THE NATURE OF ECONOMIC REGIONS

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Impressed by the accidental way in which states are created and smashed, we are looking out for a more natural and lasting spatial order of things. Geographical and cultural regions, however, are from an economic point of view just as artificial units of reference as states are. True enough, they all are of some economic relevance, but this does not alter their essentially non-economic nature. Important as their balance of payments, their price levels, their barter terms of trade may be for them, to *us* these averages and aggregates are entirely arbitrary and accidental. It is independent economic regions that we here discuss, regions not derived from but equivalent to those political, cultural, geographical units.

Even if we already knew the characteristics of economic regions —which we do not—their counterparts in the world of reality would be likely to differ more from each other than from an ideal picture. Hence studying the ideal region is both the only way to learn about the *essential*, and the first step towards investigating the *actual* structure of any real economic region. So we shall deal first with the theoretical nature of such regions, and second with their actual existence.

I

Let us start from very radical assumptions in order to prevent any spatial differences of an uneconomic origin from hiding in our starting points. We assume a vast plain with an equal distribution of raw materials, and a complete absence of any other inequalities, either political or geographical. We further assume that nothing but self-sufficient farmyards are regularly dispersed over that plain. How can any spatial differences possibly result from this initial situation?

Supposing one of those farmers tries to produce a certain commodity beyond his needs, will he be able to sell the surplus? He will be helped by the economies of large scale production, and handicapped by costs of transportation. Will the balance be in his favor? If his neighbors all have a similar way of living, the demand curve of one of them will be typical for the others as well. Let us assume d in Figure 1 to be such an individual demand curve for beer. OP being the price at the center of production P, the demand of the people living there will be PQ. PR being the freight from P to R, the demand of each of the people living in R is RS. Farther out, at F, where the freight is PF, no more beer will be sold. Hence PF is the maximum shipping radius for beer, and the total demand within that radius is equal to the volume of the cone which we get by rotating the triangle PQF around PQ as axis. Figure 2 shows that cone. To repeat: its volume, corrected for the density of population, is equal to the total possible demand if the price at the factory is OP. For other prices at the mill we get other cones of demand, and as a final result the curve Δ of Figure 3, that represents the total demand as a function of the price at the mill. π of Figure 3 is a so-called "planning curve," showing the minimum costs at which a given output could be produced if a new factory had to be built for that purpose. Only if the planning curve π intersects or is to the left of the total demand curve Δ, is it possible for our farmer to run a brewery. Otherwise he would produce at a loss.

The shape of a trading area, however, is not a circle, as we have so far assumed. For even if the whole country were filled up with such circular areas that are close enough to just touch each other, a number of people could still successfully try to enter the brewing business. For all the black corners in Figure 4 are left unused, and moreover, as has been shown by Chamberlin,[1] the size of the

[1] For those not acquainted with Chamberlin's theory it may be worth while to point out that his argument is based mainly on two facts: (1) Due to product differentiation, of which differentiation of the seller's location is just a special case, the demand curve facing the individual seller is not horizontal (as in pure competition where the product is perfectly uniform) but has a negative slope. If e.g. the seller raises his price, not all his customers will buy from his competitors as in a perfect market. To a number of them the special advantages (e.g. of convenient location) offered by him will be worth the higher price. (2) As long as the demand curve is to the right of the cost curve the extra profits thus possible

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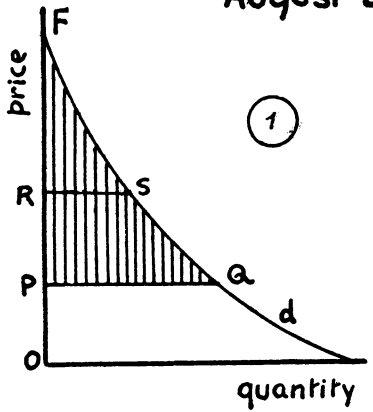

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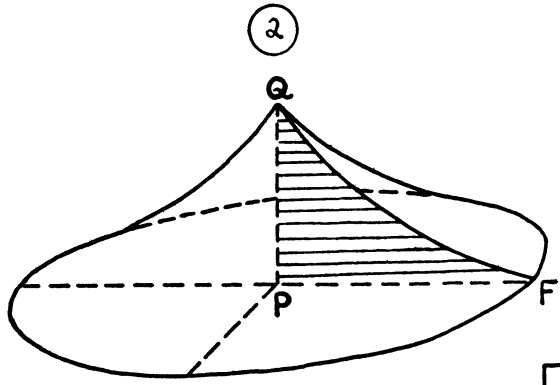

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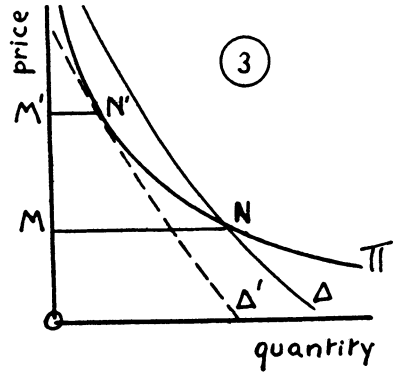

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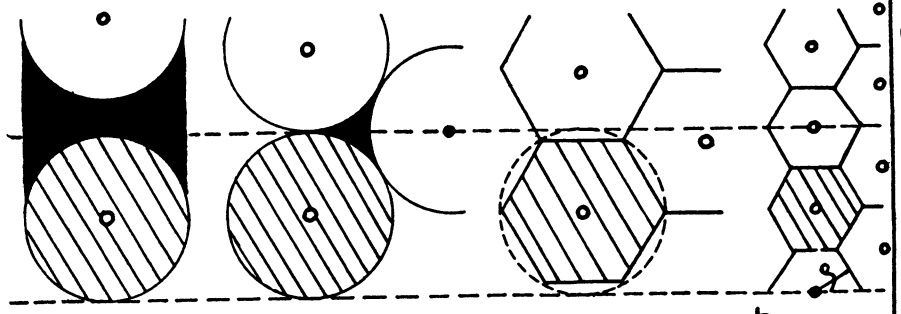


4

A: areas

area of supply — sales area

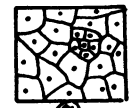
5

(milkshed)

6

B: nets of areas

unlimited — net limited — centers limited



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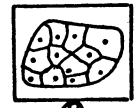
net proper (bakeries)



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belt (cotton gins)

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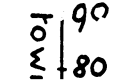
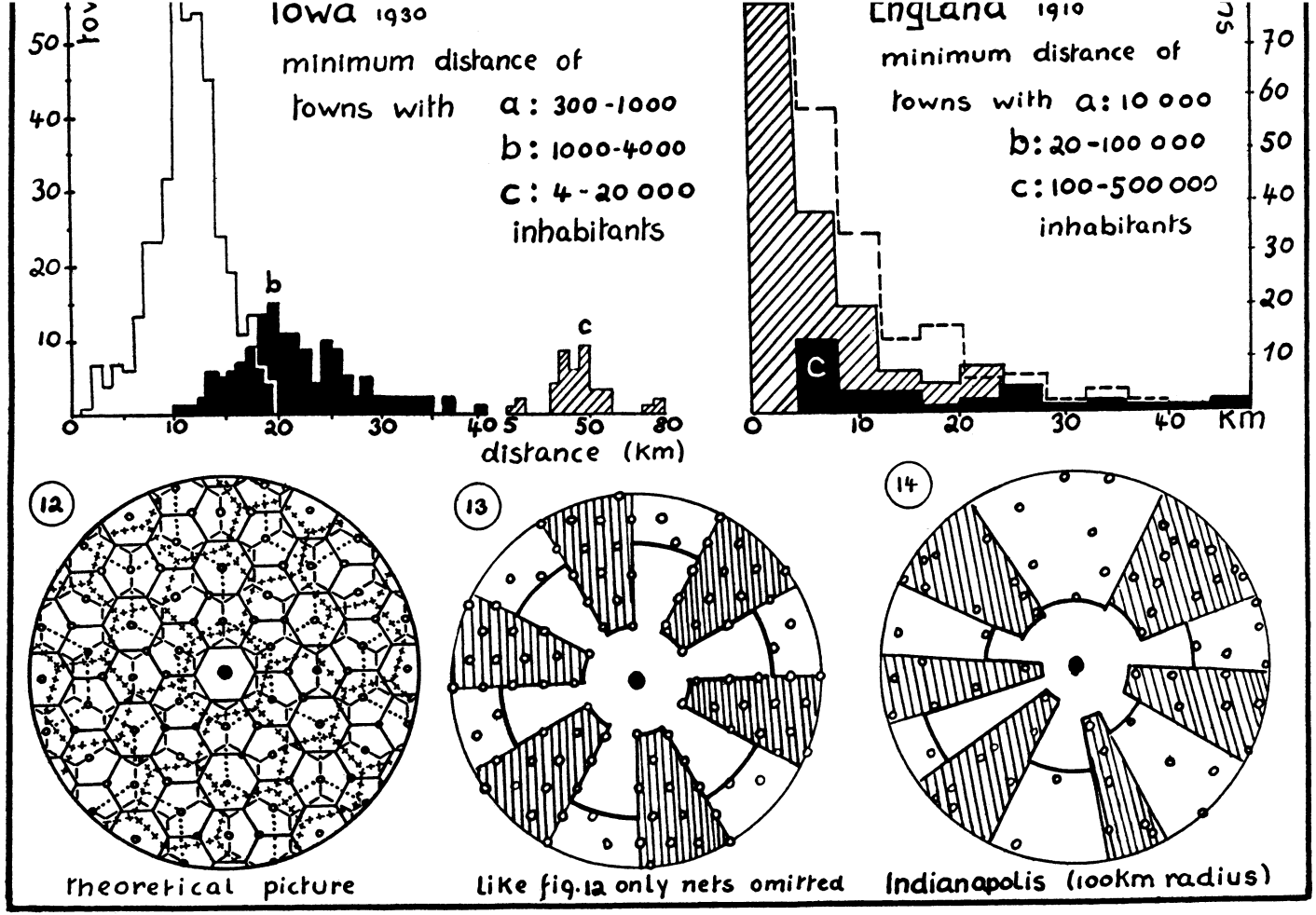
district (coal mines)

C: systems of nets

10

11





individual firm will be reduced from MN to $M'N'$ (in Figure 3) without rendering it unprofitable. The way to make use of the corners is to change the shape of the area into a regular hexagon. This will shift the curve Δ slightly to the left, as the hexagon is somewhat smaller than the circle that circumscribes it. Moreover, by Chamberlin's operation the size of the hexagon will be reduced until it is so small that the corresponding demand curve Δ' just touches the offer curve in N'. Now apparently no more people can enter the brewing business.[2] As the largest possible shipping radius results in a total demand MN, so the necessary minimum radius must yield the demand $M'N'$. Figure 4 shows the development from the largest to the smallest possible shipping range.

Two other possibilities of avoiding black corners are conceivable, namely the square and the triangle. But it can be shown[3] that the hexagon has an economic advantage over both: it affords the larger demand per square mile, provided the total area is the same in all cases. *The hexagon is, therefore, the most economical shape for trading areas.* For every commodity, a trading area in the form of a hexagon with a characteristic inner radius ρ is necessary and sufficient to render the production of this commodity profitable.

The trading areas of the various products look like nets of such hexagons, from very small ones to very large ones, depending upon the product. We can throw these nets over our plain at random. In spite of the resulting disorder, every place on the plain would have access to every product. Several considerations, however, which can only be mentioned here, suggest a more orderly and at the same time more economical arrangement. In the first place, we lay our nets in such a way that all of them have one center of

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will attract new competitors. They will sell products slightly different from those already in the market, or, as in our case, locate their businesses at places more convenient for part of the buyers. This will shift the demand curves of the old establishments to the left until they just touch the cost curves and all extra profits are wiped out. (See E. Chamberlin, *The Theory of Monopolistic Competition.*)

[2] We disregard here the possibility of reducing the area even more through spatial price discrimination.

[3] Whilst a more accurate and detailed proof is too lengthy for this short paper, the plausibility of our assertion can readily be seen from the fact that the regular hexagon has the advantage over the circle of using up all the territory, without departing as far from the ideal circular shape as either square or triangle.

production in common. This point will enjoy all the advantages of a large local demand. Secondly, we turn the nets around this center so that we get six sectors where centers of production are frequent, and six others where they are scarce, as is shown on Figures 12 and 13. This arrangement does not deprive any place of its access to every product, and at the same time provides for the best lines of transportation. It can be shown that the aggregate of freights is a minimum,[4] and the final result is a complicated but orderly system of market areas. How many of these self-sufficient systems will come into existence on our plain depends merely upon the commodity which has the largest necessary shipping radius, as long as there are no economic limits to the size of the central city.

More striking about our result than any particulars is the fact that we suddenly have crowds of economic areas on a plain which we deprived of all spatial inequalities at the outset. We first have the hexagonal market area surrounding every center of production or consumption. Second, we have a net of such areas for every commodity. And third, we have a systematic arrangement of the nets of market areas of the various commodities. It is the latter, the self-sufficient system of market areas as shown in Figure 12, that I should like to call the ideal economic region. How much of it we find in reality will be discussed in the second part of the paper.

II

As soon as we drop the assumption of a uniform plain, the size and shape of our market areas evidently become irregular. Moreover, if we no longer stick to the supposition of a uniform product, the individual areas for the same line of production overlap, and may consequently be full of holes particularly near the periphery. Yet there are numerous instances left where our assumptions are roughly fulfilled and where our results, therefore, must hold true without much modification, as factual investigations indeed seem to indicate.

[4] As more centers of production coincide more consumers are able to buy from local mills than under any other arrangement of the nets. Not only the mileage of transports but the mileage of lines of transportation as well is reduced.

Actually it is not quite accurate to compare the numerous market areas of a commodity to a net. Due to the overlapping just mentioned they often rather resemble fish scales or an irregular layer of slabs of slate. In spite of this modification the essential characteristics of a net are mostly retained, and as a matter of fact most of the maps showing trading areas that were prepared either by scholars or by business men do not give any consideration to the overlapping at all. Far more important than this modification of the structure of our nets are the changes in their extension. In some instances, for which bakeries may serve as an example (Figure 7), the nets still cover the whole territory under consideration. In fact, a survey made by the author of about half the American industry[5] would seem to indicate that the importance of this type of production is rather underrated. Nevertheless, the very nets or at least their centers are often compressed on a relatively small space, and we may speak then of belts and districts respectively. The former case may be exemplified by the net of the areas of supply of the cotton gins that is naturally limited by the cotton belt. And an illustration of the concentration of the centers of production only are the mines in a coal district (see Figures 8 and 9 respectively). Instead of tracing out the areas, which is a very difficult task, we can show their character just as clearly by measuring the minimum distance of their centers from each other. This is done in Figures 10 and 11, not for centers of a single production but for towns of a supposedly similar economic function. In Iowa, with its rather equal distribution of production, the distances between towns increase with their size, just as in our theoretical picture based on assumptions approximately fulfilled in Iowa. In England, on the other hand, the cities cluster in the coal districts and show the same distance from each other irrespective of size. Such concentrations of the nets or their centers may have purely economic reasons such as the advantages due to the proximity of many establishments of the same branch. But it may also be a reflection of the limited geographical extension of factors of economic consequence although not of economic nature. It is worth noting, however, that these non-economic

[5] It will be included in a forthcoming book on the laws of location.

factors and their economic reflections are not co-extensive. For instance, the area where cotton *could* be grown is larger than the actual cotton belt.

In addition to the limited size of the nets, and the overlapping of the individual market areas, a third deviation from the ideal pattern is worth mentioning. In our theoretical deduction we had to cope with the problem of how the various nets should be located, while the distribution of the centers of production within a net was conspicuous for its regularity. Actually this too is a problem, and a very difficult one at that. Neither of the two traditional instruments of determining the geographical distribution of production can solve it: the theory of location proper cannot because it is applicable only to a single establishment, not to a whole industry; and the theory of comparative costs fails because it is applicable only to trade between men, not between countries. The only adequate solution of the location of all the interdependent centers of production is a system of locational equations which the author hopes to present later.

The systems of nets come off worse in the real world than either the nets or the individual market areas. It is simply impossible to arrange all the irregular nets in such a way that they have at least one point in common. There exists nowhere either a city with a complete set of industries or a self-sufficient region. But this is not the worst. We could at least imagine and probably find a few actual cases where regions trade their specialties with each other through their central cities, and through them alone. In such an instance a systematic arrangement of towns as in our ideal region would still be conceivable. Actually, however, small places which in every other respect entirely depend upon neighboring cities are the centers of large market areas. As far as their particular products are concerned, even metropolitan cities or the whole nation may be tributary to those little places, the industries of which neither need nor attract a large local market. Furthermore, while the regional system of nets of market areas centers in a large city, not every big city dominates such a system. Many mining towns, for instance, have not much of an economic function towards their hinterland. In contrast with such special-

ized cities, a regional center is characterized by a variety of production and trade that links it to the surrounding country. If, now, we disregard all the market areas of the type just described, a substructure of economic regions is left. They *differ* from the ideal pattern in the important respect that there are not self-sufficient; they *correspond* to the ideal inasmuch as they too are based (1) on the advantages of a large local concentration of production, consumption or trade; (2) on the most economical layout of lines of communication.

This regional substructure can be discovered almost everywhere but it is not everywhere of equal importance. Its importance can be measured by comparison with those market areas that have to be eliminated from a regional analysis as was just pointed out. To give some examples: regionalism prevails in southern Germany.[6] The distribution of the undisputed regional centers: Frankfurt, Nürnberg, München, Zürich, Strassburg, with Stuttgart in the middle is very regular. There should be one more center to the south of München but the Alps make this obviously impossible. The rise of München over Augsburg that had the advantage of an earlier start is worth noting. München has the better location from the point of view of our theory. It is right in the middle of the region, and at the proper distance from the neighboring centers. The German Ruhr district, on the other hand, hardly displays any regional pattern whatever. According as the systematic or the chaotic distribution of the nets of market areas prevails in a given case, we may stress or disregard the regional substructure. From this it follows that while the regional concept will be most realistic with respect to some parts of a country, it would be difficult and not very useful to divide a state up into its regions.

Finally, as to the relation between economic and other regions, it is essential for the regional system of market areas to have a center. In rare and particularly fortunate cases these economic centers are the same time cultural and political ones, thus becoming the true heart of their region, as Paris is for France.

[6] This has very ably been shown by Walter Christaller, *Die zentralen Orte in Süddeutschland.*

III

To summarize, we found three main types of economic areas: simple market areas, nets of such areas, and systems of nets. Or, if we want to give a popular name to each, we may speak of markets, belts, and regions. In this sequence they become more complex, more self-sufficient, and unfortunately less real. On the one end there are the individual market areas, most simple, most real, and most dependent upon trade. The systems of market areas, or regions, on the other hand, are very complex; in an ideal case quite self-sufficient, but harder to find in reality. Many commodities are produced and traded outside of any system. And whatever systems we do find, overlap even more than the market areas of a single commodity. A clear economic region is a fortunate accident rather than a natural subdivision of states. Still, beneath a sphere of irregular market areas, we find a regional substructure of varying importance almost everywhere. Between the simple area of sale or supply and the full regional system is the net. The geographical extension of these nets or of their centers is often small. In this case these belts or districts of production or consumption are very conspicuous, but should still be distinguished from regions. A region is a system of *various* areas, an organism rather than just an organ.