

# Industrial Location and Economic Potential

By Colin Clark

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# Industrial Location and Economic Potential

*By Colin Clark*

Some of those who advocate the merits of the free market as a medium for the allocation of resources seem virtually to have made a religion of it. One might to some extent sympathise with their case if they based it on the right of men to dispose of their labour and property as they choose. Most free market economists, however, do not base their arguments on the principles of justice and freedom, but on the maximisation of welfare. This, of course, should be the object of all economists—those who hold that the principle of welfare should be excluded, and economics treated as a purely “positive” discipline, present a case which is both uninteresting and difficult to follow—and a healthy reaction back to welfare economics is now in progress. But any claim that the free market must necessarily maximise welfare under all circumstances is a dangerous one.

The more moderate advocates of the free market (the present writer included) present a practical, not a theoretical, case. Human nature being what it is, the free market has nearly always in the modern world given better results, in terms of economic welfare, than planned or regulated economies. This being so, its application should be extended; but cautiously, and always watching for its possible limitations. In judging the limits of operation of the free market, we must go beyond the primary qualification of needing a government to maintain order and enforce contracts, without which indeed civilised life is impossible. To maintain active competition, essential to the free market, other conditions are also necessary. A competitive economy is only possible with a large

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population (and is facilitated by further population growth), which is literate, and held together by a well organised network of transport, communications and finance. The rulers of small, sparsely-populated and non-literate communities will inevitably have to resort to a certain amount of government regulation and planning, as did the rulers of medieval cities. However, their belief that their crudely-planned economies represent the most advanced form of modern social organisation is mistaken; in fact, they represent a primitive form of economy, due to be replaced as soon as possible by competitive markets.

In the advanced countries also there is a problem which the free market fails to solve correctly: namely, that of location, or the distribution of industry and population over the available land.

### SLOW-MOVING ADJUSTMENTS

The free market fails in this respect partly because adjustment is completed so slowly. The essential basis of the free market is trial and error, with the consequences of a mistake quickly becoming apparent in the form of reduced earnings, inducing a subsequent correction. Now, this cannot be described as a satisfactory method of organizing the economy when it takes two centuries or more for the consequences of a location decision to work themselves out. This is no exaggeration.

Lösch, the German economist who has made the best and fullest analysis of the economics of location, pointed out that the present location of industrial population in Europe is largely determined by the distribution of agricultural population in the 18th century (though with the important exceptions of Ireland and Southern Italy). In Britain, during the 19th century, industries sprang up (though many have since disappeared) around the coalfields in hitherto sparsely-populated areas. But, apart from these, Lösch's generalisation holds fairly precisely in this country: substantial industrial growth has occurred mainly in those areas which already had a dense agricultural population, of four men or more at work per hundred acres of farm land, in 1831.

## ECONOMIC EXTERNALITIES

Apart from the slowness of these economic adjustments, the other factor which may prevent the free market from giving the best solution of location problems is the principle of “economic externalities”. If A sells something to B, whether it is labour or land or anything else, at a price they have agreed between them, economists generally recognise this action as socially beneficial. Admittedly, the sale is made to B, rather than to C or D. But, in a free market, they could have made competing offers to A, and did not do so. The sale has gone to the highest bidder, who will probably make the best use of it.

Economic externalities arise, however, when the transaction between A and B has a substantial effect on the welfare of C and D *without* their having had an opportunity to bid in the market. Most economic externalities, let me hasten to add, are beneficial, in which case we call them “external economies”—such as the growth of a more elaborate and more sub-divided economic organization, from which many people besides the original transactors can benefit. Such beneficial externalities often justify subsidies or temporary tariff protection for infant industries.

A remarkable example of the importance of “externalities” was recently given by Professor Berry in Chicago.<sup>1</sup> He points out that, in the area surrounding Chicago, the location decisions of no more than twenty leading retailers during the next year or so will inexorably control the locations of some 20,000 lesser retailers for the next 25 years.

Modern retailing, indeed, provides a particularly striking case of externalities, with the location decisions of one or two large firms attracting many others to proximity with them. Oxford City Council made a very wise decision in 1953 in proposing prohibition of further large-scale retail development in Cornmarket Street; and Mr. Macmillan, as the responsible minister, made an outrageously wrong decision in over-ruling them. For excessive concentration of business in a small area, though it may appear

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1 North Eastern Illinois Planning Commission, *Metropolitan Planning Guide Lines, Commercial Structure*, p. 94.

satisfactory for those who are trading there, creates a very harmful economic externality: namely, congestion, inflicting losses on many people who may themselves be neither buying nor selling in the congested area. Oxford City Council were clearly aware of this, and Mr. Macmillan was not.

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Advances in traffic engineering now make it possible to make reasonable guesses about the aggregate loss, in the form of delays, higher wear and tear and fuel consumption, etc., inflicted on other road users by the entry of each additional vehicle into a road system during the rush hour, and have shown how very serious these losses can be in certain areas.

Congestion appears in two forms. The first is the heavy traffic congestion appearing in certain limited areas. In London, this applies not only to the central districts, but also to all the principal road junctions within about five miles of the centre (the area known to traffic engineers as “the gluepot”). However, there is also another type of congestion, which can affect very wide areas, in which, even if traffic is not actually jammed at road junctions, nevertheless there is not enough open space for recreational purposes, and the agreeableness of towns and villages suffers from excessive building. This state of affairs may be described as “zonal congestion”. Plans for dealing with both local and zonal congestion will be proposed later.

Not only in the relatively small-scale growth of retail trading areas, but also in the growth of cities and industrial regions, a few decisions at an early stage may determine an immense number of other decisions, far into the future. Myrdal<sup>2</sup> is right in pointing out that the power of a city to attract further industrial and commercial development now mostly arises because it grew more rapidly in the past than did numerous other such places where growth could equally well, or better, have been started:

The start met with success. Thereafter the ever-increasing internal and external economies – in the widest sense of the word, including for instance, a working population trained in various directions, lively

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2 *Development and Under-development*, Cairo, 1950.

communications, a feeling of growth and elbow room and the spirit of new enterprise, etc. – fortified and sustained continuous growth at the expense of other localities and regions, where instead relative stagnation or regression became the pattern.

### IMPORTANCE OF POPULATION GROWTH

Population growth can cause hardship in an agricultural society with a limited area of land, which cannot change its production methods or its system of land tenure. In industrial societies, however, it is economically beneficial. Economists, who in this respect (though in hardly any other) are still attached to the 19th-century concept of Diminishing Returns, are only now beginning to recognize this. One would have thought that the phenomena of regional growth proved this point all too clearly. Industrial regions with rapidly-growing population have, largely because of this growth, proved altogether too prosperous, and attracted too many migrants from other regions, to the point where some deliberate check on their growth has become necessary.

This proposition is even more clearly demonstrable on a world scale, when one considers how many regions really have the power to attract manufacture. This does not mean supporting some industries working for a local market, aided by tariffs and other political privileges, but attracting manufacturing industries capable of selling their goods competitively on a world market. The number of such manufacturing regions in the world is still very small. Most of the manufacture in Europe lies along an axis running from Glasgow to Milan, with a small offshoot north-eastwards into Denmark and Sweden, and some growth in Russia. In the United States, although there is now a powerful industrial region around Los Angeles and signs of further growth in other western areas, most of the development has been along the Chicago-Connecticut axis. Another axis runs along Southern Japan (most of the rest of the country is now declining in population), while manufacture capable of export is beginning to appear around Bombay and Calcutta. This list covers most of the manufacturing regions (according to our definition) of the world.

Victorian geographers taught that the location of industry was determined by the availability of coal, and some are still saying so (the time-lag in academic thought can be almost as great as the time-lag in location itself). Proximity to coalmines became relatively unimportant even in the later 19th century, as transport became cheaper, and now the availability of cheap alternative fuels has made coal almost irrelevant. However, the pattern of industrial location based on 19th-century coalfields will persist, just as the pattern of 18th-century agricultural populations has persisted.

How can other areas compete against these established manufacturing regions, with their populations rapidly growing and all the external economies of specialized labour, transport, finance, etc., which they offer to newcomers manufacturers? A dense and growing population, an adequate educational level, a good system of transport and communications, both internally and giving access to world trade routes, appear to be essential. Even with all these, it is difficult to join the “Industrialists’ Club”, as Japan and India have found. One can sometimes buy one’s way in by quoting exceptionally low wages as Japan did. Another example of such entry into the Club was early 18th-century Lancashire, then (though not in the later 18th century) a very low-wage county compared with the rest of England. At that time also, high money wages in London prevented the concentration of industry there which occurred later. It must be remembered that big differences in money wages between neighbouring countries or regions are nearly always accompanied by substantial differences in the cost of living, so that the differences in real wages are much smaller than the differences in money wages.

If we could re-establish really striking differences in money wages today, to bring them even further above the national average in London and Birmingham, and even further below it in Scotland and Wales, we could perhaps do a great deal to re-locate industry. But this is unlikely to happen through a process of negotiations. Since trade unionism became powerful, it has suffered from what Lösch called a “passion for uniformity”, which, unintentionally, has accelerated the movement of industry from the outlying to the



central regions.

Intellectual time-lags in academic teaching are also displayed by those who still teach the theorem of Weber, who constructed an apparatus with cords and pulleys to show how a manufacturer could choose his site according to the relative weight of his fuel, raw materials and products, and the supposed single locations from or to which they had to be transported. The amount of attention attracted by this idea is probably another manifestation of the Edwardian obsession with heavy industry from which many of us still suffer. Only in a very limited number of industries does the weight of the products to be transported play any significant part in location decisions. For the great majority of industries other causes are at work, which will be sought below.

### CLASSIFYING INDUSTRIES

A classification of industries simplifies and disposes of Weber's and allied theorems. Some use materials which are bulky, perishable or otherwise difficult to transport. These nearly always yield a product which is relatively much easier to transport. Such industries are defined as "materials-oriented", and it is common sense to locate them near the source of their materials. Saw milling, sugar-beet crushing and ore processing are examples of materials-oriented industries.

"Market-oriented industries" produce unusually bulky or perishable commodities, and must therefore be located near their markets. Bread baking, ice cream, concrete blocks and soft drinks are examples. In a small and densely-populated country like Britain, however, this distinction is not very important. In this country, such goods may be transported to a neighbouring region, though they are unlikely to be carried over the whole length of the country, as most other industrial products may be.

The remainder of industries, comprising in fact the great majority, belong to neither of these two categories. To these, the American adjective "foot-loose" is well applicable. They can afford to transport either their materials or their products, over a considerable distance, if they have reason to do so. How then do

they choose their location?

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To the industrialist, distance matters (otherwise, he would not mind where he was located). But it matters much more than the crude measure of payments per ton-mile for transport costs indicates. Besides payment for transport itself, he incurs other “distance costs” in reaching markets: the time and effort of the travelling salesman, the customer’s fear of late delivery, and so on. Likewise, the industrialist incurs distance costs in purchasing his inputs. His employees must, of course, be available within daily travelling distance, while if repairs to vital equipment depend on the provision of parts and service by a specialized firm situated some distance away, a comparatively small delay in their reaching him may cause a serious loss of production.

Much more research has to be done before we can properly analyse these factors. Nevertheless, in considering possible locations for any industrialist who is not firmly materials-oriented or market-oriented, we can start by using the aggregate income of each region within his reach as a measure both of its value as a market and of its ability to supply him with various inputs. We may consider also the “distance costs” of reaching these regions, which will not be strictly proportional to distance as such—some distance costs are incurred in trading with a firm only a mile away.

Now we may borrow a concept from physics. The electrical potential at any point is the sum of all electrical charges around that point, each divided by its distance from the point in question. The *economic potential* of any point is similarly defined by summing the regional incomes around it, each income having been divided by the distance cost of reaching it.

### THE CONCEPT OF ECONOMIC POTENTIAL

The idea of economic potential was developed in Chicago in 1952 by Professor Chauncy Harris, Professor of Geography, and myself. Professor Harris developed some interesting applications in the United States, including a potential diagram based only on agricultural incomes, which indicated very well the optimum

location for plants manufacturing heavy agricultural equipment. However, the work was not continued; but the idea was recently revived in New Zealand by Dr. Elkan.<sup>3</sup>

Being aware of the slow adjustment of historic locations to be expected in the older countries, Dr. Elkan points out that the workings of location theory should be more obvious in newly-settled countries like Australia and New Zealand, especially when they are settled by a homogenous population, without marked social or regional divisions. His method was to take the “primary” production—that directly obtained from natural resources, agriculture, grazing, fishing, mining and hydro-electric power—in each of the six Australian States, and in the two islands of New Zealand, to express the net value of manufacturing production in each area as a multiple of its primary production, and to explain the relative importance of industrial production thus obtained in terms of the economic potential of the regions considered. He applied a similar analysis to the Canadian Provinces.

Dr. Elkan’s work was occasioned by the proposal for a customs union between Australia and New Zealand. Although Australia entered the present discussions in a highly arbitrary manner, refusing in advance to consider those important agricultural products of which New Zealand is the lower-cost producer, the talks are still proceeding, and agreement has been reached on some commodities. Dr. Elkan’s alarming conclusion was that, just as Australian manufacture has already largely become centralised in the two leading industrial States, so with a customs union New Zealand would lose nearly all the manufacturing industries she now possesses. Even the strongest free-trader would hardly wish to go so far as that.

Dr. Elkan used what was, in effect, a reciprocal of economic potential, in the form of a “transportation index”, measuring the purchasing power of each market *multiplied* by the transport costs of reaching it. His figures for Australia can be improved by analysing them into materials-oriented, market-oriented and foot-

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3 New Zealand Institute of Economic Research, *Technical Memorandum No. 8*, July, 1965.

loose industries. For each £1 of primary production there is found just under £0.2 of production in materials-oriented industry, with this ratio being fairly constant for all States. The market-oriented industries are defined to include some products which are transported between States, though at substantial expense. Here the ratio was about 0.6 in the central States of Victoria and New South Wales, falling with increasing distance to 0.3 in Queensland, then rising again to nearly 0.4 for Western Australia, the most distant State. Extreme distance provides “transport protection” in the local market for the market-oriented industries. Similar results were obtained in Canada, with some upturn in employment in market-oriented industries in the two most distant Provinces, of British Columbia and Newfoundland.

The conclusions are most striking for the foot-loose industries. Per pound’s worth of primary production, the central States of Victoria and New South Wales had £1.7 worth of production in foot-loose industries, the two comparatively central States of South Australia and Tasmania £0.9, and the remote states of Queensland and Western Australia £0.3 only.

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A preliminary calculation of potential has been made for the United States, using Dr. Elkan’s technique of measuring total manufacturing production in each State as a proportion of primary production. Here this ratio moves over a 500-fold range, from a minimum in South Dakota to a maximum in the north-eastern industrialised States. Even in the United States historical patterns are important, and the 19th-century industrial States of Massachusetts, New Hampshire and Rhode Island still have more manufacture than would be expected from their present potential. The formula predicts fairly well the low industrialization of the remoter States. However, the Pacific-coast States of California, Oregon and Washington are now more highly industrialized than one would expect from their potentials. Further analysis is now desirable to show how much this is due to the presence of market-oriented industries enjoying transport protection, similar to that in Western Australia and British Columbia.

Lösch, working in the United States in the 1930s, pointed out that many American manufacturing industries were at that time irrationally over-centralized. Manufacturers did not take distance costs sufficiently into account, and attempted to supply the whole country from one location. Whether or not Lösch's criticism was true, decentralization of a firm's manufacturing activities, which may be economically unjustifiable when the market is small, tends, other things being equal, to become more justifiable as the market enlarges, as it has so greatly in the subsequent decades. Moreover, during this period transport costs have risen relative to manufacturing costs, encouraging further decentralization of production in commodities whose transport costs are significant. This factor may explain comparatively high industrialization in the remotest States on the Pacific coast, but not in the less distant western States.

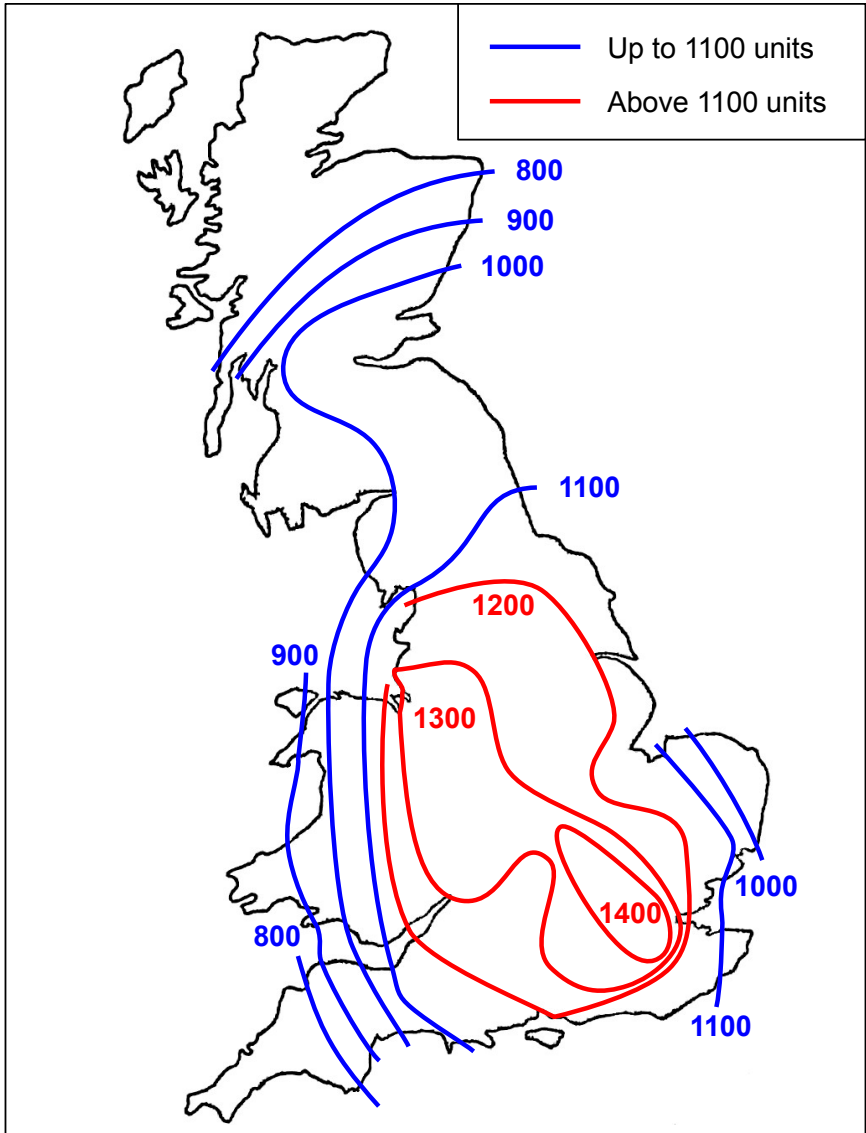
#### ECONOMIC POTENTIALS IN BRITAIN

Calculations of potential can also be made for Britain on the basis of the aggregate personal incomes of regions.<sup>4</sup> The factors for division (which are required only to show the relative, and not the absolute, costs of journeys of different lengths, the final measure of potential being in arbitrary units) are based on the supposed transport costs from the region under examination to all other regions in Britain, and to the nearest major seaport for export trade, for a ton of goods, at £1 for a journey of 25 miles or less, plus 2.4 pence (£0.01) per ton-mile up to 200 miles, plus 1d. per ton-mile beyond that.

The economic potential of the various areas of Britain, approximately calculated, is shown on the map on page 12 below. The "contour lines", it should be stressed, are drawn in terms of completely arbitrary units; the higher the figures of the contour lines demarcating any region, the greater its economic potential. The concentration of high potential along a ridge running north-westwards across the country is very clearly marked.

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4 Incomes were obtained from the Report of the Board of Inland Revenue for the year ended 31 March, 1962 (with corrections in the subsequent Report).



**Potentials in Great Britain**

We now examine the extent to which *potential* controls changes in manufacturing employment.<sup>5</sup> The areas demarcated by the various potential contours can be read approximately from the map. Next, the country was divided up into all the clearly distinguishable industrial regions, down to total populations of about 50,000, and residual rural regions. A full description of the areas covered would take too much space here, and only the principal ones are shown in the table on page 14 below. The word “periphery” for the major cities indicates the choice of an area very much wider than the “conurbations” belatedly introduced by the Census Office in 1951, which were out of date before they were introduced. Thus, the Greater London periphery is considered to extend from Maidenhead to Southend.

The table gives a very interesting result. The rate of increase of manufacturing employment in the zone of highest potential has indeed been checked. Ever since the Barlow Report of 1940, the government has to a certain extent discouraged industrial growth in already congested areas. In any case, industrialists expanding during the war naturally preferred to be away from the main city centres. This high potential area grew at an increased rate in the 1953-1958 period, though in the subsequent five years the rate of expansion, both of Greater London and of Greater Birmingham, has been slowed down. Similarly in the United States, New York and Chicago (but not Los Angeles, the third largest industrial centre) have shown rates of growth below those of other cities.

It is equally clear, however, that, throughout the whole period since 1931, the rate of expansion has been high in the next two zones, whose potential lies between 1150 and 1300 units. Among the principal districts included in these areas, slow growth in the Leeds-Bradford area, Tyneside and the Potteries has been offset by very high rates of growth in the Southampton-Portsmouth area, and in Kent and Sussex.

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5 Data relating to employment were obtained from the employment exchange records of the Ministry of Labour for the last two periods, and from the censuses for 1931 and 1951. Full tables for the former are being published in *Town and Country Planning* shortly by G. H. Peters and J. M. Bradley.

	Manufacturing employment in 1964 '000	Percentage increase in manufacturing employment (per quinquennium)		
		1931-51 %	1953-58 %	1959-64 %
<b>Potential over 1300</b>				
Whole area	4,500			
London and periphery	2,057	8.4	7.1	4.0
Birmingham and periphery	997	11.7	19.4	6.1
Manchester and periphery	846	3.8	-2.0	-2.7
Liverpool and periphery	315	11.7	8.3	2.2
Southern rural	87	11.1	24.1	21.2
Median rates of increase		5.2	8.3	4.4
<b>Potential 1225-1300</b>				
Whole area	872			
Potteries	112	9.7	-3.1	3.7
Bristol	102	8.2	5.6	2.7
Southampton-Portsmouth	97	9.3	15.7	13.4
Median rates of increase		9.3	11.5	12.3
<b>Potential 1150-1225</b>				
Whole area	1,530			
Leeds-Bradford	430	2.7	-1.5	1.0
Tyneside and periphery	269	18.4	9.0	1.0
Notts.-Derby coalfield	224	8.8	4.2	8.3
Leicester	161	5.5	1.9	8.4
Kent-Sussex rural	147	6.9	32.9	25.2
Median rates of increase		8.8	9.0	9.0
<b>Potential 1000-1150</b>				
Whole area	1,408			
Glasgow	294	3.3	3.1	-7.5
South Wales	246	22.8	3.1	15.5
Central Scotland	196	3.0	2.8	4.5
Sheffield	180	11.1	5.0	2.8
Median rates of increase		7.0	4.0	5.6
<b>Potential under 1000</b>				
Whole area	299			
Plymouth	31	7.0	4.0	13.2
Norwich	30	1.2	4.0	4.4
Median rates of increase		5.0	4.0	4.4



A potential of 1150 units, on this arbitrary scale, appears to constitute a clear dividing line. Outside it lie the whole of Scotland, most of Wales, the remoter parts of Northern England, Devon and Cornwall, and part of East Anglia. Satisfactory rates of growth obtained in South Wales and Plymouth do not compensate for the general lack of industrial progress in other regions. While the partial check to the growth of London and Birmingham is welcome, it is desirable to check them further, and the plight of the outlying areas remains serious.

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When it was suggested earlier that some form of government intervention in location was necessary, this was certainly not meant to imply that we needed the nationalization of land, or the regulation of all land transactions by a Land Commission. In Britain, there are literally millions of transactions in land and real estate every year, and an attempt to regulate them directly would require an organization large and intricate beyond belief.

Moreover, direct regulation, even if applied to a limited number of transactions, could not work efficiently. The administrators, however able and honest they were, would not know all the facts; and industrialists, in many cases, would be quite happy to leave them in their ignorance. The only safe assumption is that the administrator can never hope to know all the facts concerning the question of whether a particular industrialist really has a strong case for wishing to locate in London rather than, say, in Scotland. What, however, government can do is really to test his willingness by imposing a tax on one location and offering a bounty on the other. A proposal of this nature has been made previously, and should be re-stated.<sup>6</sup>

In recent years, the government has given incentives to industrialists to locate in depressed areas by concessions on depreciation allowances or direct grants on investment. While this may have had some good results, it is not the best way to go about it. What we particularly want is more *employment* in the depressed areas, not necessarily more industrial profits or capital assets.

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6 Clark and Peters, *Town and Country Planning*, March 1964.

A system of pay-roll taxes and rebates is the best way of dealing with this problem.

### THE SELECTIVE EMPLOYMENT TAX

Since the proposals mentioned above were first prepared, the government has introduced its own legislation for pay-roll taxes and rebates, but for quite different purposes: namely, to raise a substantial amount of revenue, and to encourage manufacture, at the expense of the service industries. This latter object might be simply in pursuance of the good old-fashioned ideas on economics which many people who ought to know better appear to hold: that service industries are inherently undesirable in comparison with manufacture, which produces a material product. These ideas, however, have been reinforced by those of the more sophisticated younger economists in the Department of Economic Affairs, to the effect that manufacture is the sector of the national product with the highest rate of growth of productivity, and that therefore we ought to have more of it, to raise the general average rate of growth. What happens, according to these thinkers, if we manufacture goods which we then find we cannot sell, is not quite clear; perhaps the presumption is that they will be forced into the export market. Others explain the whole elaborate procedure as an indirect way of subsidizing exports without infringing our treaty obligations under GATT. If so, it is a remarkably roundabout and costly way of doing it, and involves subsidizing a great many non-export manufactures as well.

A general pay-roll tax would be very desirable, at a time like this, in order to penalize "labour hoarding" by employers, which does great economic harm. But not the present proposals. They will make it far worse, for labour is being hoarded principally by manufacturers, not in the service industries. From the point of view both of economic efficiency and of social justice, moreover, a pay-roll tax ought to be proportional to earnings, and not levied on a *per capita* basis: on the one hand, to discourage the hoarding of skilled labour, which is particularly scarce, and, on the other, so as not to penalize too severely the present employment of part-timers,

pensioners or the infirm.

Finally, from the regional point of view also, the new tax will be harmful. The poor and remote areas which need help are relatively much more dependent on service industries than on manufacture.

### REGIONAL PAY-ROLL TAXES AND REBATES

Against this background, let us return to our proposals for regional pay-roll taxes and rebates. They should cover self-employed as well as wage and salary earners. However, the incomes of the self-employed and the salaries on pay-rolls already subject to high marginal rates of income tax should be assessed, for the present purposes, at not more than, say, £1,500 per year, since otherwise the result would be an impracticable addition to already high income-tax rates. The system would have to cover existing as well as all newly-established businesses, if only in order to prevent industrialists claiming a subsidy by closing down and re-starting their firms.

The rates of tax or rebate would have to be high to provide the necessary incentives, though to prevent a sudden disruption of business the full rates would come into operation only after ten years of equal annual changes (as with the tariff reductions in the EEC). They would thus constitute an additional consideration in employer's long-range planning, which is what we would be trying to influence, since we could naturally not expect results within a year or two. The taxes and rebates should be calculated according to a precise algebraical formula, to be regarded as immutable. If the rates were made discretionary, the result would be yet more pressure groups, making the politician's life intolerable.

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Three factors have to be considered in fixing the rates. The first is the extent of local congestion, indicated by the average population density within a ten-mile radius. In order to avoid imposing an unreasonably high tax on areas like Central London, however, it is proposed that the square root of the population density should be used as a scaling factor.

It is also important to consider “zonal congestion”, which results when industrialists tend to choose sites which may not be in heavily-congested neighbourhoods, but are concentrated in a very limited number of zones, particularly those round London and Birmingham and the area between them. Among the reasons for choosing a site within about seventy-five miles of a major centre are transport considerations (the convenience of a commercial vehicle being able to make a return journey in the same day). While these reasons may be perfectly valid for the industrialist, the resulting concentration has serious social consequences, which the tax should be designed to eliminate. The total population within a seventy-five mile radius should, therefore, be taken into account when deciding whether to operate a tax, or a rebate.

The third factor is the local labour situation. Economists have generally paid little attention to the effects of labour shortages in certain areas, but there may be serious repercussions on a national scale, and the establishment of industry in such areas should be strongly discouraged, as well as being rewarded in areas of serious unemployment. However, we need more than a simple formula based on the local unemployment rate. A more efficient method of attaining our object is to use the reciprocal of the unemployment figure, so that a district with 5 per cent. unemployment would be rated at 0.2 on the tax scale, while a district with a labour shortage and an unemployment rate of 0.5 per cent. would be rated at 2 (on the grounds that an increasing labour shortage has an accelerating harmful effect on the economy).<sup>7</sup>

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7 The full rate (coming into force after ten years) of taxes or rebates (negative quantities in the table below), as percentages of pay-roll in each area, should be calculated according to the following formula:  $3.33(X - 0.9) + (Y - 12) + 11/(Z - 0.534)$ , where X = the square root of average density of population residing within a ten-mile radius in thousands of population per square mile of land area; Y = total population residing within 75-mile radius in millions; Z = local unemployment percentage averaged over the last five years. The three terms represent the local congestion factor, the zonal congestion factor, and the local labour factor. The choice of numerical coefficients was dictated by the need to provide a fund which would approximately balance, creating no net revenue for, nor net burden upon, the Treasury.

To illustrate how these proposals might work out in practice a random sample of specimen areas is given in the table opposite, the rates of tax or rebate being calculated by using the formula given in the footnote above.<sup>8</sup> In this selection of areas, the district in which employers would pay the heaviest rate of tax would be Hammersmith, a heavily-congested part of West London. At the other end of the scale, a 17 per cent. rebate might tempt firms to settle in the remote Shetlands. In between, a tax of just over 1 per cent. would be levied on pay-rolls of businesses in Worthing on the south coast, and a small rebate granted to employers in Sleaford, in rural Lincolnshire.

If the full rates were in operation, the highest tax would be perhaps 20 per cent. of pay-rolls, and the maximum rebate 17 per cent. If all employers in a district incurred costs of this nature, they would to a great extent, pass them on to their customers—but this would also be the case with the rebates, and there should be no net effect upon the *national* price level. The net effect on costs in the export industries might well be beneficial, as they are, on the whole, probably located away from the most congested areas. However, *local* price levels would be considerably affected. There would be a further rise in the cost of living in London and Birmingham, and a substantial fall in Scotland and Wales. These changes would provide an additional encouragement for people to live in remoter regions, rather than in congested areas.

Whether these consequences are regarded as desirable or not, they must be accepted as inevitable if the twin problem of congested and depressed areas is to be relieved.

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Colin Clark

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8 The calculations used local unemployment figures for 1962. More recent figures, however, do not make any serious difference to the results.

Specimen rates of pay-roll tax or rebate in certain areas  
(Percentages of pay-roll)

	Local congestion factor %	Zonal congestion factor %	Local unemployment factor %	Local tax or rebate (-) %
Hammersmith, London	13.3	5.3	2.6	<b>21.2</b>
Witney, Oxfordshire	- 1.1	8.3	11.0	<b>18.2</b>
Romford, Essex	4.2	4.4	2.6	<b>11.2</b>
Reading, Berkshire	0.0	7.3	2.9	<b>10.2</b>
Stockport, Cheshire	5.0	4.4	- 0.1	<b>9.3</b>
Welwyn Garden City, Hertfordshire	1.0	5.6	2.6	<b>9.2</b>
Farnham, Surrey	0.1	4.9	2.6	<b>7.6</b>
Leeds, Yorkshire	3.7	3.1	0.6	<b>7.4</b>
Alton, Hampshire	- 0.9	5.1	2.9	<b>7.1</b>
Tipton, Staffordshire	5.9	2.0	- 1.3	<b>6.6</b>
Swale, Kent	- 0.9	2.5	1.2	<b>2.8</b>
Liverpool, Lancashire	4.5	1.4	- 3.5	<b>2.4</b>
Stratford-on-Avon, Warwickshire	- 0.8	1.5	0.1	<b>2.2</b>
Worthing, Sussex	0.0	3.2	- 1.9	<b>1.3</b>
Sleaford, Lincolnshire	- 1.9	- 0.7	1.7	<b>- 0.9</b>
Richmond, Yorkshire	- 1.9	- 0.4	- 3.5	<b>- 5.8</b>
Sunderland, Durham	5.1	- 8.3	- 2.7	<b>- 5.9</b>
Abergavenny, Monmouthshire	- 0.8	- 4.2	- 1.8	<b>- 6.8</b>
Sixth, Lanarkshire	3.1	- 7.6	- 3.0	<b>- 7.5</b>
Tranent, East Lothian	0.6	- 7.4	- 1.3	<b>- 8.1</b>
Totnes, Devon	- 0.6	- 10.3	- 0.1	<b>- 11.0</b>
Brecon, Brecknockshire	- 2.2	- 6.9	- 2.3	<b>- 11.4</b>
Amble, Northumberland	- 1.5	- 8.8	- 2.7	<b>- 13.0</b>
Shetlands	- 2.2	- 11.9	- 2.9	<b>- 17.0</b>