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Monopoly and Differential Prices

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Source: *The Economic Journal*, Vol. 21, No. 81 (Mar., 1911), pp. 139-148

Published by: [Wiley](#) on behalf of the [Royal Economic Society](#)

Stable URL: <http://www.jstor.org/stable/2222094>

Accessed: 16/01/2015 15:49

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conditions are above the average standard, and the accommodation is strictly limited, so that women are tempted to employ fair means or foul to obtain work. It is degrading for workers to have to cadge for work, and when relief-works are in the hands of private charitable persons there is considerable risk of plausible dissimulation being over-successful.

There is no excuse for perpetuating in women's relief-work the evils which were recognised and abandoned in dealing with men, and one cannot but hope that the Local Government Board may see fit to insist upon the Distress Committees taking action where there is need, and not arbitrarily closing down in one particular month without any reference to the actual extent of distress, or to the provision needed to meet it. The problem is a serious and pressing one. If in the near future no attempt is made to train the women so that they may be able to obtain work when the period of relief is over, the State is simply creating a system of subsidising wages while conferring no lasting benefit on those relieved. What is wanted, once for all, is to abandon the old bad policy of giving doles of work at the crisis of destitution, and in its place to organise a system under which the period of temporary distress may be used as an opportunity for industrial training.

JEANNETTE TAWNEY

MONOPOLY AND DIFFERENTIAL PRICES.

PROFESSOR EDGEWORTH's paper on "Applications of Probability to Economics," in the *ECONOMIC JOURNAL* for September, 1910, raises some very interesting questions in regard to the theory of monopoly and differential prices. Not only have his investigations a bearing on the theory of railway rates and charges for electricity, etc., but, as pointed out on p. 462, they have a bearing on the question of Socialism. Quoting Professor Pareto's conclusion that, under a Socialist *régime*, "Economic goods will be distributed according to the rules which we have discovered in studying a *régime* of competition. . . ." "Prices will reappear," or "will at most change their name," Professor Edgeworth continues, "But we have seen that a regulated discrimination of prices, such as might conceivably be practised by a Socialist Directory, but is not possible in a *régime* of competition, tends to increase the sum total of utility." (*E.J.*, Vol. XX., p. 462.)

The subject is a very difficult one, and full of traps, so that I have great hesitation in venturing to put forward anything in the way of criticism of Prof. Edgeworth's theses as presented in that article, but I proffer the following remarks in the hope that they may help towards the clearing up of difficulties.

A distinctive feature of Prof. Edgeworth's article is the argument that discriminating prices can be advantageous without reference to joint cost of production, and independently of the principle of increasing returns. My argument is that increasing returns, or joint costs, must come in in some way or other if discrimination is more advantageous than uniformity of charge based upon cost of production. I do not dispute the main part of Professor Edgeworth's arguments, which have reference to the comparative advantages of discrimination and uniformity when production is monopolised. But I question whether any system of discrimination can be better all round than the prices which would be attained under free competition in the absence of any tendency to increasing returns or of joint costs.

If a bridge costs a certain sum of money, and, once built, can carry an indefinite number of passengers, will it not be better to charge what the traffic will bear rather than to have a uniform system of tolls? Evidently some bridges will be worth building on the latter system, which would not be worth building with uniform charge. Therefore, there may be greater advantage to the public, provided the proprietors can be prevented from enriching themselves overmuch. This, however, is dependent on the fact that the cost of transport over any one bridge is such that increased traffic does not involve increased cost in proportion, and a bridge is necessarily something which costs an appreciable sum of money—an increase in the number of bridges is necessarily a matter of steps of appreciable magnitude.

A similar, though not quite identical case, is that of steamships. The charges for freight have some relation to the principle of charging what the traffic will bear, because there is not enough valuable traffic, as a rule, to enable large steamers, running frequently and regularly, to fill themselves with the most paying kinds of cargo. Large steamers are more economical, in proportion to the amount they can carry, than small ones, and regularity and frequency of service are important factors in the utility of the service rendered. For these reasons it is impossible for any shipowner to pursue permanently a policy of cutting the rate on the more valuable kinds of cargo, in the hope of filling his ships with only the best paying cargoes, and so to force down the

cost of transportation for all goods to a common level per ton or per cubic foot. But if the law of increasing returns did not operate in regard to the size of steamers, freights would be reduced to a merely cost basis per ton or cubic foot, regardless of the quality of the goods carried, because a high rate of freight for the highest class of goods would tempt some shipowners to cut the rate on this class and fill small steamers with only this class of goods. If I understand Professor Edgeworth correctly, he would imply that even in such a case as this there might be advantage to the public in a system of discriminating prices that could be arranged by a monopolistic owner of all ships acting with some restraint. The first of the theses (p. 443 *loc. cit.*) is that :—

“very likely a system of prices can be assigned, such that both the monopolist and his customers may gain by discrimination. The gain to consumers may well be so great that they are better off than they would have been, other things being equal, under a *régime* of competition.”

And, further, on p. 460, it seems to be stated that this would apply even though the law of constant or of diminishing returns prevails in production.

Now, in the case supposed, if the cost per mile per ton is uniform for all sizes of steamers, free competition would make all freight charges equal to that cost per ton-mile, and it is difficult to see how any discriminating system of charges could be better for the public. They could not gain unless some freight were carried at less than cost price, which could not be socially economical.

Other cases of beneficial discrimination seem, on analysis, to come down to the same principle. Thus, in the case of supply of water to a town, if the most economical supply (*i.e.*, the lowest cost per gallon) is one which would not be fully utilised by any system of uniform charges which would cover the cost, some degree of discrimination in charges would be justified; but not otherwise, unless one based them on the wholly different principle of charging less to the poor than to the rich. Omitting this consideration, there would be no case for discrimination apart from the fact that increased supply did not involve proportionate increase of cost.

If lawyers, with offices and establishments to keep up, will take business for poor clients at a lower charge than for richer ones, again it might be a case of non-commercial recognition of

the fact that the marginal utility of money is less for the rich than for the poor. But leaving that out of consideration, the case seems analogous to that of the steamships already mentioned. Rich men's business, like valuable cargoes, does not offer with sufficient regularity and frequency to enable cut-rate lawyers of good standing, if there are any, to have the most economical kind of establishment and to keep it steadily employed, on that class of business only. Assuming strict commercial competition, it does not seem as if charges could vary apart from time and trouble required, unless there is, up to a point, increasing returns in the magnitude of the establishment and impossibility of getting more than a limited amount of one class of business.

Railways are analogous to steamships, only the unit is still larger. But there comes probably a point at which increase of traffic on a railway system will involve at least proportional increase of cost, because proportionate capital expenditure will be involved. When this point is reached, ought the system of charges to be made uniform, so far as a unit of service can be discovered?

Not at once, for then the traffic would fall off and the lines would cease to be fully occupied. The existing differential system which had produced the traffic should be maintained, but if further increments of traffic were attended by more than proportionate increments of total cost, the low rates should be gradually raised, but uniformity would not be desirable until a uniform system would allow of sufficient traffic and sufficient revenue to cover all costs.

I have spoken of the law of increasing returns and of joint costs as the bases of justification for differential prices, but it would be more correct to say a condition of production such that an increased supply of certain articles or services would make easier an increase of supply of other articles or services, or of a further increase of the supply of the same articles or services. That is to say, if cost of production of x_1, x_2 , etc., units, either of different commodities, or even of the same commodity, supplied to different customers, depends not only on x_1, x_2 , etc., but also on the total scale of production $Z (= x_1 + x_2 + \dots)$, i.e., on $F_1(x_1, Z)$, etc., a bounty is theoretically right if $\frac{\delta F_1}{\delta Z}$ etc., are negative, even though $\frac{\delta F_1}{\delta x_1}$ etc., be positive; and if the bounty is not to be obtained from an outside source it should be got by a system of differential charges according to the relative in-

elasticity of demand of the different customers (c.p. Pigou's geometrical treatment, E.J., Vol. XX., pp. 358 to 370).

C. F. BICKERDIKE

MR. BICKERDIKE'S criticism is forcible and fairly aimed; yet I hope to show that it is not very damaging. His main contention is thus stated:—

"My argument is that increasing returns, or joint costs, must come in in some way or other if discrimination is more advantageous than uniformity of charge based upon cost of production."

"I question whether any system of discrimination can be better all round than the prices which would be attained under free competition in the absence of any tendency to increasing returns or of joint costs."

"It is difficult to see how any discriminating system would be better for the public."

"It [such a system] could not be socially economical."

In considering the truth and relevancy of this statement, it

will be convenient to have before us one of the diagrams¹ employed in the article against a part of which the statement is directed. Let the axis of x in this diagram represent (quantities of) a commodity for which the law of production is not that of increasing returns. The axis of y representing price, let the

¹ Fig. 2, *Economic Journal*, vol. xx. p. 447.

"demand-curve," for the sake of simplicity, be a straight line. This line is not drawn in the figure, but it may easily be constructed from the line BA , which represents *half* the amount of commodity demanded at any price. Thus there would be demanded at the price OR , *twice* the amount RP , and at the price $O\omega$, *twice* the amount ωa . To consider discrimination of prices, let us suppose that the class of commodity breaks up into species which differ in respect to the demand of the customers, but not in respect of cost to the producers; for instance, equal hauls of goods, equal in weight, bulk, and facility of handling, and all other circumstances affecting cost, but differing in the value which they acquire by transportation. Let the *dotted* lines form each the demand-curve for one of the differentiated species. Then the *average* of the amounts of the two species demanded at any one-and-the-same price (*e.g.*, $O\omega$) is represented by the corresponding point on the line BPA (*e.g.*, the point a , since $\frac{1}{2}(Oa_1 + Oa_2) = Oa$). Beginning with the case in which the cost is constant, let us suppose the constant cost to be $O\omega$. If then the uniform charge based on cost of production is $O\omega$, Mr. Bickerdike's statement, as I understand, imports that this unitary price cannot be replaced by a system of different prices for the different species; with advantage to all concerned, both producers and consumers.

The truth of this statement may be shown by observing that if the customers are to benefit by discrimination, one at least of the prices must be lowered below $O\omega$. Suppose, then, that the price of one of them, *e.g.*, that for which the demand-curve is B_1PA_1 , is lowered from $O\omega$ to $O\omega'$, ω' being a point on the axis below ω , not shown in the figure. And let the intersection of a horizontal drawn through ω' with the demand-curve B_1PA_1 be a_1' , a point on that line below a_1 , the point a_1' as well as ω' being left to the imagination of the reader. The gain in Consumers' Surplus is then measured by the area of the quadrilateral $\omega a_1 a_1' \omega'$. But the loss of Producers' Surplus is measured by the larger area of a rectangle which includes that quadrilateral, namely, the rectangle (not completed in the diagram) of which one side is $\omega\omega'$ and another side $\omega' a_1'$. Therefore, the public as a whole, producers *plus* consumers, are losers. *A fortiori*, if the cost is not constant, but increasing (in accordance with the law of decreasing returns).

Mr. Bickerdike's proposition is true, and it may be added, with reference to State regulation of what M. Colson calls "public works," important. But is it contradicted by the proposition which Mr. Bickerdike impugns? The answer is *primâ facie*

affirmative. Mr. Bickerdike has accurately quoted the passage in which it is enunciated that "the gain to consumers [through monopolistic discrimination] may well be so great that they are better off than they would have been, other things being equal, under a *régime* of competition." He has rightly understood that the proof primarily applied to the case in which there is no cost of production is meant to be extended to the general case of substantial cost. He is right, too, in conceiving my thesis to imply that in the case supposed the producers as well as the consumers would be better off than under the *régime* of competition. He has placed a very natural interpretation upon the passages which he criticises. It would have required a degree of intellectual sympathy beyond what can be fairly expected in a critic to have thought of the explanation which I proceed to offer.

The interpretation of the impugned thesis turns upon the definition of two terms, one of which has received different definitions from classical writers, while the other has, perhaps, not generally been used in any definite sense. These terms are: (1) "cost-of-production," and (2) that which is predicated of the customers of the discriminating monopolist when it is said that "they are better off than they would have been, other things being equal, under a *régime* of competition." J. S. Mill sometimes employs the term "cost of production" to denote the outlay of the capitalist-employer—the Ricardian "capitalist"—on labour; exclusive of "the reward of abstinence."¹ What if our $O\omega$ represent *this* kind of cost of production! Then the selling price would be well above the point ω ; and there would be room for that drop of (one) price, which the fulfilment of the thesis requires. No doubt we ought to include among the "other things that are equal" in the monopolistic and competitive *régime* payments of interest made to lenders who take no risk. But we cannot suppose the remuneration of the *entrepreneur* proper to be among those equal things. If a set of *entrepreneurs* form by combination a

¹ J. S. Mill, *Pol. Econ.*, Book III., ch. 1, § 1.—"The cost of production, together with the ordinary profit, may therefore be called the *necessary* price or value of all things made by labour and capital."

Ibid., "unless that value is sufficient to repay the Cost of Production and to afford, besides, the ordinary expectation of profit the commodity will not continue to be produced."

Ibid., par. 3, "the outlay [of the producing capitalist] that is the cost of production."

In a later passage, Book III., ch. 4, § 4, par. 1, Mill includes profits in cost of production. In the following section, par. 1, he hesitates between the two definitions.

monopoly, it is to be supposed that their gains are replaced by what is called in the article under consideration monopoly profit. Likewise, in the converse change, monopoly profits are replaced by *entrepreneurs'* gains. The preconception that these gains were substantial was naturally present to one who has consistently maintained¹ that the remuneration of the *entrepreneur* is not to be equated to zero. I am aware that from the point of view of one who surveys all time, the "quasi-rents" enjoyed by the *entrepreneur* appear as the reward of work and waiting. And if the true rents tend to be evanescent with the progress of freedom and education,² what remains of gain proper to the *entrepreneur* may be so minute and invisible as not to be worth disputing about. But it may be questioned whether we have yet approached this limit. There is weight in some observations which Professor Lehfeldt has recently made on this subject³ :—

Modern writers on economics have been inclined to describe a class of *entrepreneur*, who is head of a business and yet buys capital as he buys labour and materials. Now this type, though an important one to describe, is hardly to be found pure . . . "financiers' profits are to be classed with true rents."

Thus the conception of a surplus normally accruing to the *entrepreneur* is not altogether untenable.

But, indeed, I was not thinking specially of perfectly normal competition, but of competition in a more general sense, as opposed to monopoly—not so much "industrial competition" as defined by Cairnes, as that "commercial" competition which he conceives to act among the members of what he calls "non-competing groups." The profits accruing to members of such groups may be described in the phrase of Mr. J. A. Hobson as "forced gains."

As a type of this case, imagine an island on the shores of which seaweed of rare quality is periodically deposited by the unlaborious sea. The inhabitants, each owning a strip of the coast, exchange seaweed for foreign goods. Competing against each other in what may be called a perfect market, they set up a uniform rate at so much per ton of weed. Now let the competing islanders form a monopoly by combination; and let the monopolistic Directory discriminate between two species of weed, before sold indiscriminately. There is apt to result benefit

¹ Most recently in "Scientia" (Rivista di Scienza), Vol. vii., Ann. iv. (1910), pp. 92-94; a passage which may be referred to for further elucidation of the idea expressed in the here following paragraph.

² As Mangoldt's *Unternehmungsgewinn* seems to suggest.

³ ECONOMIC JOURNAL, Vol. xx. (1910), p. 554 and p. 558, and contexts.

all round, to both producers and consumers, as compared with the original competitive *régime*.

The existence of "forced gains" may properly be postulated with reference to the controversial passage about Socialism which Mr. Bickerdike has quoted. This is a dialectical rejoinder to the individualistic argument that under a Socialist *régime* values and the distribution of goods would be much the same as at present. Now, those against whom this argument was directed mostly believe in the prevalence of "forced gains" in the present system. Accordingly, the rejoinder would not be convincingly rebutted by a contention which presumes the absence of such gains.

But, indeed, the rejoinder (to the individualist argument) is more than an *argumentum ad hominem*. The rejoinder does not depend altogether on the proposition disputed by Mr. Bickerdike—that there may be beneficial discrimination in the absence of joint cost or increasing returns. For the character of increasing returns is present wherever there are "supplementary" or general, as distinguished from "prime" or special costs; that is very generally in the modern industrial world. Whether we consider the establishment (and education) of lawyers, or the plant of railways and waterworks, "there is, up to a point, increasing returns," as well remarked by Mr. Bickerdike; and accordingly relative value is apt to be altered by discrimination. It is true that some discrimination may occur in a *régime* of competition. Our islanders before their combination might possibly have hit upon the plan of selling the two species of seaweed at different prices. Mr. Acworth has adduced some remarkable instances of differential prices occurring in the present *régime*.¹ But it will be admitted that such discrimination occurs more readily and effectively under a *régime* of monopoly. It is conceivable, then, that a Socialist Directory should have an advantage in this respect over individualist competition.

Altogether, whatever dialectical value may belong to the passage about Socialism is not much affected by Mr. Bickerdike's observations. Perhaps they were not intended to bear on this passage.

As he has remarked, the main part of my arguments have reference to the comparative advantages of discrimination and uniformity when production is monopolised. I have attempted to investigate some of the conditions on which this comparative advantage depends. With reference to the method of that inves-

¹ *Railway Economics*, ch. ix.—As to discrimination in a *régime* of competition, see the article here all along referred to; *ECONOMIC JOURNAL*, vol. x., p. 460, *note*.

tigation, I am glad to have the present opportunity of again acknowledging obligation to Mr. Bickerdike's article on Incipient Taxation.¹ In the course of the investigation it appears that the comparative advantage does not rest so fundamentally, as sometimes conceived, on the principle of joint cost or increasing returns. For example, suppose the State to own and work two distinct railways or canals, similar as touching their cost, but differing in respect of the demand for transportation. Probably in such a case the State might prescribe a different scale of rates on two lines, with benefit to the public as a whole. The benefit need not depend at all on joint cost or increasing returns. We might suppose, for the sake of illustration, natural waterways for which the costs of construction and all *general* expenses, involving the possibility of increasing returns, are negligible. The benefit depends on a quite different principle, the avoidance of that *perte sèche*, in M. Colson's phrase, that loss of Consumers' Surplus which is incident to a unitary price. That the benefit may be measured by comparison with the state of the customers as it "would have been, other things being equal, under a *régime* of competition"—whatever that may mean in the case supposed—is at best a secondary proposition.² It is an *obiter dictum* not worth disputing about, but for its accidental connection with more important topics to which attention has been called by Mr. Bickerdike.

F. Y. EDGEWORTH

THE CENSUS OF 1911.

A FORECAST OF ITS RESULTS.

It is an unbroken tradition of the ECONOMIC JOURNAL to contain a forecast of the population revealed by the Census. Dr. Longstaff³ came within 0·2 per cent. in his estimate of the population of the United Kingdom in 1891, and Prof. Cannan⁴ within 0·6 per cent. in 1901.

We have constructed the following table for the intercensal period 1901–11.

¹ ECONOMIC JOURNAL, 1907, p. 101; *cp.* ECONOMIC JOURNAL, 1908, p. 399 *et seq.* 1910, *loc. cit.*

² So described, *loc. cit.*, p. 448, par. 2.

³ ECONOMIC JOURNAL, Vol. I., p. 382.

⁴ *Ibid.*, Vol. XI., p. 230.