

WILEY



THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE ■

The Suntory and Toyota International Centres for Economics and Related Disciplines

The Two-Part Tariff

Author(s): W. Arthur Lewis

Source: *Economica*, New Series, Vol. 8, No. 31 (Aug., 1941), pp. 249-270

Published by: Wiley on behalf of The London School of Economics and Political Science and
The Suntory and Toyota International Centres for Economics and Related Disciplines

Stable URL: <https://www.jstor.org/stable/2549332>

Accessed: 05-03-2020 19:39 UTC

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
<https://about.jstor.org/terms>



JSTOR

The Suntory and Toyota International Centres for Economics and Related Disciplines, Wiley, The London School of Economics and Political Science are collaborating with JSTOR to digitize, preserve and extend access to Economica

The Two-Part Tariff

By W. ARTHUR LEWIS

TWO-PART charging has made steady progress in this country since it was first suggested in the later years of the nineteenth century. In the electricity industry, where it was first adopted, the system is now almost universal; it has been adopted by the Central Electricity Board, which controls wholesale distribution, and strongly recommended to retail distributors by two committees reporting to the Electricity Commissioners. In 1921 it was applied to the telephone system, where it is now the principal method of pricing. Gas legislation has been specially altered to permit undertakings to use the system, and they were adopting it with some zeal in the years immediately preceding the outbreak of war. In industry at least one concern has been using the system for some forty years. Yet despite this progress the principles of two-part charging are not widely known or understood. Much of the literature is obscure, some aspects of the subject have never been fully treated, and even where there is agreement among the better writers, their conclusions have not yet seeped through to all the persons responsible for drawing up these tariffs. A further survey of the subject does not therefore seem inappropriate.

The essence of two-part charging is that the consumer is called on to pay two charges, one which varies directly with the amount of the commodity that he consumes, and another which does not. Thus the Post Office charges for the use of the telephone (1) a quarterly rental, payable whether any calls are made or not, plus (2) a charge for each call. Similarly for electricity one may be asked to pay a fixed charge depending on e.g. the size or rateable value of one's house, plus a charge per unit of actual consumption. Let us first examine the incentives to two-part charging, and then enquire how it serves the public interest.

I

The first incentive to the use of a two-part tariff is the existence of standing charges which continue whether a firm is operating or not. First, where in consequence of periodical fluctuations in demand, there are regular periods when equipment is standing idle, it is often suggested that the only "scientific" way to allocate costs to consumers is to use a two-part tariff. And secondly, even where there are no such regular fluctuations, an entrepreneur may find it profitable to use a two-part tariff in order to escape the risks of unforeseen change. Let us take first the regular fluctuations.

Most industries are subject to some degree of regular fluctuation in the demand for their products: at some times business is brisk, at others it is slack. The cycle may be diurnal—restaurants, buses and shops have regularly each day hours of peak demand and hours of almost idleness—or it may be weekly, or seasonal, or like the trade cycle it may extend over several years. Where the product can easily be stored, these fluctuations in demand need not induce similar fluctuations in production; the plant can work continuously throughout the year, storing in the slack period the excess output which will be required at the peak. If the product cannot be stored, or the cost of storing it is prohibitive, the result is different; the plant must be large enough to meet the maximum demand, and when demand slackens, equipment lies idle. It is then necessary, in computing marginal cost, to distinguish between supplies produced at the peak, and those produced at other times. If the plant is of equilibrium size, it is necessary, in order to produce additional supplies at the peak, to provide additional equipment; marginal cost at the peak is high, and may be nearly equal to, or even greater than, average cost. But in the slack period no additional equipment is necessary, and marginal cost is correspondingly less.¹ If the cost of storing the commodity were less than the difference between these two different marginal costs, it would pay to store, and production would be continuous; cost of storage is prohibitive when it exceeds this difference.

The conclusion that the whole of the standing charges

¹ Undertakings frequently rely on their slack periods for overhauling equipment, making new plans, or just resting. Compensation for this must be included in computing marginal cost in slack periods. In the limiting case, where all the slack time and equipment are taken up in this way, marginal cost is the same as at the peak.

is to be allocated to peak output may seem at first to conflict with the doctrine that such charges are a joint cost of peak and slack periods which cannot accurately be divided between them. But this is not so. Let us take the analogous case of growing cotton to produce seed and lint. If there is a good demand for both these commodities it is impossible to allocate the cost between them: demand alone will decide what part is to be contributed by each. But suppose that there is a very strong demand for lint and only a very small demand for seed, such that in the equilibrium situation more seed is produced than the market will take at any price above zero; then the whole cost will be contributed by, and is attributable to the production of lint. Similarly with production in peak and slack periods. If a mere lowering of price in slack periods stimulates demand sufficiently to keep equipment fully occupied at a price greater than zero, no exact allocation of costs is possible as between peak and slack. But when some equipment must lie idle in the slack period, the whole cost becomes attributable to peak output.¹

The suggestion that under these conditions the appropriate method of charging is to use a two-part tariff we owe to an English engineer, Dr. John Hopkinson, who became consulting engineer to the first Edison electric power stations in this country, and subsequently Professor of Electrical Engineering at King's College, London. For his presidential address to the Junior Engineering Society in 1892 he chose as subject "The Cost of Electric Supply".² The paper begins by stressing the fact that costs are determined by peak demand, goes on to analyse the various elements of fixed and variable cost, and concludes:

"The ideal method of charge then is a fixed charge per quarter proportioned to the greatest rate of supply the consumer will ever take, and a charge by meter for the actual consumption."³

According to this principle it is necessary to discover for each consumer not only how much he consumes during the

¹ The standing charges to which we are referring in this section are not overheads in the sense of costs which do not vary with output. They are costs which increase if peak output increases, and which in the long run can be reduced if peak output is reduced; i.e., they are part of long run marginal cost. True overheads, which do not vary with peak output, are joint costs which cannot be allocated. But such costs are rare.

² First published in the *Transactions of the Society*, Vol. III. Reprinted with other papers by Hopkinson in his *Original Papers*, Vol. I.

³ *Original Papers*, p. 261.

quarter, but also what is his maximum rate of consumption, defined as the largest amount taken in any small period, e.g. half an hour. Since the equipment of the concern depends on its maximum output in a short period, the consumer is made to pay a fixed charge depending on his maximum in a short period. A similar idea underlies the "Wright" rates offered by some concerns—a type of quantity discount whose gradations depend upon the maximum rate of consumption of the individual consumer.

This conclusion was hailed as a great discovery, and made the basis of many tariffs. Unfortunately it was based on a simple confusion. It is true that it costs a station more to supply 1,000 units if they are all to be taken in one minute than if they are to be spread over a longer period; but this applies to the aggregate output of the station, and not to supplies to the individual consumer. What is true of the individual consumer is that the cost of selling to him is greater if he buys during peak periods than if he buys during slack periods (unless there is excess capacity even at the peak). If therefore he takes 24 units all in one minute during the slack period it may cost less to supply him than if he takes 24 units at the rate of one unit per hour, because in the latter case he adds to capital costs at the peak. The maximum rate at which the individual consumer takes is irrelevant; what matters is how much he is taking at the time of the station's peak.

This point is now generally accepted among the better writers on the subject, but the persons actually engaged in framing tariffs (they are usually engineers) do not seem to have mastered it yet. A recent survey of the tariffs of the larger electricity undertakings show 34 per cent. offering to industrial consumers two-part tariffs based on individual maximum demand, and a smaller percentage offering such tariffs to domestic consumers.¹ They have also been recommended by a committee reporting to the Electricity Commissioners,² and adopted by the Central Electricity Board. Gas engineers, indeed, have gone so far as to suggest for their product two fixed charges based on individual maximum demand, one to take account of the production peak, and one for the distribution peak. Since gas can be stored, the two peaks do not coincide. The

¹ D. J. Bolton, *Costs and Tariffs in Electricity Supply* (1938), pp. 117 and 136.

² *Report on Uniformity of Electricity Charges and Tariffs* by a Committee appointed by the Electricity Commissioners (1930), paras. 119, 136.

volume of output produced varies not from hour to hour, but from season to season, the size of the plant being determined by the greatest demand in any twenty-four hours. But the calls on the distribution system vary from hour to hour. Two fixed charges to cover the standing costs of production and distribution, a third to cover "customer" costs (discussed in Section IV of this paper), and a variable to cover prime costs, would give the industry a four-part tariff—such are the heights to which this sort of analysis leads!

Hopkinson himself seems to have been a little uneasy about all this, for he added:

"In fixing the rates of fixed charge it must not be forgotten that it is improbable that all consumers will demand the maximum supply at the same moment, and consequently the fixed charge named might be reduced or some profit be obtained from it."¹

This however merely added to the confusion. For subsequent writers professed to meet the difficulty by introducing the concept of the "diversity factor". Since all consumers are not taking at their maximum rates at the same time, the sum of the individual maximum demands is greater than the total demand on the station at the time of its peak. The diversity factor is defined as the ratio of the sum of the individual demands to the total demand at the time of the peak. There are many theories as to the way in which this diversity factor should be used to "correct" cost allocations based on individual maximum demand; the subject has a vast literature. The latest English work on the subject, D. J. Bolton's *Costs and Tariffs in Electricity Supply* (1938), contains a thirty-page chapter on the diversity factor, full of mathematical symbols, curves and principles deduced from the laws of probability, though from the tentativeness with which he puts them forward, the author himself does not seem to have much faith in them. This is as well, for no amount of correction can alter the fact that the standing costs of the undertaking are related not to the maximum rate at which the individual consumer takes, but to the amount he takes at the time of the station peak. Both the Hopkinson two-part tariff and the Wright quantity discount, based on the maximum demand of the individual consumer, are fallacious in so far as they claim to be exactly allocating to each consumer the costs he causes the undertaking to incur.

¹ *Original Papers*, p. 261.

As we have already seen, the true essence of the problem is that marginal costs are greater at the peak than at other times. To put the matter loosely, capital costs are to be allocated exclusively to consumers taking at the peak, and in proportion to the amount each takes at that time. It is not uncommon to find cases where prices are for this reason higher at the peak than in slack times. Thus transport undertakings frequently offer cheap tickets in the middle of the day, the telephone system has its cheap night rates, and there are seasonal fluctuations in shipping freights and in hotel charges. Such price differentiation is not price discrimination, or charging what the traffic will bear, for those terms in their proper meaning relate to differentiation based on differences in elasticity of demand, while the differentiation here is due to differences in marginal cost, and is just as likely, if not more so, in perfectly competitive conditions as in cases of monopoly.

Nevertheless, while we may say that the "normal" way to allocate standing charges where there are peaks is simply to charge different prices at the peak and in slack periods, it is theoretically possible to achieve the same result with a two-part tariff. If the fixed charge is based not on individual maximum demand but on individual consumption at the time of the station peak, the total charge to any consumer will be the same as it would be if he were charged different prices at different times for a consumption with the same time pattern. This method of allocating standing charges need not be confined to electricity. The season tickets offered by transport undertakings are of the same kind; the holder is expected to travel to and from work at the peak, and makes his contribution to expenses in a lump sum; he is then allowed to travel free at all other times, since the cost of carrying the marginal traveller at other times is negligible. Even the long fluctuations associated with the business cycle could be dealt with in this way, the consumer paying at the beginning of say every ten years a fixed sum based on his consumption during the boom. In the case of electricity the indices at present used by various undertakings on which to base their fixed charges—rateable value of the consumer's house, size of the house, capacity of apparatus installed (even individual maximum demand)—may be more or less fair bases for estimating the proportions in which different consumers take at the time of

the peak ; but they cannot claim to be allocating the standing charges as exactly as would a charge varying directly with consumption at the time of the peak.¹

Yet the two-part tariff may be the best method available. Charging different prices at different times is only possible if the time of consumption can be recorded. In the early days of electricity such differentiation seems to have been out of the question because of the cost involved in installing special meters to time the consumption of the individual consumer and charge him accordingly. In these circumstances some early concerns were content to make a charge which did not vary with the hour, and which was clearly inappropriate not only because it allocated part of the standing charges to units consumed in slack periods, but also because the result of so doing was to discourage consumption in the period when marginal costs are low. Where there are regular fluctuations in marginal cost, and the timing of consumption is impracticable, two-part charging is superior to making only an undifferentiated variable charge, because off-peak consumption does not make any contribution to the fixed charge and is stimulated by the low variable. It is true that when the two-part tariff is first introduced, the low variable will also tend to stimulate peak consumption, but if there is a general increase in peak consumption, the fixed charge will be increased to meet the heavier standing charges, and will allocate them more or less correctly according as the index chosen truly reflects the proportions in which different consumers take at the time of the peak.

We must therefore conclude that as a method of cost allocation where there are peaks in demand and supply, the two-part tariff is superior to having a single undifferentiated price which discourages off-peak consumption, but inferior to charging different prices at different times, though it may sometimes be more convenient than the latter if the measurement and timing of consumption are costly. This may have been the case when electricity was first being developed, but does not seem to be so any longer. According to Bolton :

“ If one were starting *de novo* it would be an easy matter to invent a much more scientific tariff on the costs side,

¹ In addition each of these bases has its own disadvantage. E.g., rateable value is a much more arbitrary index of consumption than is even the size of the house ; and charging according to capacity installed tends to discourage installations. For a discussion of this see *Report on Uniformity of Electricity Charges*, paras. 70-99.

and moreover a perfectly practical one.¹ Undertakings usually know when their peaks will occur, both locally and on the bulk supply. Tariffs would be framed to avoid these times, and for domestic loads they might be, say, 4d. a unit from 4 to 6 p.m. and $\frac{1}{2}$ d. all other times. A combined single-phase meter and synchronous clock could be mass produced for about 30s. to 35s., and for another 5s. the makers could probably extend the hands and put it in a bakelite case. It could then hang in the hall and show the time of day (and, incidentally, the rate of charge). An alternative method of changing the timing could be by 'ripple control', referred to at the end of Chapter VII.

"Such a tariff would require no alternatives and would save all individual assessments and charges whatsoever. It is perfectly easy to understand, particularly after all the publicity recently given to the 'shilling trunk calls' based on exactly the same principle. It represents real costs and at the same time it gives endless scope for heating, cooking, etc., at competitive figures for all times outside the narrow high price zone. However, such ideals (if ideal they are) must be reserved for some brave new world, since the timid old one has chosen other methods and is too fearful of change to be likely to give them up."²

II

To conclude that two-part charging, using any of the usual bases for calculating the fixed charge, is an inferior method of cost allocation, is not, however, to conclude that it is either an undesirable or an unprofitable method of recovering the standard charges. It may be a method by which a firm protects itself against the risks of unforeseen change.

Let us suppose that an entrepreneur is deciding to invest capital in the form of durable equipment in a certain industry. In doing this he runs the risk that his expectations of the future may be frustrated; if there are new products, new rivals, new inventions, or other unfavourable changes, he may be unable fully to recover the money he is investing.

¹ The author adds the cryptic footnote: "I.e. it would work, and in fact has worked. But this is not to say that it would be more satisfactory, in practice, than our present schemes. Experience in Paris suggests that it might not, and anyhow it is far too large a question to be discussed in a sentence."

² *Op. cit.*, pp. 208-9.

How is he to protect himself against the risk of such changes ? From his point of view, the most satisfactory arrangement might be to avoid all risk by getting each potential consumer to pay in advance some proportion of the sum invested. If in the aggregate consumers contributed sums sufficient to cover the capital invested, the entrepreneur would be relieved of all risk of loss. Nevertheless, much as this arrangement might please the entrepreneur, it would be unlikely to please the consumer, who is reluctant to pay in advance for services which he may never use. If this method proved impracticable, the entrepreneur might try as his next best course to get each user to contract to take a minimum quantity of the product, or if payment is by monthly subscription, to subscribe for a minimum number of months—this is a common feature of telephone, gas, electricity and other undertakings. Failing this, the entrepreneur may try to protect himself by securing exclusive contracts, the customer promising not to use the services of any rival undertaking. The list of concerns using such contracts is large ; it includes the railway companies, who offer special “agreed charges” to clients who send all their traffic by rail, liner conferences who offer a “deferred rebate”, brewers, film distributors, iron and steel concerns, a manufacturer of shoe machinery, and others. Or he may simply offer quantity discounts. All these are methods of tying the consumer to the undertaking, relieving the entrepreneur of the risk of loss due to miscalculations or to changes in demand or supply conditions.

Such devices run counter to the spirit of private enterprise. The essence of that system is that entrepreneurs are the specialists in risk-bearing. It is therefore very difficult to introduce such devices into an industry where entry is unrestricted and easy. There is usually some entrepreneur who is willing to charge the consumer per unit consumed, and to assume himself the risk that over a number of years demand will be large enough for him to recoup all his costs¹ ; and where there are such entrepreneurs,

¹ Sometimes it is suggested that in very risky industries no entrepreneur will come forward unless protected either by a monopoly or by special contracts. For instance, the patent system receives some support on the ground that entrepreneurs would be unwilling to try out new inventions unless protected by a monopoly. Similarly combinations in liner shipping are said to be necessary since shipowners would be unwilling to send their ships on regular voyages unless protected against intermittent competition. There seems to be little ground for this view. In the liner case the combinations emerged because there were too many regular sailings, not because there were too few, and their effect was to reduce, not to increase the number. But this is too large an issue to be developed here.

consumers are unwilling to be tied by payment in advance or by any exclusive contract. Competitive private enterprise demands that overhead costs shall be recouped not through any fixed charge, as the theory of the two-part tariff suggests, but by inclusion in the variable charge.¹

The monopolist, too, may meet his overhead costs simply by having a sufficiently high variable charge. But he may choose between doing so and making a fixed charge. He may have a fixed and no variable charge, or a variable and no fixed charge, or some combination of both. The risk of unforeseen change is a strong argument in favour of a fixed charge, which will throw upon the consumer any loss resulting from unfavourable change. Hence unless the entrepreneur is willing himself to bear this risk—and with it the possibility that there may be *favourable* changes—he may seek to impose such a charge. His incentive to insure himself in this way will be particularly great if his product has to face strong competition from other products. For the imposition of a fixed charge in a sense ties the customer to the undertaking, making it worth his while to buy as much as possible from that concern, rather than to divide his purchases, so that his average price may fall as low as possible.

However, the power of the entrepreneur to secure himself in this way depends on the attitude of consumers and on the strength of his monopoly position. It may well be that if a fixed payment is demanded some consumers who are not certain how large their consumption will be will refrain from buying at all. Thus a recent survey of gas undertakings in Great Britain which offer consumers the alternatives of a two-part tariff and a single variable charge shows that a large percentage of those who would benefit by switching over to the two-part tariff fail to do so. Ignorance of the advantages of the two-part tariff may account for this to some extent, but it is also probable that some consumers prefer to remain on the ordinary tariff because they are uncertain how large their consumption is likely to be, and unwilling to commit themselves to the payment of a

¹ Sometimes part of the "overheads" can be traced to some particular consumer. For instance, a firm may generate its own electricity, but may also connect itself to the public service as an insurance against breakdowns. Where the public station has to instal extra plant as a reserve against this contingency it will make a fixed charge to the firm whether it takes any electricity or not. But in these cases the "overhead" is not an overhead at all; it is a cost directly attributable to the particular consumer, and would not be incurred but for the undertaking to serve him; it is a "customer" cost, as defined in section IV of this paper.

fixed charge.¹ Where this is an important element, there must be no fixed charge or only a low one, or alternatively consumers must be permitted to choose between a two-part tariff and an ordinary one. Note however that in some cases the element of risk may work the other way. A potential customer may say, "I am unwilling to take this commodity on the basis of so much per unit because I am uncertain how much my family and I will take from time to time, and I may find at the end of the year that we have run up a tremendous bill; I would prefer you to quote me one lump sum charge, and then let us take as much as we like." If the commodity is a new one, or subject to large and unpredictable variations in demand (e.g. one's demand for medical services) the risk element may well favour the imposition of a high fixed charge with a very low or no variable.

In sum, we can see that there is much more in the analysis of standing charges than meets the eye. To the economist, brought up on the analysis of competitive markets, what to do about such costs presents little problem; they go into a variable charge, fluctuating with demand. To the public utility engineer, impressed by the fact that these are fixed costs not diminishing with output, the ideal charge is a fixed charge. Either of these may be the more profitable solution in any given case, but each case must be considered on its own merits.

III

So much for standing charges and their relevance to two-part charging. In the literature of the subject this is the topic most often mentioned, but there are other incentives to two-part charging which we must now examine.

The first point to be considered is that it may not be worth while making a variable charge if the cost of measuring the amount taken by each consumer is high. In the early days of electricity and of the telephone, before simple recording devices were invented, consumers were for this reason charged a lump sum independent of use. Similarly in some countries it is considered that the cost of installing water meters in each house, and reading them periodically, would not be justified. This argument is most forceful

¹ See P. Chantler, *The British Gas Industry*, pp. 127-130.

where elasticity of demand is not very high, so that consumption is not much greater if unmeasured than it would be if it were measured and charged for. If elasticity of demand is high, and marginal cost high, the argument loses its force.

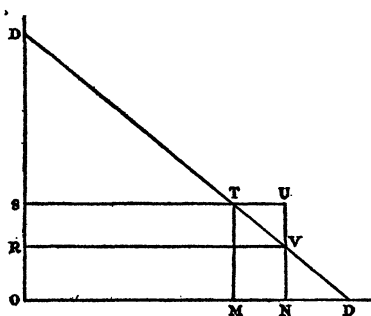
Another point in favour of having a fixed charge is that it may make it possible for the firm to extract some of the "consumer's surplus". The extent to which this is possible depends on the income elasticity of demand for the commodity. If income elasticity is zero, then when a fixed charge is imposed, so long as it is not so high that the consumer ceases to buy altogether, he will buy the same amount at any given marginal price as he would have bought if there were no fixed charge; he will therefore be paying a higher average price for any given quantity than he would be prepared to pay if there were only a variable charge. The effect of the two-part tariff is as it were to shift his demand curve to the right.¹ But this is only so where income elasticity of demand is low. What it boils down to in practice is that the firm will gain from the two-part tariff if customers keep their eyes on the cost of the marginal unit rather than on the total amount spent on the commodity. If the customer watches the size of his bill rather than the marginal price the demand curve facing the firm will be substantially the same whatever system of charging it may use. This point is not always understood. Thus it is sometimes suggested that the success of the two-part tariff is proved by the fact that sales expand when a firm adopts it.² But this view is fallacious. If the fixed charge is small, the effect of adopting a two-part tariff is to lower the average price at which the commodity is sold. But if the firm lowered its average price without adopting a two-part tariff sales would similarly expand. The only relevant question is, if the average price had been lowered to the same extent without adopting a two-part tariff, would sales have expanded to the same or a lesser extent? For the two-part tariff is superior only in so far as it enables the firm to sell more at any given average price than it would if average and marginal prices coincided. In some cases

¹ The two-part tariff shares this characteristic with quantity discounts of the "block" type. Wherever the average charge differs from the marginal charge, the demand curve tends to be shifted to the right.

² E.g. J. T. Haynes, giving the results of a two-part tariff at Rotherham, makes this claim. *The Two-Part Tariff as an Aid to Gas Sales*, pp. 23-35.

this will be so, in others where the customer concentrates on the size of his bill rather than on the marginal price the two-part tariff has not this advantage.

The fact that two different elasticities are relevant when the two-part tariff is used, income elasticity and elasticity of substitution at the margin, is important where two products are highly competitive with each other, as in the case of gas and electricity. The point is not important if one product is a substitute for the other in all uses, for then even if one industry is offering a two-part tariff with a very low variable charge, the consumer will carefully compare his probable total expenditures in using the one product or the other before he commits himself to the payment of the fixed charge. Here competition is determined not just by the marginal price, but also by the amount of the fixed charge; it is average price that counts.¹ But the position is different if each product has a use in which it is essential, and competition is limited to certain additional uses, e.g. if electricity is considered essential for lighting, and gas for cooking, but they compete for heating and other purposes. Here since the fixed charge has to be paid anyway, only the marginal price is relevant. Each industry may find it profitable so to reduce its variable charge that it only just covers marginal cost. It is easily shown that it will not pay to go below marginal cost. Thus in the following diagram, if DD is the demand curve, OS the marginal cost,



and income elasticity is assumed zero, the maximum consumer's surplus which can be extracted from this particular consumer by way of fixed charge is the area DST . If the

¹ If after making the comparison the consumer chooses the product using the two-part tariff, he will become tied to the firm, which will then profit if there should be unforeseen change unfavourable to him. But this is a separate point which we have already discussed in the preceding section of this paper.

firm made a variable charge less than OS , say OR , the consumer would demand ON , and the firm's net revenue would be a maximum of DST minus TUV , the fixed charge being increased to DRV . If the variable charge is to go below marginal cost, it must be for some reason other than consumer's surplus, such as the reasons already mentioned. Now marginal cost is not the same as prime cost; it includes all costs which vary with output. In the long run most costs, including equipment and expenses of management, vary with output, and this must be remembered in appropriate circumstances. In the limiting case all the firm's costs are marginal costs, to be recouped through the variable charge, and if it is subject to strong competition the firm will be unable to tap consumer's surplus by levying a fixed charge. In general a fixed charge can only be levied if the firm is in a strong monopoly position, or if marginal cost is less than average cost and firms take account of this in their oligopolistic competition with each other.

Next we come to two-part charging as a form of price discrimination. The effect of making the same fixed charge to all consumers is to discriminate against the small ones. This will pay only if their demands are on the average less elastic than those of large consumers. This is not usually the case, but may be found in special conditions. Thus the small consumer of electricity may be small because he is using it only for lighting, while the large may be using it for heating, power, or other purposes for which the demand is much more elastic than for lighting. One way of meeting this situation would be not to use a two-part tariff, but to charge different prices for current used for different purposes. The two-part tariff, however, serves the same purpose; it is an alternative to rate classification.

Nevertheless it is unlikely that the ability to bear a fixed charge will be the same among all consumers. To avoid discriminating heavily against small consumers, undertakings sometimes have a different fixed charge for each consumer, varying according to the rateable value of his house, the number of rooms, or some similar index. This has indeed the advantage that the fixed charge can be made to increase so rapidly that in effect larger consumers are made to pay higher average prices per unit than smaller consumers, if the smaller are thought to have the more elastic demands.

To avoid frightening off the smaller consumers it is also

customary to offer as an alternative to the two-part tariff a single variable charge, somewhat higher than the variable charge of the two-part tariff; the latter is then used only by larger consumers. Or the firm may offer not a two-part tariff but a "block" quantity discount; e.g. it may say, "for the first 20 units, 6d. per unit, additional units at 1d. per unit". This is not so hard on the small consumer, while for the consumer of more than 20 units it has the same effect as a two-part tariff in that the average price differs from the marginal. Here too the size of the first block may vary from consumer to consumer.¹

Finally, the whole of this discussion so far has been based on the tacit assumption that price discrimination is practicable. This is of course only the case if the commodity cannot easily be transferred from those who pay a low price to those who pay a high price. Suppose, for example, that a department store tried to recoup its overhead costs by using a two-part tariff: it might for instance offer a 10 per cent. discount to any customer who pays a "quarterly subscription" of £2. It would be unlikely to continue the scheme long, because it would soon find that some people were getting goods through subscribing members without themselves paying a subscription. Unless buyers can be isolated from each other, the two-part tariff is an unprofitable method of pricing.²

There is, however, one exception to this rule. If a firm is selling to middlemen, a two-part tariff will enable the large middleman to produce more cheaply than the small,

¹ It has sometimes been suggested that when a firm first introduces the block quantity discount each consumer should have as his first block an amount equal to his previous consumption. But this is not an easy policy to put into effect. J. T. Haynes, who contemplated introducing it in one undertaking he controlled, explains why it was rejected: "It was then proposed that every consumer should be charged a greatly reduced price for all gas used in excess of his normal consumption. This sounded attractive, but examination revealed a number of difficulties. What was a consumer's normal consumption? A large number of typical meter cards were examined, and adjacent houses were found to have widely different consumptions, affected by the number in the family, periods of sickness, inclination or disinclination to use gas, etc. The application of the proposal in such cases would quickly create a sense of unequal treatment between neighbours, and could not be defended by the undertaking in the light of the equal conditions clauses in the Corporation's Gas Acts." See *The Two-Part Tariff as an Aid to Gas Sales*, p. 13. C. L. Paine's proposal (see his article "Some Economic Consequences of Discrimination by Public Utilities," *Economica*, 1937) would be even more difficult to apply than this, because it involves raising the upper price above the level of the previous price and estimating how much each consumer would have bought if this were the only price.

² The department store might meet this difficulty by putting a limit on the amount bought on any one subscription, say £30. But then "membership" ceases to correspond to the true two-part tariff, and becomes a means of charging a special price to those who purchase between £20 and £30.

if the fixed charge is the same to both, and perhaps to capture his business. The firm may prefer to have only a few large customers, for it may wish them to be able to form a combine to increase their own charges to the public, so that it in turn may be able to share part of their monopoly gains. Trade unionists sometimes for a similar reason urge their employers to combine. In such circumstances the firm will discriminate heavily against small customers, having a fixed charge which is very high relatively to the variable, or even dispensing entirely with the variable and allowing any customer who pays the fixed charge to take as many units as he likes. On the other hand, it is equally likely that the firm may fear that a reduction in the number of its customers might be harmful, since they may be able to combine to force down its charges. In this case it will pursue the opposite policy, discriminating not against the small middleman but against the large. Or again it may particularly want to discriminate against large purchases if the commodity is trade marked and perishable, and it wishes to maintain a reputation for freshness; or to discriminate against small purchases if it wishes to create a reputation of exclusiveness for its products (e.g. cosmetics). Any argument for reducing the number of one's retail outlets is an argument supporting the use of a two-part tariff; any argument in favour of increasing their number is an argument against having a fixed charge.

IV

We have left to the last the case for two-part charging based on the existence of "customer" costs, because, though it seems the most obvious case, to analyse it is to get a summary of the whole problem. "Customer" costs are those costs which have to be incurred if any given customer is to be served, but which do not vary directly with his consumption; such costs as equipping his house with electric wires and fittings, installing a meter and reading it periodically, keeping his account and so on; costs which vary with the number of customers rather than with output.

Suppose, for example, that an electricity concern is supplying electric current, and undertakes to wire premises and instal all necessary fittings. The cost of the installation is an indivisible item which does not vary directly with the

amount of current consumed. At first sight it seems quite reasonable to make a separate charge for this, or to use a two-part tariff, basing the fixed charge on the cost of installation, or at least to offer quantity discounts for current. But this is not necessarily the most profitable policy. In suitable circumstances the firm may prefer to make only a fixed charge, supplying the consumer with as much current as he likes without any additional charge. Or on the other hand it may prefer to instal "free of charge", recouping itself for the cost of installation by having a high variable charge. Its fixed charge may be high, low, zero, or even negative (that is to say, instead of asking the consumer to pay for installation, the firm may actually pay him a "rent" for the privilege of installing its equipment on his premises). Similarly, its variable charge may be high or negative; the firm may not merely supply current free, but it may also undertake to repair the equipment free of charge (this being the equivalent of a variable negative) or pay a refund to the consumer if his consumption is large.

This problem is not confined to public utilities; it appears wherever there are complementary goods like gramophones and gramophone records, razors and razor blades, motor cars and tyres, telephone instruments and a telephone service, or other twin commodities one of which is a durable instrument which must be installed before the other can be used. If conditions were suitable a company might give away gramophones to stimulate the sale of records, or give away records to stimulate the sale of gramophones. This poses the question, what is a commodity? In the former case the company would say that it was selling records, the gramophone being only part of the cost of production; in the latter it would be the record that was part of the cost of selling gramophones. The enjoyment of any satisfaction involves a number of separate costs, some of which are indivisible, and it is a problem to decide how many of these indivisible costs are to be treated as different commodities and charged separately, and how many to be merged into a single variable charge. Nor is the problem confined to cases where all costs are undertaken by the same firm. Even if the gramophone companies are separate from the record companies, it may pay one set of companies to subsidise the other; so also it might pay motor car

manufacturers to subsidise the sale of petrol, and so on. Given the complementarity it is always the same problem: how high should the fixed charge be relatively to the variable?

We can also fit into the same category another problem which is really only a limiting case of the first. This is the case where the only cost is an indivisible customer cost. An example of this is a case where a firm leases machinery to manufacturers. There is only an installation cost, the cost of the machine. Yet the firm may charge either a fixed monthly rent, or a monthly rent plus a royalty varying with the output of the machine, or a royalty alone with no fixed rental.¹ Wherever a firm is leasing some durable commodity, the use of which is measurable, it can adopt, if it wishes, a two-part tariff as its charge. How high should the fixed charge be?

In competitive conditions the solution is simple: the fixed charge is no more and no less than the cost of installation. But in an imperfect market this is not necessarily the most profitable policy; then all the arguments for and against a fixed charge which we have discussed in the previous sections are once more relevant. The difference now is that we must take as our base for the fixed charge the amount of the installation cost. Arguments in favour of a fixed charge are to be interpreted as supporting a fixed charge greater than the amount of the installation cost; arguments against a fixed charge are arguments for reducing the fixed charge below installation cost, even to zero or a negative price.

Thus the element of risk may serve to reduce the fixed charge below installation cost: consumers may hesitate to wire their premises because they are not sure that their consumption of electricity will justify the initial sum involved, so the firm may assume that risk for them. Or on the other hand it may be the variable charge which they fear, and so the firm may quote a single fixed charge, allowing them to consume as much as they please. Similarly, if potential purchasers of motor cars are deterred by the high initial cost involved, the gasoline companies might profitably subsidise the motor manufacturers, and raise the price of petrol; but if it is the running cost which deters the pur-

¹ A well known case is that of the United Shoe Machinery Company, which leases machinery to shoe manufacturers on a two-part basis.

chaser, it will be the motor manufacturer who will profitably subsidise the gasoline company, the tyre company, the repair companies, and so on.

Similarly, where marginal costs are low and the cost of measuring consumption is high, there will be no variable charge. If the cost of producing petrol becomes small enough, car owners will be allowed all they want in return for an annual tax on their cars.

The relevance of the two elasticities is as great here as to the allocation of overhead costs. Sometimes by reducing the variable charge one can increase the amount of consumer's surplus to be obtained through the installation charge. At other times, free installation is justified, because it leads to such a terrific increase in demand for the subsidiary commodity. Discrimination, too, may justify either a high installation and low variable charge, if for instance demand is less elastic in some uses than in others; or a fixed charge less than installation cost and high variable charge, if the firm is selling to middlemen and particularly wants to have a large number of outlets, for example if it is leasing machinery and fears the consequence of a buyers' monopoly. With customer costs, as with standing charges, there is no simple solution; each case must be weighed on its own merits.

V

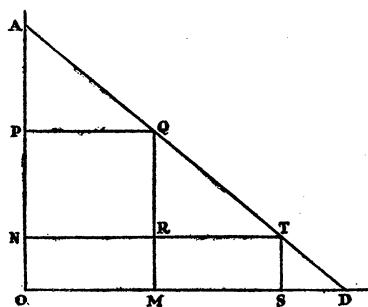
It remains to consider two-part charging from the standpoint of the public interest. We have seen that from the point of view of the entrepreneur the two-part tariff may frequently be the most profitable method of charging. Can we say that the public interest requires that the fixed charge should be exactly equal to customer cost and that anything more or less is undesirable?

To answer this we must re-examine the incentives to making a fixed charge greater or less than customer cost. The first was that the tariff may be used as a means of allocating overheads where there are peaks in production due to peaks in demand; we saw that it is an inferior method of doing this, even from the standpoint of the entrepreneur, but there is no substantial reason why it should not be adopted if it prove the most convenient. Secondly, a two-part tariff may be a means by which either the entrepreneur

D

or the consumer relieves himself of risk. There is nothing in this inherently contrary to the public interest; but there is some danger of abuse if the consumer is "tied" to one undertaking in competition with others. Especially is this so if the variable charge is reduced below marginal cost, for competition between undertakings must be based on marginal cost if there is to be an "ideal" allocation of resources. Or thirdly, two-part charging may be adopted where the cost of measuring individual consumptions is disproportionately great; this too does not necessarily run counter to the public interest.

When we come to the two-part tariff as a means of stimulating consumption at the margin the matter is not so simple. It is now generally agreed that the "ideal" output of a concern is such that every consumer is getting every unit for which he is prepared to pay marginal cost.¹ If marginal cost is equal to or greater than average cost, there is no case for a fixed charge; a variable charge equal to marginal cost will cover the total costs of the firm. But if marginal cost is less than average cost, a variable charge equal to marginal cost will not cover total costs. If total costs are to be covered, either the variable charge must be greater than marginal cost, or a fixed charge levied in addition to the variable. It is easily shown that it is better to recoup the difference between average and marginal cost by a fixed charge than to add it to the variable. Consider the following diagram where AD is the demand curve (for convenience a straight line) of a consumer whose income



elasticity is assumed to be zero, and ON the marginal cost on the assumption that the cost of supplying this consumer

¹ There are difficulties in applying this principle to the use of a two-part tariff by public utilities because marginal cost to the undertaking is not necessarily equal to marginal social cost; on this problem see C. L. Paine, *loc. cit.*, pp. 428-431.

is constant and there is no customer cost. Suppose that the firm was formerly charging a single price OP (average cost), and that it now adopts a two-part tariff with a variable charge ON . This consumer's purchases will then increase from OM to OS , income elasticity being assumed zero. If the amount of the fixed charge is equal to the area $PQRN$, the consumer will be better off than he was under the previous system since QRT will be added to his consumer's surplus. He will in fact be better off than before so long as the fixed charge is less than $PQRN + QRT$. This means that two-part charging can benefit both the buyer and the seller better than having a single variable charge, equal to average cost. The danger is that the firm may try to take the whole of the consumer's surplus, ANT , in which case two-part charging becomes the most perfect form of discrimination, and capable of the gravest exploitation. But provided that this danger is guarded against, two-part charging is clearly better than having only a variable equal to average cost, in cases where marginal cost is less than average cost.¹

Next, an objection raised against two-part charging is that small consumers may have to go without the commodity because they cannot afford to pay the fixed charge. In so far as the fixed charge is being levied as a contribution to overhead costs, this is easily met by an appropriate adjustment of the fixed charge; it is not in the interest of the undertaking, any more than of the public, that the charge should be so high as to exclude anybody. But where the fixed charge is levied to cover customer costs, the objection is equivalent to suggesting that some consumers should get the commodity for less than it costs. Thus, in 1933 the Parliamentary Secretary to the Board of Trade explained to representatives of the gas industry why he would oppose any clause permitting a two-part tariff in a forthcoming Bill:

"I am not attempting to justify the exclusion of the minimum charge from the Bill on any ground of logic or technicality. I am doing it entirely on the political

¹ Note that in these cases where marginal cost is less than average cost some writers have favoured an alternative solution, viz. : to charge only a variable equal to marginal cost, and to meet the difference by a subsidy out of general taxation. The points at issue between this solution and two-part charging involve questions of social justice rather than economics. For a discussion see, for example, C. L. Paine, *loc. cit.*, and H. Hotelling, "The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates", *Econometrica*, 1938 and discussion with Ragnar Frisch in *Econometrica*, 1939.

argument that the Government are not prepared to face the opposition that would necessarily come from people in scattered places amounting to millions in total who would never understand the reasons behind a clause of this kind.”¹

An argument like this for compelling the gas industry to supply gas below cost to some consumers and to recover the loss from others does not seem to be strictly within the province of the economist.

Again, two-part charging may be used as a means of increasing or reducing the number of one's retail outlets. For example, it is sometimes alleged that one consequence of two-part charging by the United Shoe Machinery Company has been to maintain an excessive number of small shoe manufacturers. In general we may assume that it is not in the public interest to have a larger or smaller number of outlets than would emerge in conditions of perfect competition. But there is seldom perfect competition either in manufacturing industry or in retail trade. Hence the most that we can say is that the usefulness of two-part charging depends on whether or not it tends to bring about the results which would emerge under perfect competition. For example, if it is used in order to counteract monopolistic tendencies in the outlets it is in the public interest; if it is used to reduce the number of outlets in order to create an illusion of “exclusiveness”, it is harmful.

The public's principal safeguard against the abuses of two-part charging is competition, which makes exploitation impossible. Where there is little competition, the abuse of two-part charging merges itself into the general problem of the control of monopoly. We cannot take up this subject here in all its ramifications. It is sufficient to point out that in the cases where the two-part tariff is most common there is already some machinery of control. In industry the outstanding case of two-part charging, the shoe machinery case, is based on patent rights; and there already exists under the patent legislation provision for the control of abuses which might well be tightened up. Elsewhere two-part charging is most common in public utilities, the price policies of which are usually subject to regulation in one way or another. Two-part charging can be of great benefit to the public; all that is needed is control adequate to prevent abuse of the power it confers on those who use it.

¹ *Joint Committee of the House of Lords and House of Commons on Gas Prices* (H.L. 24, 91, H.C. 110), 1937, para. 16.