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Public versus Private Electricity Supply.

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THE FABIAN RESEARCH DEPARTMENT

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The Report of the Committee on the Control of Industry (Mrs. Sidney Webb, Chairman) is now in preparation, and will be published in 1914.

It is proposed to form a Committee on Industrial Insurance.

PUBLIC v. PRIVATE ELECTRICITY SUPPLY.

ONE of the most remarkable economic developments of modern times has been the rapid growth of what is called municipal trading, and perhaps few economic questions have been discussed with more rancour and ignorance on both sides; for it is seldom that even the supporters of the movement advance much in the way of argument beyond sentiment, or vague generalities for the faith they profess.

The general ignorance on the subject is the less pardonable in view of the great mass and ready accessibility of the material available by which the success or failure of the movement may be gauged.

Can a public service be provided better by a public body than by a private enterprise? And how are we to define "better"?

Many defenders of municipal trading argue their case on ethical and even on æsthetic grounds, but the man who has to foot the bill requires something more concrete, and asks: Can a municipality supply as good an article at as low a price as can, say, a public company; and if so, how can we be sure of it both in regard to price and quality?

Now in many fields of activity it is difficult to compare the results produced under the two rival systems we are considering. This difficulty arises frequently from the absence of generally accepted criteria of "goodness."

One party insists on cheapness regardless of economy, another on efficiency regardless of cost, and so on; and there is heard

"Great argument
About it and about."

What is required at the moment is a comparison based on the production of some definite commodity whose value and cost can be readily and accurately gauged.

Now a Board of Trade unit of electricity is a pretty definite thing from a commercial point of view. It cannot be adulterated; its quality cannot vary much from definite standards; it can be accurately measured; and whether we buy it from a company or a town council we can be fairly certain of obtaining an identical article.

Here also we have an article the cost of production of which, by the judicious investment of twopence at any railway bookstall, can be ascertained in the case of a large number of separate undertakings, both publicly and privately owned.

The *Electrical Times* publishes in nearly every issue tables showing the analysed yearly returns of some 300 of the statutory undertakings, and as these returns are made out in a form prescribed by Act of Parliament they are readily comparable.

In addition to the above, the publishers produce an annual reprint of these tables, usually containing in addition to the figures relating

to the separate undertakings group analyses giving the results produced by the companies as a whole and by the municipalities as a whole. Let us see what these figures have to say to us.

TABLE I.

	Local Authorities.	Companies.
Capital Expenditure per Kilowatt of Maximum Load	£96	£153
Working Expenses per Unit sold ...	0·80d.	1·27d.
Average Price charged per Unit ...	1·70d.	2·52d.
Amount provided for Depreciation and Reserve per £100 of Capital ...	—	£1·32
Amount provided for Sinking Fund per £100 of Capital	£3·15	—
Load Factor*	20·68 %	18·53 %

Table I. gives us the position of affairs as shown in the last (1910-11) issue of these annual tables, and the figures crudely as they stand appear to present an overwhelming case for the municipalities.

Thus, as regards capital expenditure, for each kilowatt of maximum load (that is to say, for a given capacity for meeting the demand for energy at any time) the companies have expended in cash or credit 60 % more than have the municipalities. In working expenses they spent 59 % more per unit sold; their consumers paid them on an average 48 % more per unit.

And here arises one of the loudest and most persistent of the charges levelled against municipal economics. "They are living on their capital," say the objectors; "in a few years their plant will be obsolete or worn out, and notwithstanding this they will still be obliged to go on paying interest on the capital invested, while new loans will have to be raised for the renewal of their machinery."

Now, if this is true, in what a parlous condition must be the electric supply companies in view of the fact that whereas the municipalities are hastening to perdition on sinking funds averaging 3·15 %, not to mention any additional reserves they may be accumulating, the companies are only providing 1·32, or less than half the amount set aside by the municipalities for the protection of their capital, and this notwithstanding the fact that whereas the companies' statutory powers are virtually terminable at the end of forty-two years, those of the local authorities are to all intents and purposes perpetual.

And yet the companies' shares and debentures are readily saleable at quite substantial prices!

Many other voices are raised in refutation of the evidence crudely set forth in Table I. "The municipal undertakings are much larger than those owned by companies, wherefore they work more cheaply."

The municipalities make large paper profits by selling energy to themselves for street lighting, etc., at exorbitant prices. They charge working expenses to capital account. They sweat their workers.

* Ratio of actual to possible output of units by the plant installed.

They pay extravagant wages for the purpose of vote catching. They have invented a whole calendar of new crimes in addition to the old ones doubtless practised by such enterprising local authorities as may have ruled those "Cities of the Plain."

These things obviously want looking into. Let us make an investigation in order to ascertain what of truth may be in them.

The first of these charges has an appearance of reason, inasmuch as the biggest yearly loads of the municipalities' undertakings averaged 2,000 kilowatts, while that of the companies averaged only 1,440 kilowatts during the year we are considering. We must therefore compare our undertakings size for size.

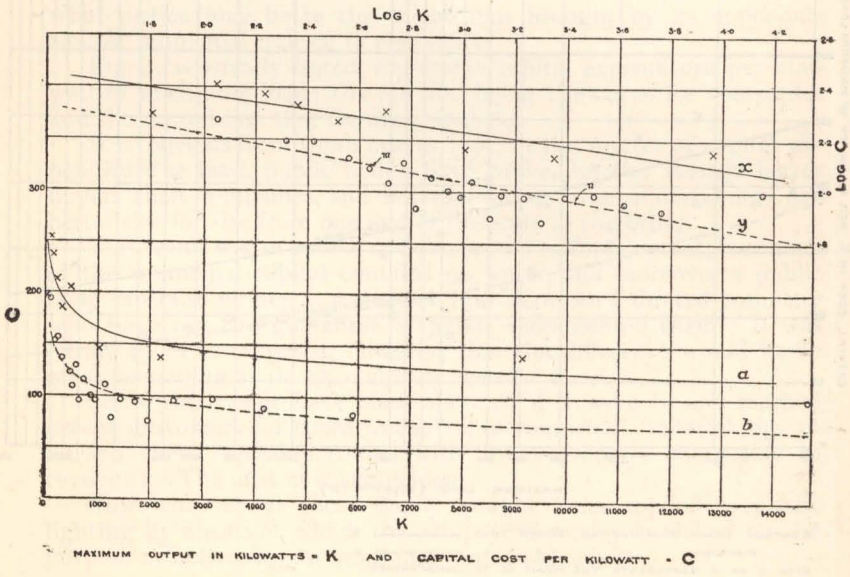
If the list of authorities given in the *Electrical Times* table be taken, and each group (municipal and company) arranged, not in alphabetical order, but in a table commencing with the largest undertaking (as measured by its maximum load) and ending with the smallest, and if we plot on squared paper the figures given, the abcissæ representing the size of the undertaking and the vertical ordinates any other column of figures, such as the total cost of production per unit or the capital expenditure per kilowatt of maximum load, we shall find that we get a series of dots distributed like the tail of a comet about a mean curve.

What we want is to find the mean trend of that curve.

N.B.—The exposition here following of the method of analysis used is not necessary to the main argument; it is given in order that anyone sufficiently interested to do so may verify for himself the results obtained.

A higher degree of regularity may be obtained by further sub-dividing our towns into groups of ten each, and again plotting our co-ordinates; they now fall into a much more orderly arrangement, but it is still not easy to draw a curve which shall represent their mean. (See Fig. 1.)

FIG. 1.



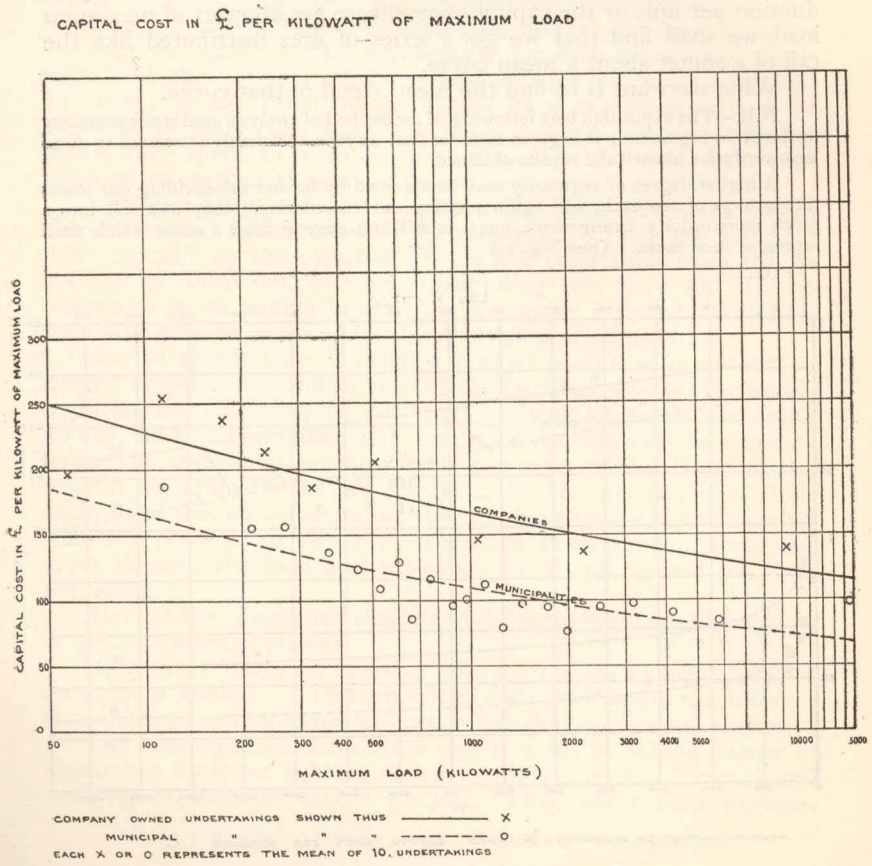
If, however, we take these co-ordinates and instead of plotting them directly we plot their logarithms, we shall find that they lie roughly along a straight line (see *y*, Fig. 1), and it is a very easy thing to find the mean of a number of co-ordinates following a straight line law: all we have to do is to separate them into two groups, one containing, say, all the figures of the first half of the table, and the other all the figures of the second half. We then find for each group the average of all the ordinates, and likewise the average of all the abcissæ; thus we get two separate pairs of co-ordinates, one for the top half of our table and the other for the bottom half. (See *m* and *n*, Fig. 1.) Plotting these two points on our squared paper, we draw a line through them which represents the mean of all our separate co-ordinates.

Now what does this straight line mean?

Having taken as an example the relation between maximum load and capital expenditure for municipal undertakings, if our abcissæ represent logarithms of maximum loads in kilowatts, and our ordinates logarithms of capital cost per kilowatt in £, the line would start from an ordinate measuring 2·58 above the zero point and slope downwards toward the right at the rate of 0·179 inches of vertical height for every inch measured along the horizontal, or in other words:

$$\text{Log } C = 2{\cdot}53 - (\text{Log } K \times 0{\cdot}179),$$

FIG. 2.



or to express our formula numerically: $C = \frac{340}{K^{0\cdot179}}$ from which formula we can calculate the mean curve for our co-ordinates already plotted. (Fig. 1, *a*.) The full line *x* is the corresponding logarithmic line for companies, and gives us the formula

$\text{Log } C = 2\cdot63 - (\text{Log } K \times 0\cdot136)$, or $C = \frac{430}{K^{0\cdot136}}$ as shown in *b*, Fig. 1.

Although these formulæ represent hyperbolas it is not to be argued therefrom that the relation between the size of an undertaking and the cost of its installation or working follows a true hyperbolic law. All that is claimed in the present paper is that for the purposes of comparison, and within the limits of the data available, the mean relation is sufficiently nearly an hyperbola to render any departure from such law negligible.

It will be observed that in curves *a* and *b*, Fig. 1, most of the co-ordinate points are grouped at one end of the diagram, that is to say in the region of the most usual size (1,000 to 2,000 kilowatts). In order to make our comparison clearer it will be well to draw our diagrams in such a way that the mean of the ascertained co-ordinates (as represented by circles and crosses respectively) comes nearer the middle of the diagram, while at the same time the extremes are included in the picture. This can be done by graduating our abcissæ in such a way that equal distances represent equal *proportions* instead of equal quantities, that is to say by making our horizontal scale a scale of logarithms as in Fig. 2, which represents the same curves as are shown in Fig. 1. (Compare Figs. 1 and 2.) The abcissæ of this and the succeeding figures, with the exception of Figs. 9 and 12, are graduated in this way, not with any ulterior motives of hanky-panky but for the sake of clearness only.

The method of analyses above described has been followed in all cases in the following curves with the exceptions of that representing "Rent, Rates and Taxes" and of the graph illustrating the relations between "price" and "user," Fig. 12.

Having obtained a means of comparing the results size for size of publicly and privately owned undertakings, let us proceed to make our comparisons and discover what is to be learned therefrom and what justice may be in the accusations brought by its opponents against municipal trading in electricity.

Fig. 2, as already stated, represents capital expenditure per kilowatt of maximum load; the full line being the curve for companies and the dotted line that for municipalities.

It is obvious from these curves that, in the matter of capital expenditure at least, public bodies have proved on the average better buyers than companies, and not merely for large undertakings but better size for size from one end of the scale to the other.

This result was of course to be expected to some extent, inasmuch as the municipal capital contains no water, and moreover a public body can raise money at a cheaper rate than can a limited company who have not the guarantee of public rates behind them. It was hardly to be anticipated, however, that the difference would be so great, averaging as we have already seen 60 %.

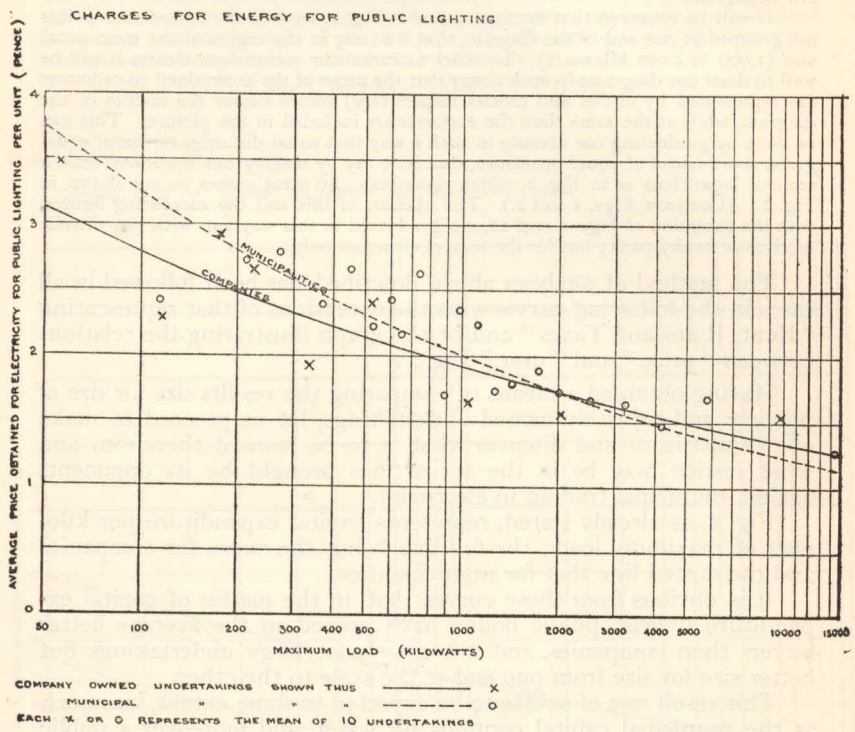
Could this result have been obtained if it were to any marked extent customary for those in control of municipal undertakings to burden their capital accounts with items properly chargeable to revenue? The answer is self-evident.

Now what about those dearly bought units applied to public lighting by means of which the ratepayers' money is filched for the purpose of bolstering up moribund municipal fads?

Fig. 3 tells us something about this, and what it tells us is that there is "not much in it." The companies' charges are lower by a small percentage for the smaller undertakings and higher for the larger ones, the two curves crossing at a point representing a maximum load of 2,000 kilowatts.

If therefore the ratepayers are badly off under the municipal régime as regards the cost of electricity for public lighting, they are on the average very seldom better and generally worse off under the companies ; moreover, inasmuch as the municipal undertakings pro-

FIG. 3



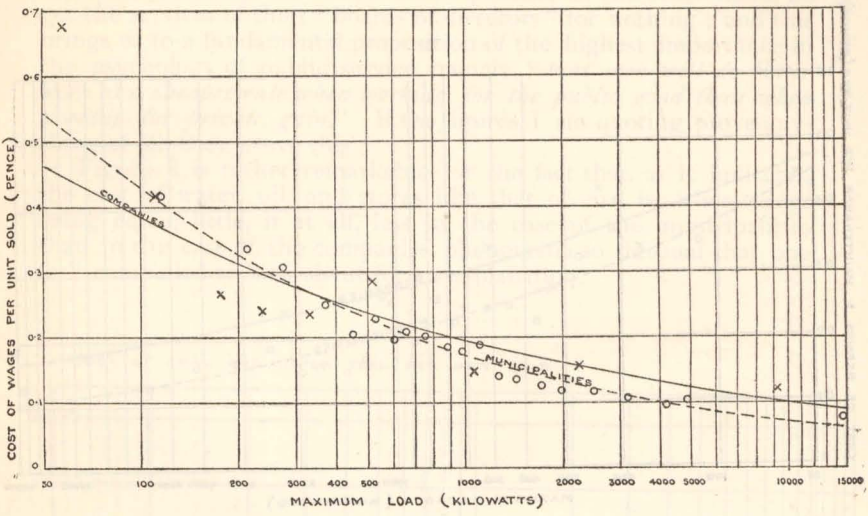
duce at a considerably lower price than do the companies, much of the cost of public lighting must obviously come back to them in the form of profit or in reduced charges for general supply.

Fig. 4 gives us the respective wages curves for the two classes of undertaking, and we must decide from these curves whether "sweating" or "extravagance" is to be charged against the municipalities.

The municipal curve lies somewhat higher than the company curve up to about 350 kilowatts, and above this limit follows a lower trend, so that of the two counts sweating perhaps more nearly fills the bill. But is it not at least arguable that wise expenditure of capital and able management have resulted in a saving in the

FIG. 4.

COST OF WORKMENS WAGES PER UNIT SOLD



COMPANY OWNED UNDERTAKINGS SHOWN THUS ——— X

MUNICIPAL " " " – – – – O

EACH X OR O REPRESENTS THE MEAN OF 10 UNDERTAKINGS

amount of labor required? The whole tendency of the evidence supports this view. Indeed, to judge by the comparatively small difference between the respective wages curves and the large differences between those representing other items of expense, it is reasonable to deduce that the municipalities pay on an average a higher rate of wages than the companies but more than make up the difference by judicious management.

Fig. 5 gives us the relative amounts spent per unit sold on "Repairs and Maintenance." Here surely we have the municipalities "on the hip."

To the meanest intelligence it must be obvious at first glance that the plants of the municipalities are rapidly qualifying for the scrap heap, owing to neglect of the elementary duty of preserving the machinery intact.

The difference is remarkable; the amount per unit spent by the companies being of the order of 50 % higher than that provided by the municipalities.

But it is *only at first glance* that this charge appears justifiable; for the difference is of much the same order as those between the respective expenditures on management and capital, items of expense which cannot be avoided by the simple method of neglecting to provide them. It is fair to claim therefore that the muncipalities are doing at least as much, if not more, than the companies (in view of their excellent showing on other items) in the way of maintaining their plant in efficient working order.

FIG. 5.

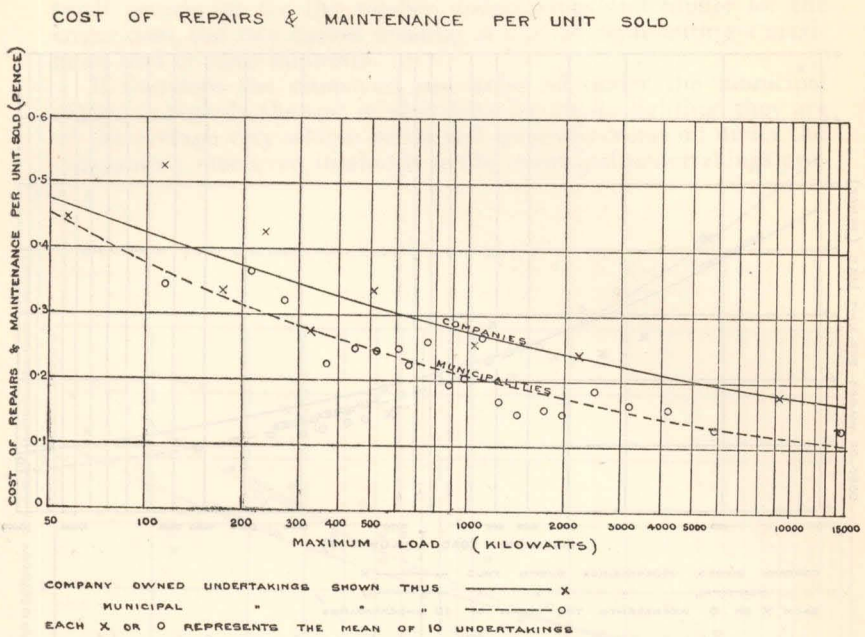


Fig. 6 shows the relative cost of coal per unit sold for the two classes of undertaking. It is only fair to the engineers of the companies to point out that the difference in this case is not in reality as great as would appear from the diagram, and that the apparent difference is largely though not entirely due to the fact that a larger relative percentage of the municipal undertakings is situated in the coal areas.

In Fig. 7 are given the relative amounts spent on management and establishment charges.

What can be the explanation of the extraordinary divergence between these curves? Why should companies have to pay, on an average, anything from 75 % to 300 % more for the management of their undertakings than have the municipalities?

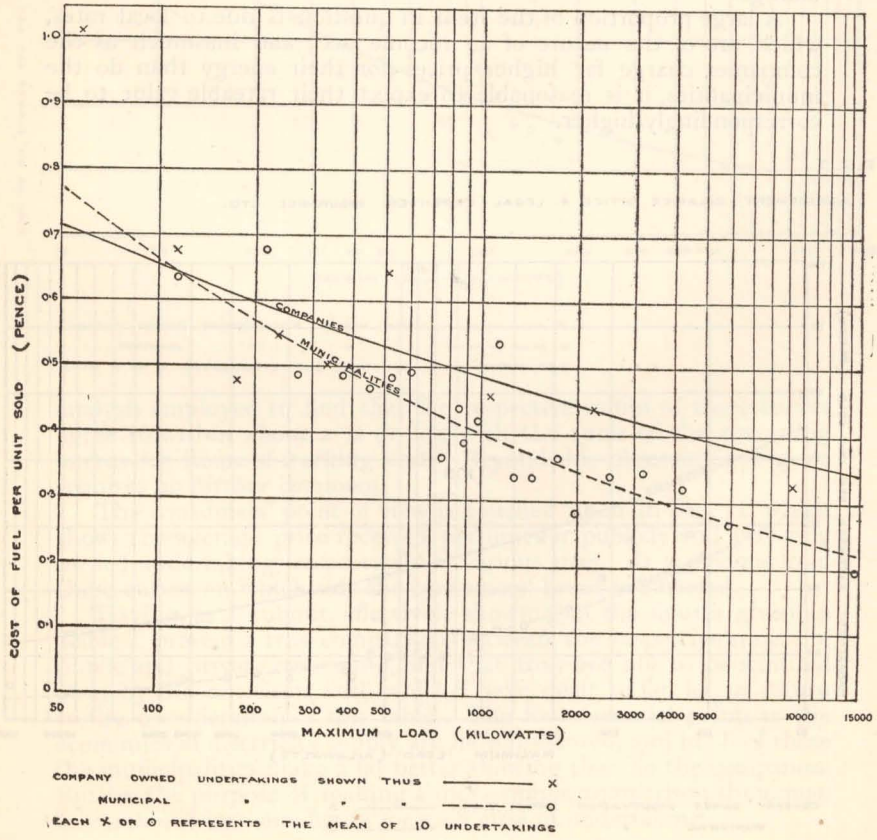
The answer to this question probably lies in the realm of psychology.

The municipalities sweat their officials? Probably they do; certainly the average pay of municipal electrical engineers is extremely low. But it is open to the economist of the cynical "Manchester school" to retort, "If we can get the best men for the rates we pay, why pay more?" and in view of what has gone before, the rejoinder can scarcely be made that the service obtained is of the "nasty" as well as of the "cheap" variety. The general result produced by the municipal engineers is of itself a magnificent testimonial to their efficiency.

The companies have directors' fees to meet? This is, of course, true. You cannot get brains or energy for nothing when your object is private profit. The municipalities, on the other hand, do get the services of their "boards of directors" for nothing; and this brings us to a fundamental proposition of the highest importance in the psychology of public service, namely, "*that men will do better work at a cheaper rate when working for the public good than when working for private gain.*" If the figures I am quoting prove anything at all, they prove this.

Figure 8 is rather remarkable for the fact that, as it indicates, the cost of water, oil, and stores like that of coal is, other things being equal, little, if at all, less in the case of the municipalities than in the case of the companies, phenomena so unusual that one feels compelled to look about for an explanation.

FIG. 6. COST OF COAL AND OTHER FUEL PER UNIT SOLD



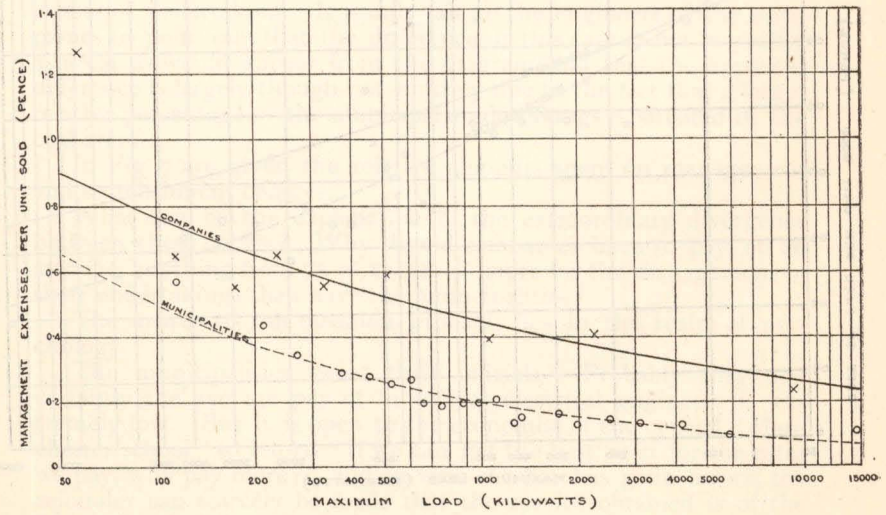
This will probably be found in the fact that where technical as apart from financial matters are concerned there is probably not much to choose between the two classes of undertakings. The companies' engineers would doubtless produce quite as good results as their municipal brethren under equally favorable economic conditions. It is obviously in the board room that the chief differences between public and private trading arise.

Rents, rates, and taxes are presented in Fig. 9, and here will be found some possible explanation of the often heard complaint that the companies are not fairly treated in the matter of rating. The item in question does not appear to follow any law analogous to those governing output and cost under other heads of expenditure (or, indeed, any law at all, except such as under providence may guide the inscrutable workings of the minds of the assessment authorities). They commence equally at or about 0·15d. per unit, and rise and fall respectively to about 0·2d. per unit in the case of the companies and about 0·1d. per unit for the municipal undertakings.

A large proportion of the item in question is due to local rates, which are of the nature of an income tax; and inasmuch as the companies charge far higher prices for their energy than do the municipalities, it is reasonable to expect their rateable value to be correspondingly higher.

FIG. 7.

MANAGEMENT, SALARIES, OFFICE & LEGAL EXPENSES INSURANCE ETC.



COMPANY OWNED UNDERTAKINGS SHOWN THUS ———— X

MUNICIPAL " " " — — — — — O

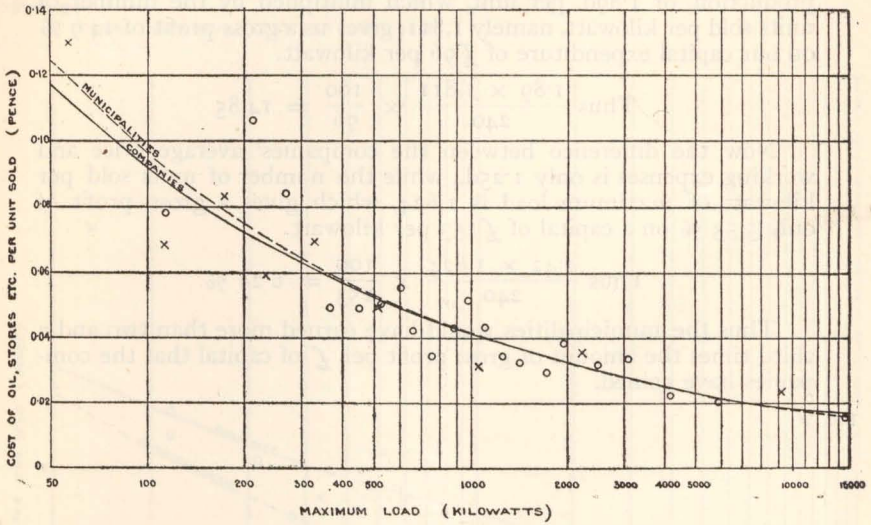
EACH X OR O REPRESENTS THE MEAN OF 10 UNDERTAKINGS

The remainder of the difference is probably to be accounted for by the obviously superior economic efficiency which the municipalities evince, on the whole, throughout their operations.

In Fig. 10 we have curves representing the grand totals of the preceding curves, and it is an interesting check on the method of

FIG. 8.

COST OF OIL, WASTE, WATER, AND STORES PER UNIT SOLD



COMPANY OWNED UNDERTAKINGS SHOWN THUS ———— X

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EACH X OR O REPRESENTS THE MEAN OF 10 UNDERTAKINGS

analysis employed to find that the respective values of these curves agree to within about 2 % or less with the sums of the preceding curves for items of working cost. Beyond this observation Fig. 10 requires no further comment.

The consumers' point of view is touched upon in Fig. 11, which shows the average price received per unit for publicly and privately owned undertakings respectively of various sizes. It is obvious from these curves on which side the consumers' bread is buttered.

Having, as I submit, effectively shown that the figures given in Table I. present a true comparison between the respective results of public and private ownership, and that they are not to be whittled away by the criticisms with which I have dealt so far, let us return to the consideration of this table. The four essential points in the economics of electricity supply are here presented, and in all of these the municipalities make a far better showing than do the companies. But for the purpose of making a more simple comparison these may be combined into one figure for each class of undertaking.

For this common figure we may take the gross profit per £100 of capital on the assumption that both classes of undertaking charged their consumers the same average price for energy.

In the return we are considering, the number of units of energy sold per kilowatt of maximum load is for municipalities 1,811. The average price charged by the companies, including meter rents, etc., is 2·69 pence.

Had the municipalities charged the same average prices, their gross profit per unit would have been this figure less their cost of production, or 1·89d. per unit, which multiplied by the number of units sold per kilowatt, namely 1,811, gives us a gross profit of 14·9 % on our capital expenditure of £96 per kilowatt.

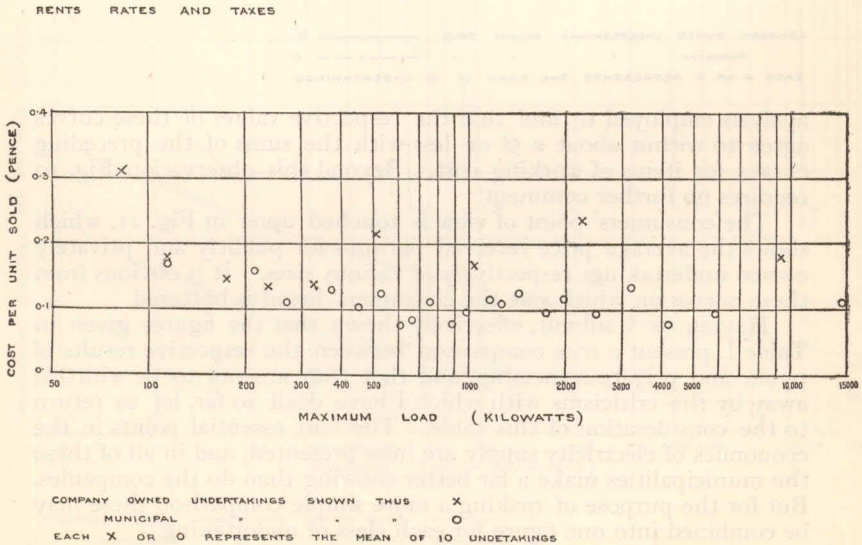
$$\text{Thus } \frac{1{\cdot}89 \times 1{,}811}{240} \times \frac{100}{96} = 14{\cdot}85$$

Now the difference between the companies' average price and working expenses is only 1·25d., while the number of units sold per kilowatt of maximum load is 1,624, which gives a gross profit of only 5·53 % on a capital of £153 per kilowatt.

$$\text{Thus } \frac{1{\cdot}42 \times 1{,}624}{240} \times \frac{100}{153} = 6{\cdot}28\ \%$$

Thus the municipalities would have earned more than two and a third times the amount of gross profit per £ of capital that the companies have gained.

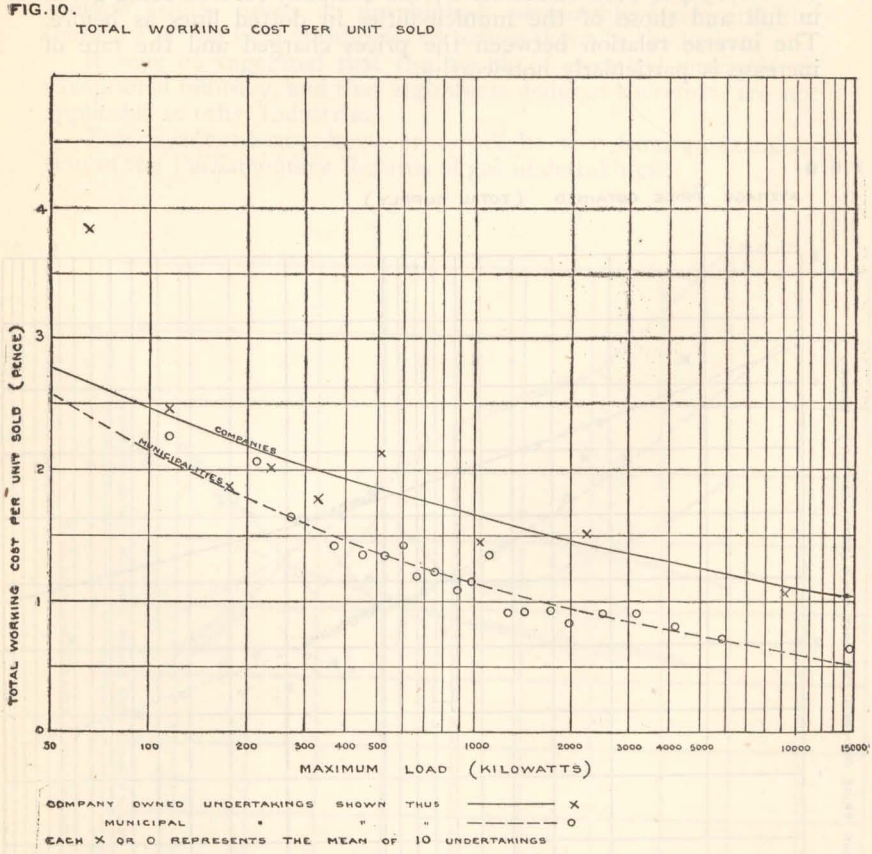
FIG 9



If we take nett profit as the basis of comparison, still keeping the two classes of undertaking on an equal commercial footing, the greater success of the municipalities from the purely commercial point of view becomes still more strongly marked.

Thus, accepting the companies' provision for depreciation and reserve as a sufficient allowance in both cases (and there is no commercial reason why if it is sufficient in the case of the companies whose powers are terminable it should not be sufficient in the case of the municipalities who have perpetual powers), we find the nett

FIG. 10.



profits are 13·53 % in the case of the municipalities, and 4·95 % in the case of the companies ; the former figure being about two and three fourths times the latter.

If, then, the two systems are compared on the usual basis of profit, it is evident that the municipalities have beaten the companies by the handsome margin of nearly three to one.

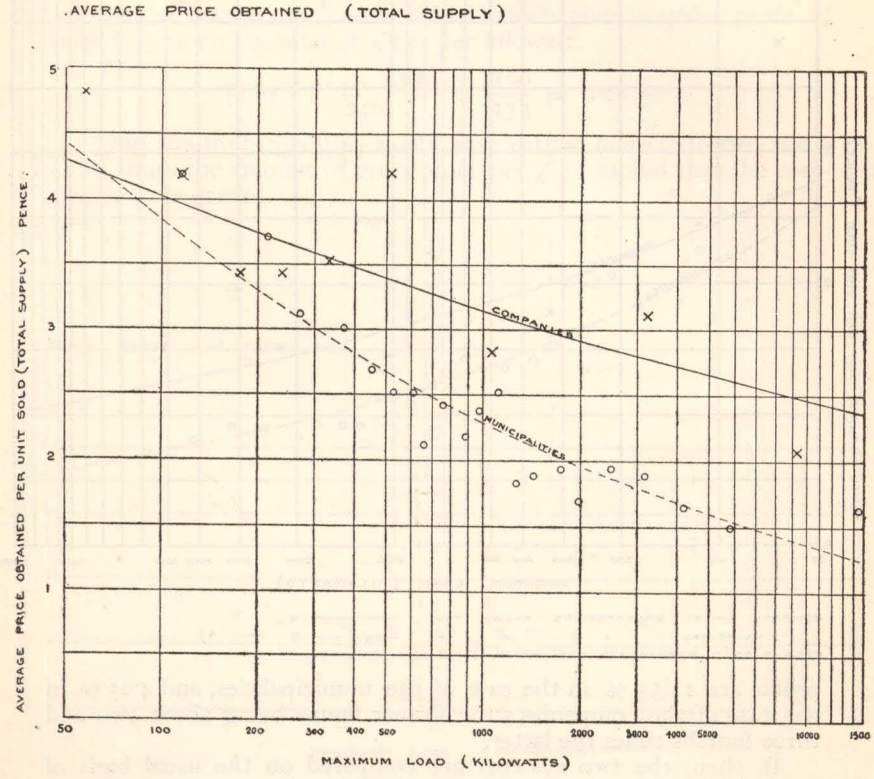
So far the municipalities have been on their defence, but we now come to a set of facts justifying a prompt and vigorous attack upon

the claim of private enterprise to toleration even, let alone encouragement, in the field of public service.

The "sale" of an article depends largely on its selling price, and this is as true of electrical energy as it is of any other commodity.

The retarding influence of private ownership upon the development of the electrical industry becomes evident from an examination of Fig. 12, in which are depicted the average prices charged and the average sale in units per head of population for provincial undertakings, as derived from the *Electrical Times* annual tables for the years 1903-4 to 1911-12 inclusive; the company returns being given in full and those of the municipalities in dotted lines as before. The inverse relation between the prices charged and the rate of increase is particularly noteworthy.

FIG. 11.



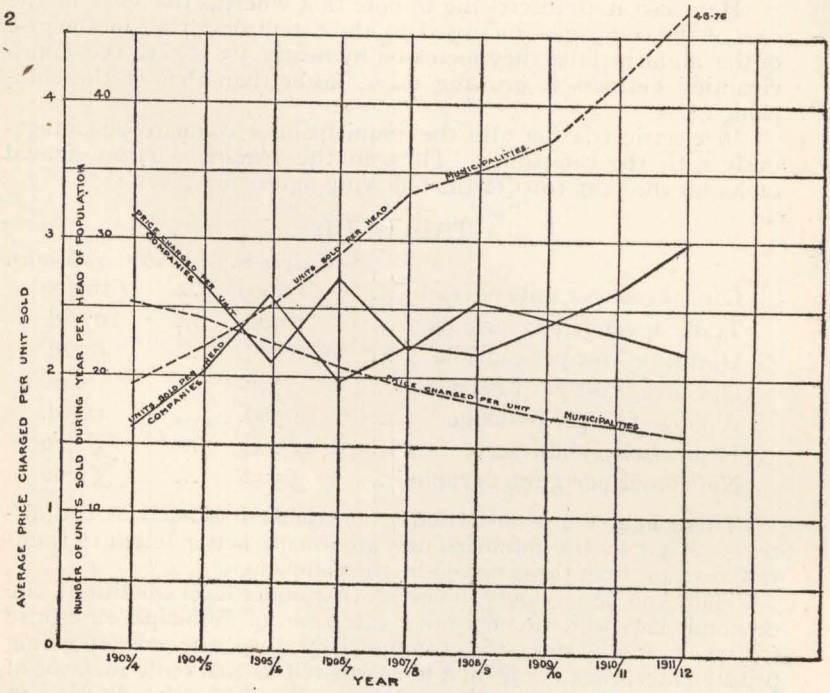
Compare the development in the one case with that in the other and consider what an intolerable drag on the electrical industry universal company ownership would have been. Thus in the provinces instead of an annual output of some 790 million units for the year 1910-11, we should have been fobbed off with only 460 million.

Instead of a capital of £36,000,000, earning for the public 11·3 %, we should have spent in its place some £28,000,000, plus 60 % or so of water, in order to earn 4·3 % thereon for private investors. Note also the tendency of the companies to maintain their average selling prices at the highest permissible figure and the tendency of the local authorities to reduce theirs to the lowest.

It may be suggested that the supply of electrical energy is an exceptional industry, and that arguments deduced therefrom are not applicable to other industries.

This is not the case, however, as will be seen from an examination of the Parliamentary Returns of gas undertakings.

FIG. 12



AVERAGE PRICE CHARGED AND UNITS SOLD PER HEAD OF POPULATION

COMPANY OWNED UNDERTAKINGS SHOWN THUS ————

MUNICIPAL • • • ----------

PROVINCIAL UNDERTAKINGS ONLY.

That for December, 1911, shows the following results :

TABLE II.

	Companies.		Municipalities.
Capital per 1,000 cubic feet of gas sold per annum	16s.	...	12s. 7d.
Working expenses per 1,000 cubic feet sold	31·86d.	...	28·1d.
Revenue per 1,000 cubic feet sold ...	42·56d.	...	38·5d.

Thus, on the basis of equal conditions as before, the gross profits of the municipalities would have been 1s. 2½d. on a capital of 12s. 7d., or 9·58 %, as compared with the gross profit of 5·57 % earned by the companies.

In addition to the above, the municipalities have provided sinking funds, etc., to the amount of nearly a third of their capital. It would be interesting to know what proportion of their capital the companies have written off.

Here also it is interesting to note that whereas the sales in the case of the companies increased to the extent of 2·7 %, in the case of the municipalities they increased by nearly 3·3 %, i.e., the municipalities' business is growing 20 % faster than that of the companies.

In electric traction also the municipalities compare advantageously with the companies. Thus, in the *Electrical Times* annual tables for the year 1910-11 the following figures are given :

TABLE III.

	Companies.		Local Authorities.
Capital cost per mile of track ...	£15,000	...	£16,100
Traffic revenue per car mile ...	9·90d.	...	10·58d.
Operating cost per car mile ...	6·00d.	...	6·52d.
Operating cost per passenger ...	·79d.	...	·64d.
Average fare per passenger ...	1·30d.	...	1·05d.
Depreciation and reserve ...	£1·43	...	£2·70
Nett profit per £100 of capital...	£5·58	...	£6·66

These figures are not strictly comparable, inasmuch as the districts served by the municipalities are usually better suited to tramway traction than those served by the companies.

There can be no doubt, however, that under level conditions, the economic laws which render other categories of municipal enterprise so much more successful commercially than the corresponding private enterprises would in a few years tell as markedly in favor of the municipal traction undertakings as they have already done in the case of municipal electricity and gas supply.

Doubtless the figures I have quoted and the conclusions I have deduced therefrom will be met by the protest (that final refuge of the destitute controversialist), "Statistics can be made to prove anything"; but I have not much fear that statistics (real statistics) can

be produced which will suffice to refute my proposition that our municipalities can "beat to a frazzle" the private companies working in the same fields of enterprise.

The question here suggests itself, in what fields of commercial activity is private enterprise likely to succeed better than public enterprise?

It is not the province of the present paper to discuss the relative merits of the two rival systems from the sociological or politico-economic aspects. These have been and will continue to be dealt with by other pens. My object has been to clear the field of some of the more common and immediate misconceptions and superstitions concerning municipal enterprises which are still widely believed in, and I must now leave it to my readers to judge how far this object has been successfully attained.

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