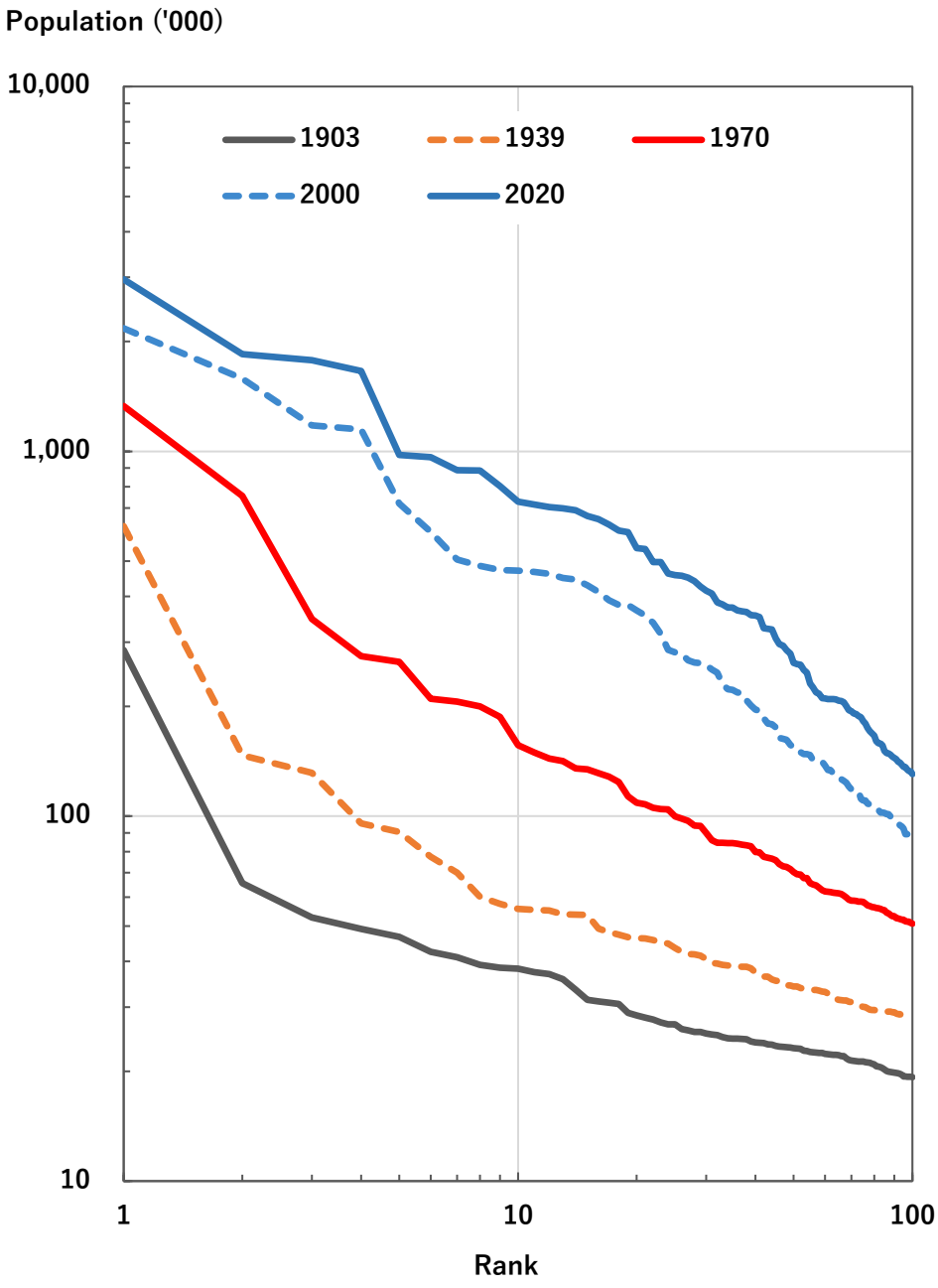
$\log_{10} Y = a \log_{10} X + b$

1970： a = −0.8688
b = 6.0400
R^2 = 0.7865
P − Index = 6.5380
F − Index = 2.7029

1980： a = −0.9105
b = 6.2074
R^2 = 0.8410
P − Index = 5.8193
F − Index = 2.4591

Reproduced from IDE (1989), p. 90.

Figure 4. Rank-size distributions of Philippine urban settlements, 1903-2020



Source: Census reports.

For the method of selecting the 100 urban settlements, see text.

Table 1. Rank-size regression results

	Constant	Slope	R^2 (adj)
1903	4.48	-0.34	0.85
1939	4.99	-0.43	0.89
1970	6.43	-0.59	0.97
2000	14.84	-0.73	0.98
2020	8.34	-0.72	0.97

Table 2. Population growth of urban settlements by ranking category

(% per annum)

Ranking category	1903-1939	1939-1970	1970-2000	2000-2020
Rank 1	2.20	2.13	1.37	0.86
Ranks 2-5	2.17	3.57	2.92	0.85
Ranks 6-10	1.33	3.09	2.74	1.46
Ranks 11-50	1.27	2.35	2.93	1.36
Ranks 51-100	1.03	1.80	1.92	1.26
National population	2.08	2.43	2.08	0.85

Table 3. Number of Metro Manila cities appearing in each ranking category

	1903	1939	1970	2000	2020
Ranks 1-10	1	1	6	6	5
Ranks 11-50	0	2	6	9	9
Ranks 51-100	3	2	2	1	1
Smaller than the 100th*	13	12	3	1	2

Note: Metro Manila was formed in 1975, covering 17 urban settlements including one municipality whose population was smaller that of the 100th). Their identification is simply extended back to 1903.

Table 4. Share of Metro Manila cities in the total urban population (the 100th and above) by ranking category

(%)

	1903	1939	1970	2000	2020
Ranks 1-10	40.8	44.3	76.0	68.5	60.5
Ranks 11-50	0.0	4.6	17.6	30.3	27.3
Ranks 51-100	6.0	4.4	4.1	2.0	2.7
Ranks 1-100	12.3	16.6	35.3	37.7	32.8

Table 5. Population growth of Metro Manila cities as against that of other cities by ranking category

(% per annum)

		1903-1939	1939-1970	1970-2000	2000-2020
Ranks 1-10	MM	2.2	5.2	2.6	1.2
	non-MM	1.8	2.7	3.9	3.0
Ranks 11-50	MM	-	7.3	5.4	1.9
	non-MM	1.1	2.3	3.0	2.7

Note: Growth rate cannot be defined for MM of ranks 11-50 in the 1903-1939 because there was no MM city or municipality in that ranking category in 1903.

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