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Population and Costs in Relation to City Management

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pensions in Ireland during the year ending with March last was 2,321,729*l.*, which exceeded by 106,225*l.* four times the amount paid during the first quarter of 1909, and was considerably more than double the amount paid during the year ending March 31 last in Scotland, the total population of which is estimated to exceed that of Ireland by more than half a million. A report of the result of the above mentioned official inquiry concerning the marked excess of old age pensions in Ireland compared with those in the other divisions of the United Kingdom, would be full of interest from a statistical point of view.

N.A.H.

IV.—*Population and Costs in Relation to City Management.*

By C. ASHMORE BAKER.

WHILST preparing the figures given in a recently published volume of tables relating to municipal money matters,¹ it occurred to the writer that it might be of interest to ascertain if anything in the way of a direct relation exists between population and the cost of City management. This inquiry is of particular interest at the present time in view of the movement which is taking place in several of our larger cities towards the absorption of their smaller immediate neighbours. Apart from any advantages to be derived from uniformity of administration, which may be claimed for such a policy, the question of cost is an important one, and it has frequently been claimed that the aggregation of administrative areas tends to a general reduction in administrative costs.

A comparison of the averages for the four groups of towns into which the tables are divided indicates, as a matter of fact, with some exceptions, a slight general *increase* in the cost of any given service *per head of population* as the sizes of the towns increase. The most striking feature shown by a comparison of the figures is, however, the extremely small influence which the mere population of a town exerts on the *per capita* cost of its public services. Thus the cost per head for education for the group of urban district councils, which are their own education authorities, is only 12 per cent. lower than that of the group of county boroughs, notwithstanding the fact that the average populations of the two groups is as 36,000 to 137,000, or as 1 to nearly 4. The total revenue also of the former group bears a similar relation to that of the latter.

In the case of several services, such for instance as salaries and superannuation, street maintenance, public lighting and sewerage, there appears to be little or no direct relation between *per capita* cost and population. Indeed, as regards the three last, the uniformity

¹ *Rates, being the revenue and expenditure of boroughs and urban district councils of 10,000 or more inhabitants (England and Wales).* Analysed and compared by C. Ashmore Baker. London: P. S. King and Son.

FIG. 1.—Diagram connecting population and expenditure for county boroughs.

(From Rates, 1910.)

Explanation.—The curves represent expenditures in pence per head of population as follows:—

Cd	Education.	Df	Sundry loan charges (mostly non-reproductive).
Da	Police.	Dg	Other miscellaneous expenditure.
Db	Justice.	Eb	Maintenance of roads and streets.
Dc + d	Hospitals, libraries and museums.	Ed	Public lighting.
De	Salaries and superannuation allowances.	Ef	Sewerage.

The curves lettered on the left refer to the left-hand vertical scale of pence; those lettered on the right to the right-hand scale.

In certain cases wide departures from the normal are due to one of the towns in the group of eight to which this point on the curve relates, having an abnormal expenditure under the heading in question (*e.g.*, Ef and Df). In such cases the mean of the remaining seven towns is indicated by a dotted line.

N.B.—The abscissae are in all cases divided logarithmically.

between the average figures for the four groups of towns is a particularly striking fact. Thus:—

Numbers.	Group.	Average population.	Per capita costs for		
			Roads.	Lighting.	Sewerage.
72	County boroughs	137,500	d. 55·0	d. 19·7	d. 16·2
54	Large urban districts	36,250	55·5	19·5	17·8
245	Non-county boroughs	16,900	57·4	21·1	15·9
756	Small urban districts	6,400	59·6	16·4	15·3

In order to ascertain the probable influence of population while eliminating to some extent such influence as might be exerted by differences in statutory powers, the writer has analysed the figures given in the tables for the important group of county boroughs, seventy-two in number, and varying in population from some 25,000 souls to nearly three-quarters of a million. These seventy-two towns having been arranged in order of population were divided into nine groups of eight towns each. The "unweighted" average cost per head for various services was then ascertained from the tables for each group of towns, and from the figures thus obtained the appended curves were prepared. (Fig. 1.)

On this diagram, the feature which immediately "jumps to the eye" is the tendency of nearly all the lines to reach a *minimum* in the neighbourhood of the 90,000 population mark. While this tendency is too regular throughout the whole set of curves to be fortuitous, it is not easy at once to point to an explanation.

FIG. 2.—*Municipal revenue and population.*

The above is a "smoothed" curve representing the variations of the total net revenue of the county boroughs with population. (From *Rates*, 1910.)

In this and the succeeding figures, the curve is "smoothed" by co-ordinating the average figures for every ten consecutive towns as described in the text.

It might well have been supposed that, as in ordinary business concerns, standing charges would cause expenditure under most heads to be higher for small than for large towns. A glance at the smoothed curve connecting population and total revenue (Fig. 2) will, however, show even more clearly that the average revenue per head to be raised by the small towns is less than that for the towns having the largest population figures, and that such relation as may exist is not as simple as might have been expected. This curve was prepared by plotting the average of every 10 consecutive towns in the list. Thus, the first point in the curve represents the average for towns 1 to 10 inclusive, the second point represents the average for towns 2 to 11 inclusive, and so on. This curve, as will be seen, reflects the general tendency of its component curves as indicated in Fig. 1.

An inspection of the tables themselves indicates wide variations in the cost of a given service as between town and town. Thus,

FIG. 3.—Produce of *id.* rate, police rate, and crime (smoothed curves).

A. The dotted branch is obtained by eliminating watering places and residential towns from "business" towns. (From *Rates*, 1910.)

B. Includes payments to pension funds. (From *Rates*, 1910.)

C. (From *Criminal Statistics*, Part I, 1906.)

under the head of public lighting per head, we have such divergent figures as 55*d.* in the case of Blackpool, and 5·8*d.* in that of Oldham, while sewerage varies from 1·3*d.* at St. Helens to 145*d.* at Burnley, and even such items as police and salaries and superannuation show ratios of three or four to one as between *maximum* and *minimum*. Notwithstanding such divergences as these, however, the curves, as I have said, do indicate a general interdependence between the two factors of cost and population which is too recurrent to be without significance.

The upper curves shown in Fig. 3 were therefore prepared, and it is at once apparent that the governing factor, at least for municipal expenditure, is rateable value, which is also, of course, a measure of rent. The dotted bifurcation of the top curve represents the figures relating to "business" towns only, the figures for residential towns and watering places having been deducted.

With a view to ascertaining if this influence of rent could be discovered in other directions, other curves were constructed in a similar manner, and it will be seen that in every case there is a distinct dip between the 70,000 and 90,000 population marks, at least indicated, and generally strongly marked. Fig. 4 represents the relation between population and area in square miles per thousand persons, and it is interesting to compare this with the top curve in Fig. 3. From such a comparison it may be seen that while up to a point in the neighbourhood of 90,000 both rent and area per head decrease together, beyond this point while area per head still falls and tends ultimately to become constant (*i.e.*, when the land is packed as full as it will hold) the rateable value (*i.e.*, rent) per head rises.

The meaning of this is probably as follows. In the smaller towns the "site value" per acre remains approximately constant, and the rent is spread over a greater number of persons as this population increases. At the point, however, at which the centre parts of the town become loaded to their *maximum* capacity, probably the point at which transit facilities become a necessity rather than a convenience, the site value commences to increase rapidly, giving rise to a corresponding increase in rateable value and rent, which would appear to be reflected in the cost of all activities wherein these two factors are involved.

It is interesting to observe the general resemblance between the crime rate curve and that representing expenditure on police (Fig. 3), the former being an accentuation of the latter. Whether police expenditure is dependent on the crime rate or whether the crime rate is a function of the percentage of policemen to population, I prefer to leave to observers more expert than myself to determine. At all events, it would not appear from the curves that police expenditure acts as a deterrent to crime, though both these figures have a distinct relation to rent.

Curves showing the cost of gas and electricity have been added (Figs. 5 and 6), and these are of some interest as, in contrast with the preceding figures, they do show on the whole a well-marked tendency for the cost to decrease as the population of the ad-

ministrative area increases. The close general correspondence between these two curves is perhaps not so remarkable as might at first appear, the prevailing factors being the same in both cases, viz., price of coal and density of population (*cf.* Fig. 4).

FIG. 4.—Population and population-density (smoothed curve).

The hump commencing at the 50,000 population mark is chiefly due to the high ratio of area to population in the case of Barrow-in-Furness. (From *Rates*, 1910.)

FIG. 5.—Cost of gas (per cent. of average).

(From *Returns of Gas Undertakings for 1907*.)

FIG. 6.—*Cost of electricity (per cent. of average).*Per
cent.(From *The Electrical Times Annual Tables*, 1909.)

ERRATA.

Mr. Welton desires to call attention to the following errata in his paper published in the *Journal* for March, 1904, on the smaller urban districts of England and Wales:—

On page 31, "Falmouth, 16.9 per cent. of tailors," should be *sailors*.

In the small table on page 29, the ratio of "Indefinite workers (engine drivers, &c.) in Surrey" is printed "6.6," but should be 0.6 per cent.

On page 31, the ratio of "Carriage builders in Doncaster" is given as "7.1 per cent.," but should be 10.8 per cent.