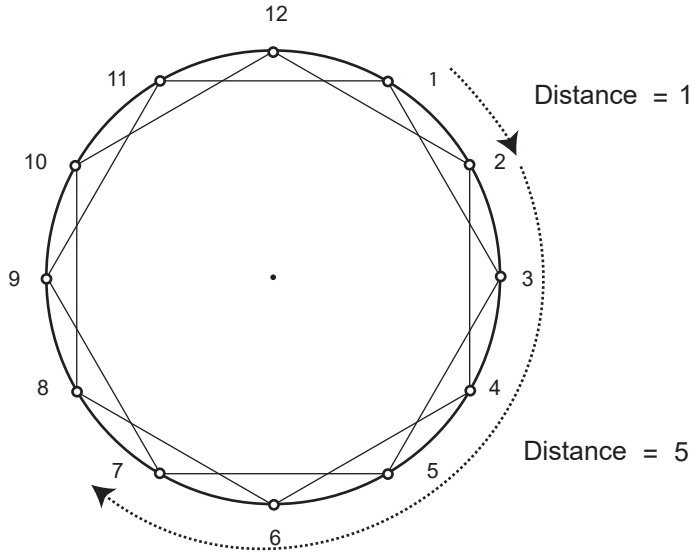


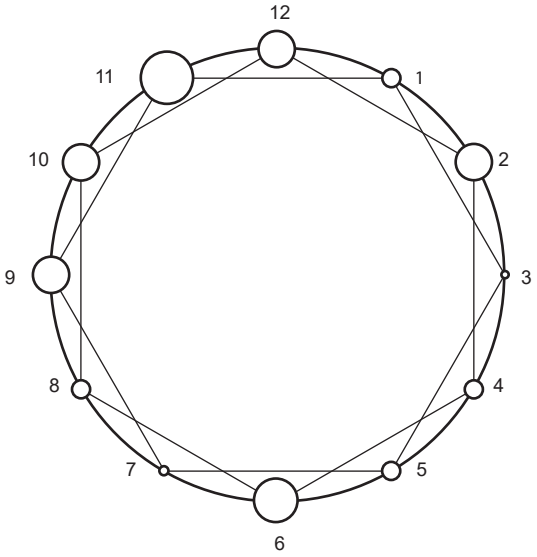
"... the choice of model represents a mixture of judgment and compromise. The model must be something you know how to make - that is, you are constrained by your modeling techniques. And your model must be something you can construct given your resources - time, money, and patience are not unlimited.[...] And how do you know that the model is good ? [...] it is a good model if it (p. 69) succeeds in explaining or rationalizing some of what you see in the world that you might not have expected. (p. 70) [...] You make a set of clearly untrue simplifications to get the system down to something you can handle; those simplifications are dictated partly by guesses about what is important, partly by the modeling techniques available. [...] But there are also costs. The strategic omissions involved in building a model almost always involve throwing away some real information. [...] And yet once you have a model, it is essentially impossible to avoid seeing the world in terms of that model - which means focusing on the forces and effects (p. 71) your model can represent and ignoring or giving short shrift to those it cannot. The result is that the very act of modeling has the effect of destroying knowledge as well creating it. A successful model enhances our vision, but it also creates blind spots, at least at first. (p. 72)."

"Dynamics in a Multi-Location Model" : " I choose the simplest setup that preserves symmetry : the locations are equally spaced around a circle, with transportation possible only around the circle's circumference. We let the distance between any two neighboring locations equal 1.[...] we consider ... the case of 12 locations, laid out like a clock face.(The number 12 was chosen because it is a fairly small number with a large number of divisors). In this case, the distance between location 2 and location 7 is 5..."

Development, Geography, and Economic Theory, 1995, p. 69-72 and p. 105-106

PAUL KRUGMAN : CLOCK GENERATED BY HIDDEN REGULAR HEXAGONS

FIGURE 1



PAUL KRUGMAN : RANDOM ALLOCATION OF MANUFACTURING WORKERS

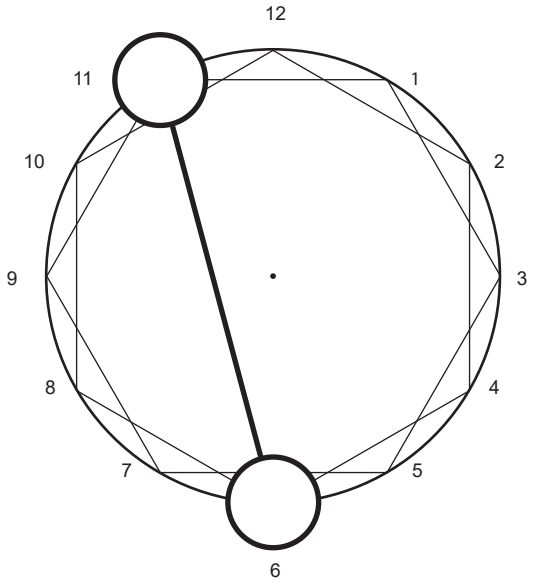
Assumptions of the model : 1) two sectors : agriculture and manufacturing 3) farm labor units be set equal to production 2) substitution of manufacturing and substitution of production 4) economies of scale in manufacturing 5) full employment 6) physical distance between locations 7) real wages 8) motion of manufacturing force.The short-run equilibrium is calculated employing five parameters : farm labor force, manufacturing force, share of manufactured goods in expanditure, transportation cost, elasticity of substitution.
Basically three parameters determine the share of manufacturing in each location :
1) goods in expanditure 2) transportation costs 3) large number of symmetric product varieties.

Centripetal force : "Agglomeration is favored by low transport cost ... large share of manufacturing ... strong economy of scale at the level of the firm [...] when transport costs are sufficiently low it is worthwhile for manufacturers to concentrate their production geographically...Once they have decided to concentrate production ... the optimal is one that other producers have also chosen."
Centrifugal force : inversely " the elasticity of substitution, is inversely related to the equilibrium degree of economies of scale. High elasticity of substitution works against agglomeration"

"I have adopted ... a Monte Carlo approach : start the economy with a random allocation of manufacturing workers across locations " ... on the clock (figure 1), with a sum of probability of workers in all locations $\sum = 1$

Development, Geography, and Economic Theory, 1995, p. 103-106

FIGURE 2

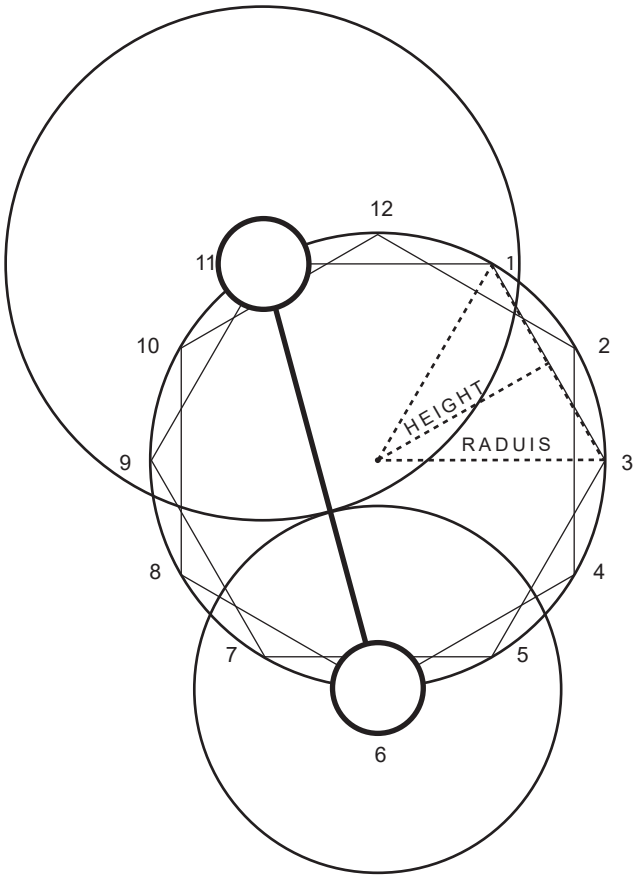


I have carried out a number of simulation experiments with a highly stylized economy in which locations are lined up symmetrically around a circle. For each simulation I began with a random of manufacturing across locations, then let the economy evolve ... When the parameters are such that several manufacturing centers typically emerge, however, they are normally roughly evenly spaced around the circle. That is, this linear economy spontaneously organizes itself into a pattern of central places with roughly equal-sized areas." (p. 63) [...] "The first set ... of initial random allocation of workers across location (figure 2) ...eventually organizes itself into two manufacturing concentrations [...] This puts the two concentrations almost but not exactly opposite one another on the circle."[...] (figure 3) "... it is evident that there is a process of reinforcement of initial advantage. Thus location 11, which starts with the largest share of workers, is able ... to attract still more workers and eventually take half of the total." [...] "A second city emerges at location 6." (p. 106) [...] "... the eventual pattern is one of two central places almost symmetrically placed." (p. 107)
"All this is for a one-dimensional economy, but I am ... highly confident that the same model extended to two dimensions would produce a (p.63) lattice of central places with hexagonal market areas : Lösch vindicated. I am less confident but hopeful that in a model with two or more manufacturing sectors characterized by different scale economies or transport costs the approach will yield Christaller-type hierarchies." (p. 64)

Development, Geography, and Economic Theory, 1995, p. 63-64 and 106-107

PAUL KRUGMAN'S HOPE : THEORETICAL RENOVATION OF CENTRAL PLACE THEORY

FIGURE 3



1) The implicit initial use of regular hexagons in rotation (August Lösch) to make the “clock” generates regularly spaced out and symmetric places on the circumference of the circle. But the "central places" (6 and 11) which appear by using the “numerical method” with a Monte Carlo approach are not symmetrically arranged on the circle. This contradiction between the project (symmetry) and the result (asymmetry) is not surprising because the exact mathematical solution of Walter Christaller’s problem shows that the probability to find a symmetric arrangement of places on a regular hexagon is equal to 0. All other solutions are asymmetrical.
2) The circles around the “central places” 6 and 11, which have unequal radiuses because of the asymmetry, are not in intersection. This impossibility ensues from the initial choice to space out regularly places on the circle (figure 1). It introduces into the use of the first hexagon (1, 3, 5, 7, 9, 11) a confusion between the length of the radius and the length of the height, this last one being considered as equal to the length of the radius of the second hexagon (2, 4, 6, 8, 10, 12). The used geometry makes impossible the construction of a system of regular hexagons fitting together (August Lösch). Furthermore, August Lösch's algorithm which allows to deduct by rotation more and more big hexagons is not respected because both regular hexagons initially used are equal.
Paul Krugman’s “hope” to find *in fine* a system of central places corresponding to Walter Christaller’s and August Lösch’s ideas by using its model with 27 equations and 11 parameters is frustrated in spite of the choice of initial conditions *ad hoc* and of the use of very powerful computer means.

Development, Geography, and Economic Theory, 1995

PAUL KRUGMAN'S DESPERATION ?
FAILURE OF HIS CENTRAL PLACE THEORY MODEL

FIGURE 4